3-3413

# A Survey of Flexible Manufacturing Systems Implementations

Dr. William P. Darrow\*

U.S. DEPARTMENT OF COMMERCE National Bureau of Standards National Engineering Laboratory Center for Manufacturing Engineering Factory Automation Systems Division Gaithersburg, MD 20899

\*Guest Worker from Towson State University

July 1986



**U.S. DEPARTMENT OF COMMERCE** 

NAL BUREAU OF STANDARDS

100 -U56

QC-

86-3413

1986



**NBSIR 86-3413** 

# A SURVEY OF FLEXIBLE MANUFACTURING SYSTEMS IMPLEMENTATIONS

Research Information Center National Bureau of Standards Gaithersburg, Maryland 20899

> NBS72 QUOO , USG 1986

Dr. William P. Darrow\*

U.S. DEPARTMENT OF COMMERCE National Bureau of Standards
National Engineering Laboratory
Center for Manufacturing Engineering
Factory Automation Systems Divison
Gaithersburg, MD 20899

\*Guest Worker from Towson State University

July 1986

U.S. DEPARTMENT OF COMMERCE, Malcolm Baldrige, Secretary NATIONAL BUREAU OF STANDARDS, Ernest Ambler, Director



#### ABSTRACT

This report presents descriptive data on three hundred manufacturing facilities that are using computer integrated manufacturing (CIM) techniques to machine component parts for commercial, industrial, and military products. Of these, 258 were categorized as Flexible Manufacturing Systems (FMS). Key descriptive statistics were gathered for each system. The data is organized into records by the user's country, company, and geographic location. Each record is made up of 24 fields that describe the facility, the product, and the operating parameters, as well as providing a reference to the source(s) of information. In many instances the information has proven to be sparse. Nevertheless, taken in aggregate, a picture of the state of the art for FMS has emerged from the study. This picture is reflected in the graphical summaries of the data, which are presented by region for Eastern Europe, western Europe, Japan, and the United States. An analysis of trends in FMS implementation, product and material characteristics, and materials handling technology is made for each the above regions.



TABLE OF CONTENTS	PAGE
Abstract	. ii
Acknowledgments	. iv
List of Figures	. vi
Introduction	. 1
Background	. 1
Objective	. 2
Benefits	. 2
Methodology	. 2
Scope and Limitations	. 3
A Working Definition of FMS	. 5
Comparisons and Contrasts Between the NBS and the ITA Report	. 6
Analysis of Survey Results	. 7
FMS Implementations By Region	. 8
Product Characteristics for FMS	. 11
Materials Handling Trends for FMS	. 13
Graphical Analysis of FMS Trends and Attributes	. 15
Summary and Conclusions	. 29
Appendices	
A. Data Base Schema and Data Dictionary	. 33
B. List of Abbreviations	. 35
C. FMS Implementation Data Base	. 38
D. Bibliography	.189



#### **ACKNOWLEDGEMENTS**

It is most appropriate to acknowledge the National Bureau of Standards (NBS), whose policies foster joint research projects with U.S. colleges and universities. In particular I would like to acknowledge Dennis Swyt, who was most helpful in securing an NBS appointment for the writer as a Guest Worker. Of equal importance was the contribution of the personnel in the Factory Automation Systems Division, especially Howard Bloom, Albert Jones, and Charles McLean, who were instrumental in establishing the project goals, and who have continued to offer encouragement throughout the life of the project.

Early on in the project contact was made with Thomas Gallogly and John Mearman of the Department of Commerce (DOC), Office of Capital Goods and International Construction Sector Group, in the International Trade Administration (ITA). The International Trade Administration had just completed the first draft of "A Competitive Assessment of the U.S. Flexible Manufacturing Systems Industry," (the ITA report) which has since been published. The ITA report had many of the same objectives as the present study. The Office of Capital Goods personnel cooperated fully with the author in preparing this report, including sharing a number of their source documents. There is no question that their support greatly strengthened the study at hand, and that the ITA report provided the most comprehensive study of FMS implementations published to date.

George Hutchinson at the University of Wisconsin-Milwaukee, who has done extensive research on Eastern European manufacturing technology, was kind enough to provide a number of his publications. His work has proven to be the single most valuable source of information available on manufacturing technology in the Eastern Block countries.

#### ACKNOWLEDGEMENTS (CONT'D)

Towson State University's Department of Business Administration provided moral support, and absorbed the mileage costs incurred in traveling between the university and both NBS and the DOC. These costs were substantial, and their contribution greatly appreciated. Charles Mott, the Department Chair, is recognized in particular for promoting research among the business faculty. The Faculty Research Committee, at Towson State, provided funding for the purchase of reference materials, which is gratefully acknowledged.

LIST OF FIGURES	PAGE
. Distribution of FMS Technology Based Upon Number of Systems	. 15
. Distribution of FMS Technology Based Upon Number Machine Tools	. 15
. Eastern Europe Number of FMS Machine tools	. 16
. Western Europe Number of FMS Machine tools	. 16
. Japan Number of FMS Machine tools	. 17
. USA Number of FMS Machine tools	. 17
. Eastern Europe Lot Size Distribution	. 18
. Western Europe Lot Size Distribution	. 18
. Japan Lot Size Distribution	. 19
O. USA Lot Size Distribution	. 19
l. Eastern Europe FMS Product Mix	. 20
2. Western Europe FMS Product Mix	. 20
3. Japan FMS Product Mix	. 21
4. USA FMS Product Mix	. 21
5. Eastern Europe FMS Materials Usage	. 22
6. Western Europe FMS Materials Usage	. 22
7. Japan FMS Materials Usage	. 23
8. USA FMS Materials Usage	. 23
9. Eastern Europe Part Cube Distribution	. 24
O. Western Europe Part Cube Distribution	. 24
1. Japan Part Cube Distribution	. 25
2. USA Part Cube Distribution	. 25
3. Eastern Europe Materials Handling Distribution	. 26
4. Western Europe Materials Handling Distribution	. 26
5. Japan Materials Handling Distribution	. 27
6. USA Materials Handling Distribution	. 27



#### INTRODUCTION

The introduction briefly summarizes the background, objectives, and benefits of this project. This is followed by a discussion of the methodology used to carry out the project. The scope, and limitations of this project are given, along with a working definition of FMS. This section also includes a comparison and contrast between this report and a related report produced by DOC/ITA.

#### Background

This research was done while the author was affiliated with the NBS as a Guest Worker. The work was first suggested by Howard Bloom, Charles McClean, and Albert Jones of the Factory Automation Systems Division of the National Bureau of Standards (NBS). The Factory Automation Systems Division is responsible for the continuing development of elements of a hierarchical control system for the bureau's Automated Manufacturing Research Facility (AMRF). The personnel working on the AMRF project have consistently maintained close communication with both industry and the academic community, and thus were very much aware of what was going on in FMS technology. However, they had never formally undertaken an international survey. These interests were consistent with the author's own interests in manufacturing research, and inspired the project at hand.

#### Objective

The objective of this research was to survey the existing literature on FMS implementations and develop a data base to assess the state of the art in flexible manufacturing systems. Included in this objective was the development of data for each system implementation that described the facility, the products, and the operating parameters.

#### Benefits

There are four main benefits expected to result from this work:

- 1. Providing a data base for further study of FMS implementations
- 2. Identifying broad FMS technological trends in terms of:
  - a) Design and implementation
  - b) Product characteristics
  - c) Materials handling systems
- 3. Providing additional data to assess the state of the art for FMS from an international perspective
- 4. Providing a bibliography on FMS implementations

#### Methodology

Appendix D of this report lists a data base of 300 records that was put together based upon the results of a literature survey. The data provides descriptive information on FMS system design in terms of the machine tools used, tool management, and the materials handling technology. Both the computer and control systems used are identified. In addition systems

capabilities such as real time scheduling, the use of alternate operations, automated inspection, and the use of adaptive control are noted. Product data is collected in terms of the part geometry, part cube, the material used to fabricate the part, production rates, and the part's product application. Management practices in terms of lot sizing, labor and machine scheduling, and financial justification are also included. All data is tied to the year of system implementation, thus providing the raw data for trend analysis.

A subset of the data base, consisting of 253 records which were classified as FMS, was used to develop a set of 26 graphs. The graphs were used to analyze broad FMS technological trends in terms of design and implementation, product characteristics, and materials handling systems.

An international perspective was provided for by partitioning the FMS data into four parts representing Eastern Europe, Western Europe, Japan, and the United States. While the main objective of the study was not to evaluate international competitiveness, this turned out to be a convenient framework for analysis.

The report includes a bibliography of 86 articles which were referenced by the data base. Each record includes a field with specific references to the appropriate source document(s). This provides a convenient way of locating additional information about a particular implementation, or about any subset of the data base. Further analysis is facilitated by the fact that this information is available on a floppy disk as a DBase III file.

#### Scope and Limitations

The scope of the report is limited to FMS that are used in machining, or metal cutting, applications. A number of FMS systems have been encountered in

both electronic and mechanical assembly operations. There have also been recent reports of FMS systems used for sheet metal and grinding operations. However, the vast majority of FMS continue to be in metal cutting operations, and that area serves as the focus of this report. The scope of the report is further refined below, where a working definition of FMS is developed.

The principal limitation was restricting this investigation to a literature survey. Other techniques would have included the use of survey forms, telephone interviews, and plant visitations. These other techniques were ruled out, as a practical matter, due to lack of funding for the project. This limitation did not turn out to be as severe as it was first thought to be. The region most affected by lack of funding was the United States, where other means of data collection would be most applicable. However, data for US implementations was readily available in technical publications.

A second limitation is the lack of complete information. This is especially true of the Eastern European countries. There is no question that this region's numbers are understated due to the lack of published information on advanced manufacturing capabilities in Eastern Europe. This problem is quite serious. However, if the reader thinks of the information presented for the Eastern Bloc as a lower bound on their true capabilities, the report makes a contribution to an assessment of the state of the art for FMS implementation in Eastern Europe.

A third limitation is the rapid growth and diffusion of this technology, which appears to be exponential at the present time. This study represents a "snapshot" of the technology taken in the Fall of 1985, which can be used to understand the evolutionary trends in this industry.

#### A Working Definition of FMS

There is at present no consensus on a definition for FMS. The working definition in this report is a system defined by the following attributes:

- 1. A set of two or more general purpose metalworking machine tools
- 2.A host computer linking the machine tools to supervise computer numerical control (CNC) operations
- 3. An automated materials handling system, linking the machine tools and the other work centers in the system together

  This definition is virtually identical to that given in the <a href="Flexible">Flexible</a>
  Manufacturing Systems Handbook (22).

There are other attributes that are desirable, and in the future may be incorporated into a definition of FMS. For example:

- 1. Flexible scheduling
  - a. Alternate routings
  - b. Alternate operations
  - c. Real time schedule revisions
- 2. The ability to process a variety of parts
  - a. A number of parts in a given part family
  - b. A number of different part families
  - c. The ability to economically produce a lot size of one part
- 3. The ability to have random (non-unidirectional) flow of material
- 4. Automatic tool changing (ATC)
- 5. Adaptive control
- 6. Automated part inspection

Many of the systems reported in this study have one or more of these advanced features, and a few systems have all of the above capabilities.

The ITA report, "A Competitive Assessment of the U.S. Flexible Manufacturing Systems Industry," (14) and this report (the NBS report) share the objective of trying to develop descriptive information about FMS implementations. The main difference is in focus. The ITA report attempts to assess FMS technology in terms of international trade and competition, while the NBS report focuses upon FMS technology in terms of system design and operating practices. As a result, the ITA report is organized from the perspective of suppliers of FMS technology, while the NBS report is organized from the user's perspective. Differing objectives also lead to the inclusion of operating parameters in the NBS report.

There was also a highly significant difference in methodology. The ITA report is based largely on first hand information made by contacting FMS suppliers and users in the USA. Information on overseas implementations was obtained from reports submitted by both US foreign service officers stationed overseas, and from foreign embassy officials stationed in Washington D.C. Another difference in methodology is the availability of computer data base containing the results of this project on a floppy disk (DBase III format for IBM-PC compatible computers).

As previously acknowledged, the ITA report provided an excellent foundation, upon which this report was able to build.

#### ANALYSIS OF SURVEY RESULTS

There are 300 records in the data base. The analysis section is based upon a subset of the data base made up of 253 records. This subset is made up of all of the systems, for the regions of interest, that were classified as either a FMS or as a Flexible Transfer Line (FTL). Most of the other records included in the data base—were for Machine Cells (MC). The main reason for including Machine Cells in the study was to disseminate information on Eastern European manufacturing technology. This region has a significant level of activity in Computer Aided Manufacturing (CAM). However, as in other regions, many or the CAM facilities can not be properly classified as FMS.

Flexible transfer lines, as classified herein, are technologically the same as FMS. The only difference is that the FTL is dedicated to the production of one or two specific parts, while the FMS has demonstrated greater flexibility by producing a greater variety of parts. The main difference between FTL and a traditional transfer line is the use of general purpose machine tools in the former, and custom designed machinery in the latter. It is the flexibility of the FTL that makes it an economically viable alternative to the traditional transfer line.

The 258 records in the data base representing flexible systems were then sorted by region. The four regions used were Eastern Europe, Western Europe, Japan, and the United States (USA). A series of graphs, which are presented in the next section of this report, were developed to support the analysis that follows. There were five FMS implementations omitted from the analysis, four in Taiwan and, one in Korea. This was done to clearly focus attention on the Japanese systems, rather than to try and include the Japanese in an broader definition of an Asian region.

In order to have a common basis for comparison between regions, the number of machine tools in the FMS (or FTL) systems was used. For example, in evaluating product mix for a given region, each category of product was weighted by the number of FMS machine tools (not the number of FMS implementations) associated with the production of that class of product. If the number of machine tools for a given implementation was not found in the literature, a conservative estimate of two machines was used. This assumption was necessary, as omitting the records without machine tool counts would distort the analysis much more than any bias introduced through estimation.

The year of implementation is often difficult to assess through the literature. This comes about because there are several milestones in an FMS project that are newsworthy. When given, the date used was the date that routine production began. Otherwise the best date available was used. Unfortunately, in a number of cases it was necessary to take the date of the publication which first referenced the FMS as the year of implementation. Fortunately, the uncertainty about the exact implementation date does not obscure the underlying trends.

#### FMS Implementations By Region

When looking at the number of FMS implementations, shown in Figure 1, the West Europeans lead with 107 systems, an impressive 42.3 % of the total. The USA and Japan follow with 64 and 59 systems, representing shares of 25.3 % and 23.3 % respectively. Eastern Europe trails with 23 systems, which accounts for the remaining 9.1% of the reported FMS implementations.

Perhaps of greater significance is the fact that Western Europe leads all other regions in terms of the number of firms with FMS experience, with at

least 82 different firms having reported FMS installations. Both the USA and Japan have at least 59 firms with FMS experience, while only 13 unique firms were identified for the Eastern Block. Although economic conditions and government policy can greatly influence the growth and dirfusion of FMS technology, the number of firms with experience is a key factor in determining the potential of any region.

When the comparison is based upon the number of FMS machine tools, as in Figure 2, Western Europe loses share to both Japan and Eastern Europe, while the USA share remained essentially unchanged. This shift reflects the fact that many Western European FMS installations have only two machine tools. It also reflects the fact that the machine tool count for a large number of West European facilities was not available. In the latter case, a bias may have been introduced, as an estimate of two machine tools was used. The increase in Japanese share is not due entirely to a bias in estimation. Several Japanese installations have large numbers of machine tools under computer control. Using this method of comparison, Western Europe and Japan are roughly equal at shares of 31.5 % and 30.9 %. The USA is close with a share of 25.2 %, while Eastern Europe trails with a 12.4 % share.

The growth of FMS technology is shown for each region in Figure 3 thru Figure 0. Each figure plots the cumulative number of machine tools, for the given region, by year. Each graph is a stacked bar chart, including prismatic, rotational, and other systems. The other systems either handle both prismatic and rotational parts, or they are unclassified. The figures show a rapid exponential-like growth in both Western Europe and Japan. The USA also exhibits an exponentially shaped growth curve. However, the curve for the USA reflects a significantly slower rate of growth. The growth curve for Eastern

European countries shows a slow, nearly linear, rate of growth.

Eastern European systems are under represented in this report. This follows directly from the limited amount of published information available on Eastern European manufacturing technology in general, and in particular to policies relating to publication of technology related to their defense industry.

In comparing rotational versus prismatic systems, the former are found to represent a small but nearly constant proportion of the installations for all regions except Eastern Europe. In Eastern Europe, rotational systems predominated in the seventies, and continue to account for approximately half of the FMS facilities.

Lot sizing data is shown by category in Figures 7 thru 10. The definition for each category is given below:

Category	Lot Size
1	1 - 10
2	11 – 50
3	51 - 100
4	101 - 500
5	Over 500

The data for Eastern Europe is inconclusive, as it is based upon two observations. It is included because it shows that at least one system has a high enough degree of automation to produce minimal lot sizes. The distributions for both the USA and Japan are skewed to the left, which is an indication of a high degree of flexibility. The distribution for Western Europe is significantly different, indicating the likelihood that a typical lot size is in excess of 50 parts.

#### Product Characteristics for FMS

The product mix for each region is represented as a series of pie charts in Figure 11 thru Figure 14. Unknown product applications, which are shown on the graphs, are omitted in the estimates of product mix given below. This results in the numerical values for product mix figures used in the report being different than the corresponding figure as shown on the graph. Product and materials categories were developed to analyze product characteristics, as indicated below:

#### Product Categories

- 1. Machine Tools
- 2. Heavy Equipment (Commercial)
- 3. Heavy Equipment (Military)
- 4. Aerospace (Commercial)
- 5. Aerospace (Military)
- 6. Automotive
- 7. Consumer Products
- 8. Industrial Products
- 9. Unclassified

#### Material Categories

- 1. Steel or Cast Iron
- 2. Aluminum
- 3. Stainless Steel
- 4. Nonferrous Alloys
- 5. Unclassified

Little is known about the product mix in Eastern Europe. The sketchy information presented in Figure 11 reflects traditional product applications of FMS technology in the machine tool and heavy equipment industries. Notably absent is any information on military products. The Eastern block countries are world leaders in arms production, and yet there are no military product applications reported for Eastern Europe. A much more representative range of products is seen in graphs for the other regions.

Japan, as might be expected, has no significant application of FMS

machine tools, which represents 61.4% of the mix, and other industrial products, which accounts for an additional 25.2% of the product mix.

western Europe has a balanced product mix. fraditional applications such as heavy equipment, industrial products, and automotive products account for 70.9 % of the mix. Macnine tool applications are a surprisingly small 14.3 % of the mix, and military applications only accounted for 5.1 % of the mix.

The USA has a mix reaturing 29.9 % heavy equipment (civilian), 25 % various industrial products, and 27.2 % military products. Only 7.1 % of the mix represents the machine tool industry. The USA dirrers from its international competitors in having a much larger military component, and a much smaller machine tool component in its product mix.

Materials applications are shown in Figures 15 - 18 As expected, they correspond to the product mix. The predominant materials being used in every instance are iron and steel. The use of aluminum and stainless steel is evidenced in both Western Europe and the USA, where aerospace products make up a significant part of the mix. The use of other nonferrous materials is rare.

Early product applications in FMS were typically for large prismatic parts used in heavy equipment applications such as housings for transmission and differential gears on trucks, tractors, and construction equipment. In looking at trends in FMS product applications it is useful to look at the part cube. The part cube distributions are shown in Figures 19 - 22. Eastern European systems have a wide range of part volume capabilities, as do those of Japan. Part volumes in Western Europe are skewed toward smaller part volumes, and yet none of the reported part volumes is less than a cubic foot. The part cube distribution for FMS machine tools in the United States ranges from a minimum of a l foot cube up to a 4 ft x 4 ft x 5 ft part volume. The number of

part cubes less than or equal to one cubic foot in volume suggests that there is a greater diversity at present, by comparison with earlier FMS product applications. The categories used to evaluate part cube distribution are listed below:

Category	Cube Size (Edge Length)
1	Up to 1 foot
2	Between 1 and 2 feet
3	Between 2 and 3.28 feet
4	Between 3.28 and 6.42 feet
5	Over 6.42 feet

Materials Handling Trends for FMS

Summaries were made for seven different types of materials handling equipment. The frequency of use for each type of equipment is shown by category for each region in Figures 23 thru 26. Any installations that did not have information of materials handling technology was excluded from this summary. The resulting sample sizes were 13, 71, 42, and 46 for Eastern Europe, Western Europe, Japan and the USA. The categories are defined below:

Category	Materials Handling Equipment
1	Roller Conveyor (RC)
2	Cart with Towline (CT)
3	Rail Guided Cart (RG)
4	Automatic Guided Vehicle (AGV)
5	Robotic Application(s) (RA)
6	Stacker Crane (STK)
7	Automatic Storage and Retrieval System (ASRS)

As the categories are not mutually exclusive, the percentages may add to more than  $100\ \%$  for any region.

One of the surprising observations is the large number (53.8 %) of facilities in Eastern Europe that have robotic applications. Though based upon a small sample size of 13, this suggests a high degree of automation. The data for Western Europe and in the USA includes a representative mix of each of the available technologies. The only marked difference between these two regions appears to be in the use of ASRS, where the USA has an estimated 17.4 % usage versus a 5.6 % usage in Western Europe. Japanese FMS installations make a greater use of ASRS (40.5 %) and AGV's (47.6 %) than other regions, while making smaller but substantial use of robotic technology (26.2 %). Overall, the use of AGV's is becoming more common in the more recent systems.

GRAPHICAL ANALYSIS OF FMS TRENDS AND ATTRIBUTES

FIGURE 1 Distribution of FMS Technology
Based Upon Number of Systems

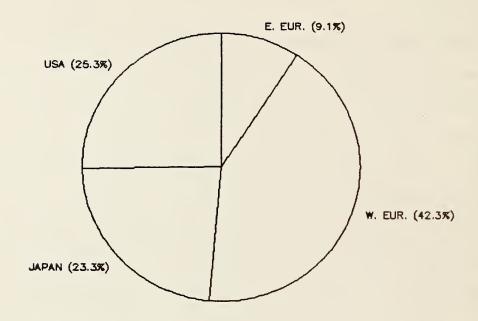


FIGURE 2 Distribution of FMS Technology
Based Upon Number of Machine Tools

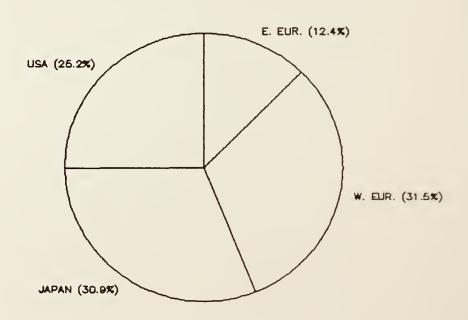
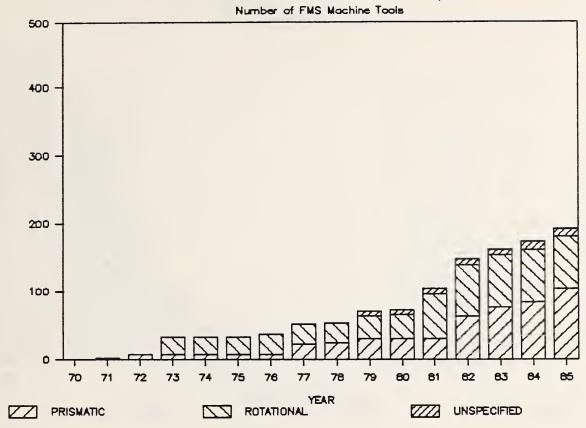


FIGURE 3. Eastern Europe



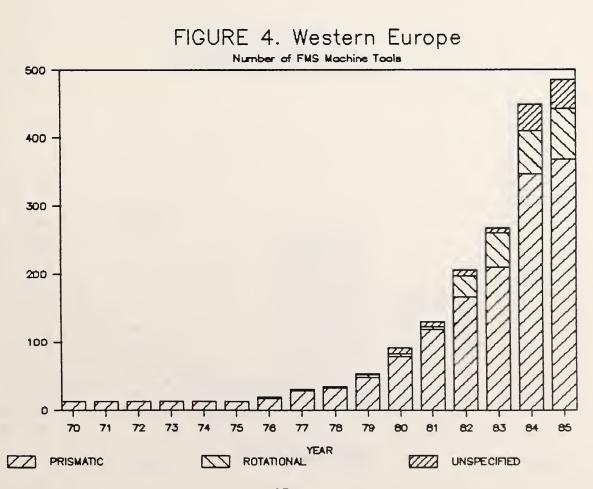
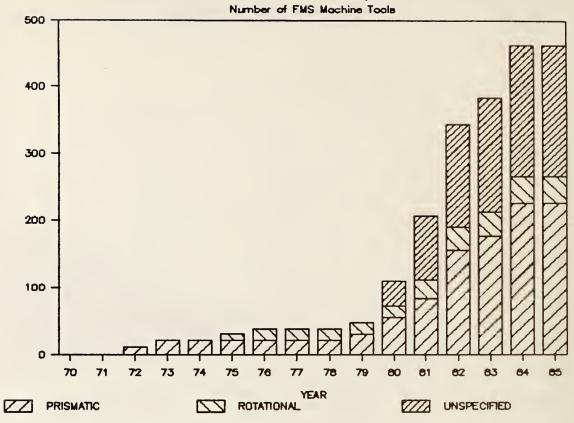


FIGURE 5. Japan



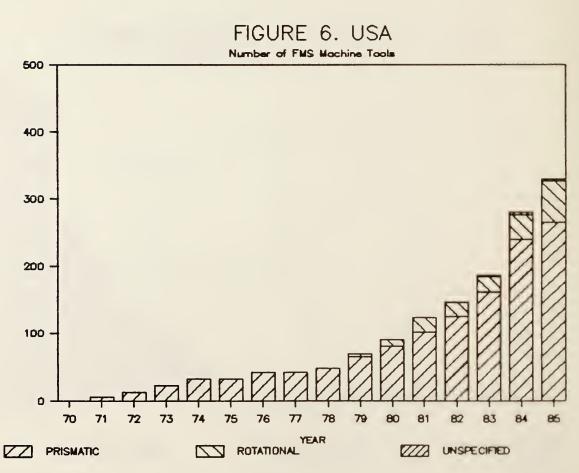
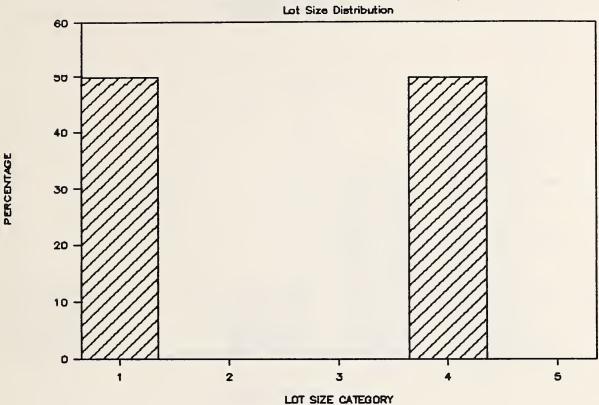


FIGURE 7. Eastern Europe



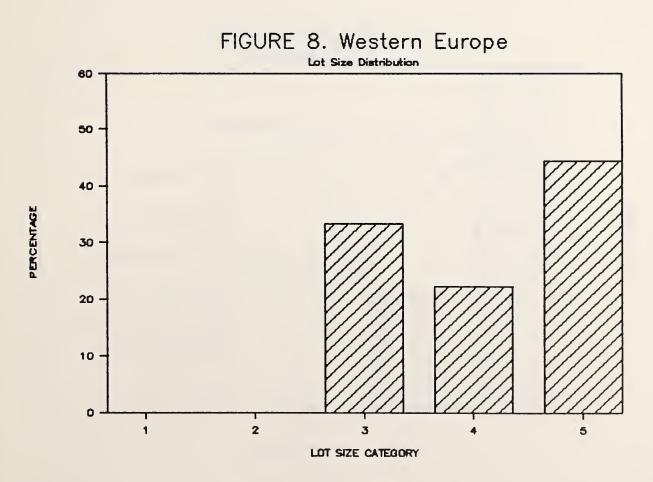
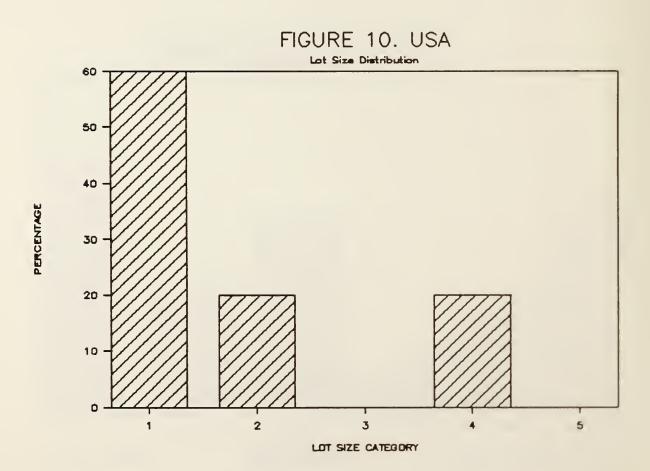


FIGURE 9. Japan
Lot Size Distribution

LOT SIZE CATEGORY

2



## FIGURE 11. Eastern Europe

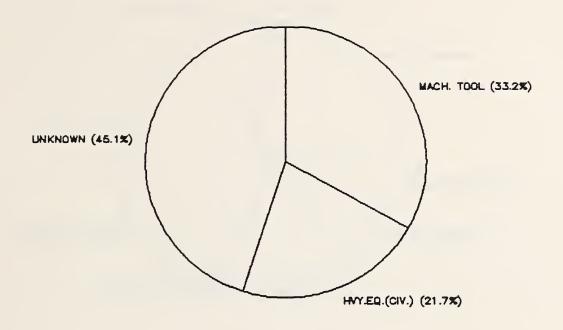
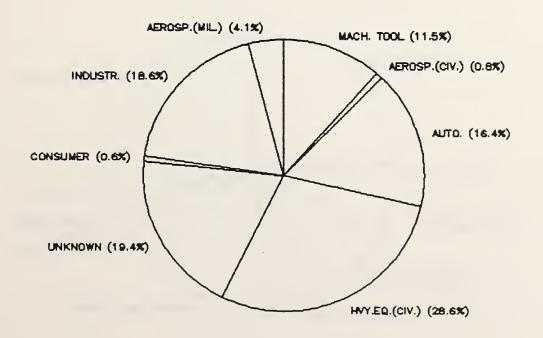


FIGURE 12. Western Europe



### FIGURE 13. Japan

FMS Product Mix

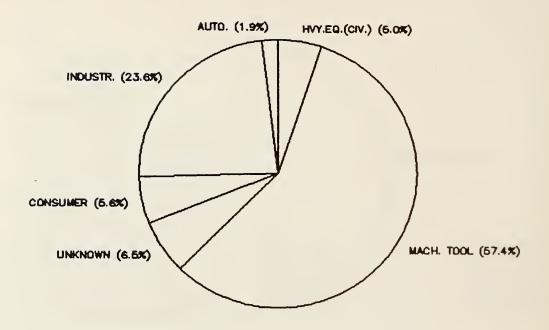


FIGURE 14. USA
FMS Product Mix

HVY.EQ.(CIV.) (28.9%)

MACH. TOOL (6.9%)

HVY.EQ.(MIL.) (9.7%)

AEROSP.(CIV.) (5.4%)

AEROSP.(MIL.) (16.6%)

FIGURE 15. Eastern Europe
FMS Moterials Usage

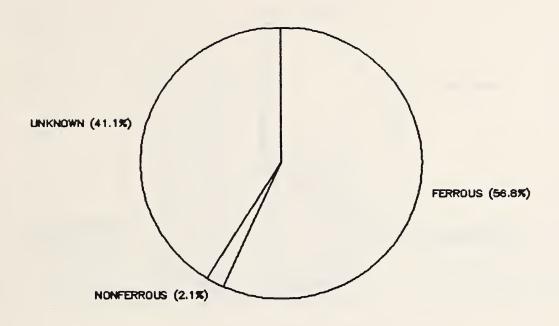
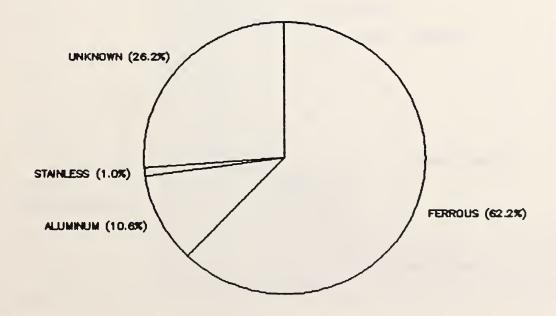


FIGURE 16. Western Europe
FMS Materials Usage



### FIGURE 17. Japan

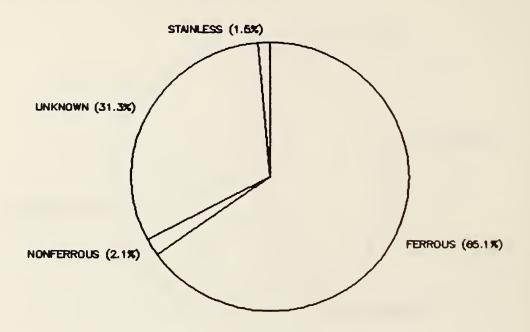


FIGURE 18. USA

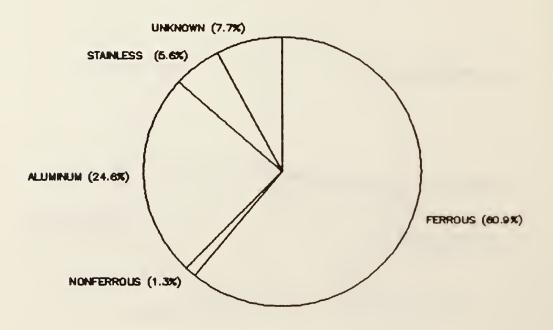


FIGURE 19. Eastern Europe

Port Cube Distribution

80

40

30

10

20

PART CUBE CATEGORY

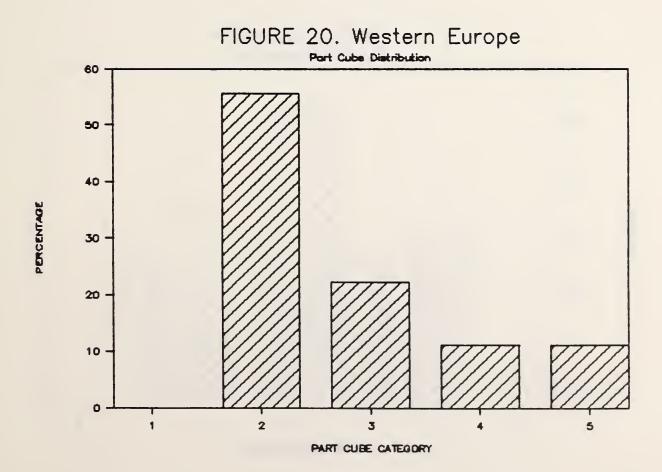
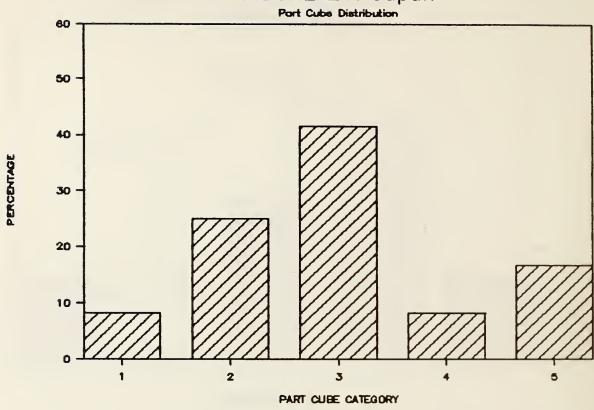


FIGURE 21. Japan



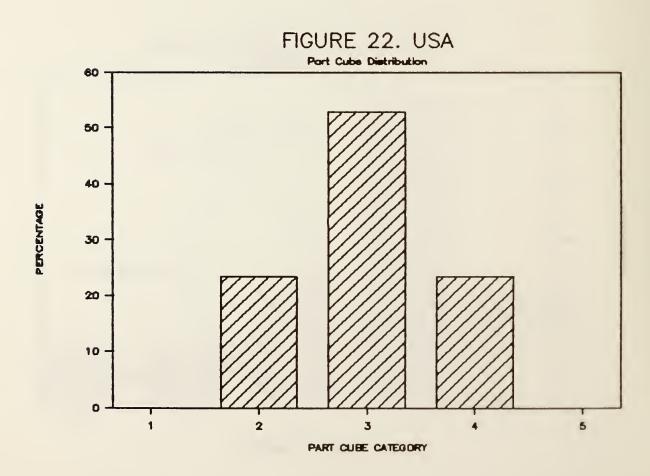
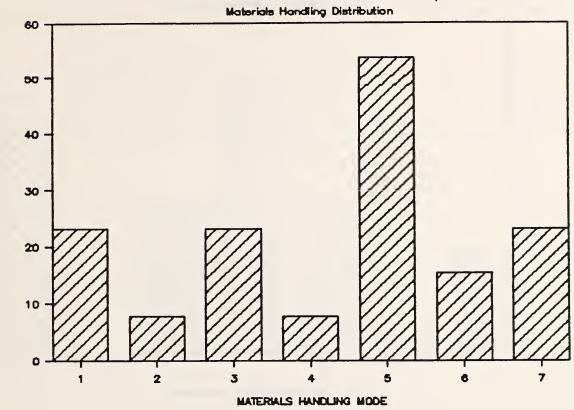
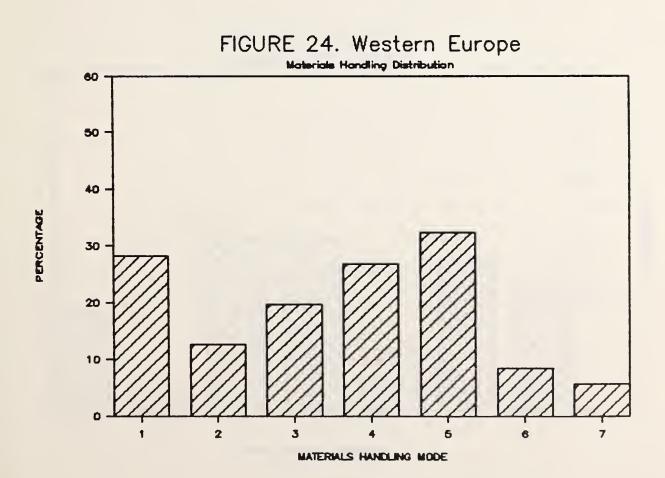


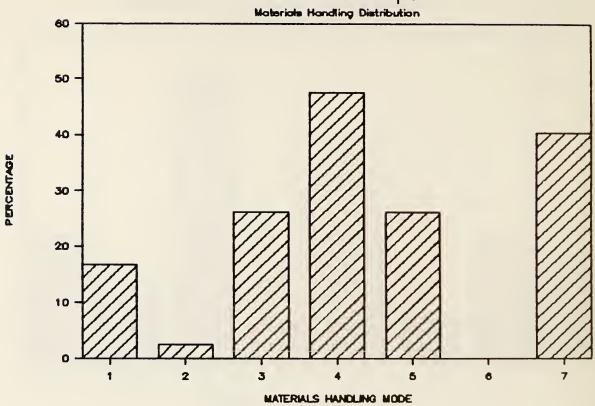
FIGURE 23. Eastern Europe

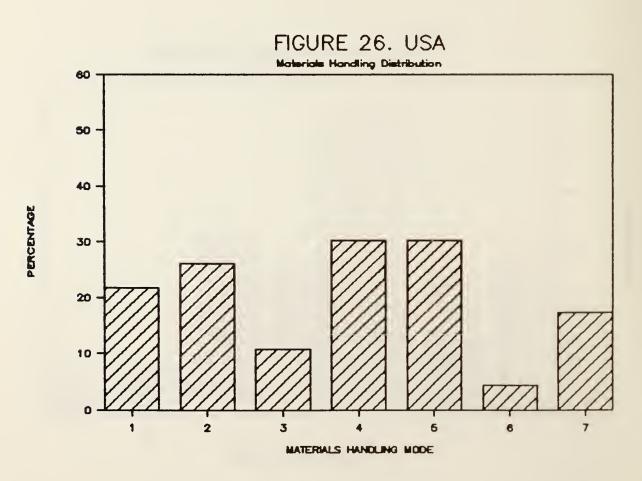


PERCENTAGE



# FIGURE 25. Japan





#### SUMMARY AND CONCLUSIONS

In order to assess the state of the art and to provide a basis for comparison, the main points from the analysis section will be summarized for each region. Overall conclusions for the report will also be given.

### Eastern Europe

In Eastern Europe the numbers of systems reported are fewer than for any of the other regions studied. In addition, the growth of FMS technology appears to be linear, occurring at a slow and constant rate. This is in marked contrast to all other regions, which appear to have an exponential growth rate. However, Eastern European FMS implementations may be greatly underestimated in this report, reflecting the lack of published information on eastern block technology. One factor that suggests that the eastern block systems are being underreported is the complete lack of information on any military product applications.

The FMS systems in Eastern Europe are approximately half rotational systems, and half prismatic systems. Some evidence of the state of the art in these systems comes from the report that at least one system can economically produce a lot size of one. One available indication of the level of automation in these systems comes from the fact that slightly more than half of the implementations, which reported on their materials handling technology, use robotics. Although based upon a small sample size of 13, the use of robotics suggests a relatively nigh degree of automation.

# Western Europe

Western Europe leads the other regions in terms of the number of FMS implementations and the growth rate for FMS implementations. This region has more individual firms with experience in FMS technology than any other. Although both governmental policy and economic conditions have a strong influence on the growth and diffusion of technology, Western Europe clearly has a great potential for technological growth in this area.

In terms of product mix, Western Europe has a balanced mix of traditional products with heavy equipment, industrial, and automotive products accounting for nearly 80 % of the product mix. The minimum lot size reported was 50, which may be an indication that the Western European systems have less flexibility than those found in other regions. A wide variety of materials handling technologies are used. There is some evidence that the Western European systems make less use of automation in their materials handling systems. The use of robotics is about the same as in Japan and the USA. However, the use of AGV's and ASRS is less prevalent in Western European Systems than for those surveyed in Japan or in the USA.

#### Japan

Japan trails the USA and Western Europe in terms of the number of implementations reported. The Japanese share of FMS technology increases when the comparison is based upon the number of machine tools, reflecting the fact that several of their FMS implementations are very large. The product mix for the Japanese systems differs markedly from the other regions in that the principal product is machine tools, which represent 64 % of all products

manufactured on FMS. This fact suggests that Japan has the potential to rapidly increase the use of FMS technology, even though they trail both Western Europe and the USA in terms of the number of firms employing FMS.

USA

The USA has a strong position in FMS technology. However, there are at least two areas of concern. First, the growth rate of FMS technology seems to be somewhat lower than that for Western Europe or Japan. Second, the product mix differs in that machine tool production on FMS is lower than that for any other region. Partly offsetting this is the drive for further automation provided by defense related products.

#### Conclusions

The data base, graphical comparisons, analysis, and summary above presents a state of the art picture of FMS technology in terms of the major operating characteristics. The report also provides an international comparison, in terms of growth and diffusion, for the four regions studied. However, this was not the only objective of this project. Perhaps of greater importance is the potential to use this research to provide a framework for further studies. The first contribution to future research is identifying the users of FMS technology. A second contribution is providing the information in a computerized data base to facilitate further work. The data base is highly flexible, and can be expanded to include both additional implementations (records) and additional data (fields). It is hoped that this report serves to encourage further investigations into FMS implementation.

APPENDICES

#### APPENDIX A. DATA BASE SCHEMA AND DATA DICTIONARY

COUNTRY: User country

COMPANY: User company

LOCATION: Location of FMS installation

DIVISION: Division of user company

SUPPLIER: Principal supplier of FMS

CLASS: System classification: FMS, FTL, or MC (see FMS abbreviations)

YEAR: The reported, or estimated, year when the FMS began routine

production

FIN\_JUST: Financial justification information

COMPUTER: The host computer

CONTROLS: The process controls. In the Eastern European installations the

FMS system nomenclature is given in this field.

PRODUCTS: The principal products produced by the FMS

MATERIALS: The materials used to produce the product. Where not specified, this

was inferred from the product when obvious. For example, aluminum

was given as the material for aircraft parts, cast iron and steel

were given as materials for machine tool parts.

NO PARTS: The number of different unique parts produced by the FMS

NO FAMILYS: The number of product (or part) families produced by the FMS

PARTS ANN: The number of parts produced annually, or the production rate

PART CUBE: The dimensions of the part envelope

PART SHAPE: The basic part geometry/production mode: prismatic (P),

rotational (R), and unrestricted (U)

SCHEDULING: Descriptive information about the operation's scheduling

SCHEDULE2: A continuation of the SCHEDULING field

# APPENDIX A. DATA BASE SCHEMA AND DATA DICTIONARY (CONT'D)

LOT SIZE: Lot size information

CREW SIZE: Crew size information. This is given by shift when possible.

MACH\_SET: A list of the number and types of machines in the FMS (see FMS abbreviations)

MATL\_HANDL: A brief description of the material handling equipment (see FMS abbreviations)

TOOLING: A brief description of the tool system used in the FMS (see FMS abbreviations)

FEATURES: A brief description of the FMS system features (see FMS abbreviations)

REFERENCES: A listing of the bibliographic reference numbers of the articles used in defining the record

### APPENDIX B. LIST OF ABBREVIATIONS

#### Class

FMS: Flexible Manufacturing System

FTL: Flexible Transfer Line

MC: Machine Cell

# Machine Tools

MC: Machining centers

NHM: NC Horizontal Mill

NVM: NC Vertical Mill

NM: NC Mill

NV: NC Vertical Lathe

NT: NC Lathe

ND: NC Drill

NB: NC Boring

NG: NC Gear Cutting

NGR: NC Grinding

WS: Wash Station

CMM: Coordinate Measuring Machine

MT: Unspecified Machine Tool

SP: Special Purpose Machine Tool

# Organizational Abbreviations

DOC: Department of Commerce

NBS: National Bureau of Standards

ITA: International Trade Administration

# APPENDIX B. LIST OF ABBREVIATIONS (CONT'D)

# Materials Handling:

CT: Cart with towline

AGV's: Automatic Guided Vehicle(s) (Wire Guided)

RA: Robotic Application

RG: Rail Guided Shuttle

RC: Roller Conveyor

CAR: Carrousel

ASRS: Automatic Storage & Retrieval

STK: Stacker Crane

X: Other

#### Features:

AC: Adaptive Control

AE: Acoustic Emission

CC: Central Coolant

SC: Self-contained Coolant

P: Probing

I: Inspection

X: Other

WS: Wash Station

#### Miscellaneous Abbreviations

CAM: Computer Aided Manufacturing

CIM: Computer Integrated Manufacturing

CNC: Computer Numerically Controlled (Machining)

DNC: Direct (Computer) Numerically Controlled (Machining)

# APPENDIX B. LIST OF ABBREVIATIONS (CONT'D)

#### Justification:

WIP: Work in process reductions

FLR: Floor space

LT: Lead time

MT: Reduction in the number of machine tools required

LAB: Reduced labor cost

PMX: Changing product mix

ROI: Return on investment

PB: Pay back period

UT: Machine utilization

PRD: Increased production

CST: Reduced manufacturing cost

# Tooling:

CAR: Carrousel

HI: Head Indexer

HC: Head Changer

ATC: Automatic Tool Changing

# Part Geometry:

R: Rotational

P: Prismatic

U: Unrestricted

_		
1.		Austria
	COMPANY:	Steyr Puch
3.	LOCATION:	
4.	DIVISION:	
5.	SUPPLIER:	Mandelli
6.	CLASS:	FMS
	YEAR:	84
	FINANCIAL DATA:	
	COMPUTER:	
	CONTROLS:	
	PRODUCTS:	
-		
-	MATERIALS:	
	NUMBER OF PARTS:	
	PART FAMILIES:	
	PRODUCTION RATE:	
	PART CUBE:	
	PART SHAPE:	Prismatic
18.	OPERATION	
	SCHEDULING:	
19.	LOT SIZE:	
20.	MACHINE SET:	2 MC
21.	MATL. HANDLING:	
22.	TOOLING:	
23.	FEATURES:	
	REFERENCES:	14
	COUNTRY:	Belgium
		Belgium Caterpillar
2.	COMPANY:	Caterpillar
2. 3.	COMPANY: LOCATION:	
2. 3. 4.	COMPANY: LOCATION: DIVISION:	Caterpillar Gosselies
2. 3. 4. 5.	COMPANY: LOCATION: DIVISION: SUPPLIER:	Caterpillar Gosselies Hueller Hille
2. 3. 4. 5. 6.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS:	Caterpillar Gosselies Hueller Hille FMS
2. 3. 4. 5. 6. 7.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR:	Caterpillar Gosselies Hueller Hille
2. 3. 4. 5. 6. 7. 8.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA:	Caterpillar Gosselies Hueller Hille FMS
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER:	Caterpillar Gosselies Hueller Hille FMS 80
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS:	Caterpillar Gosselies Hueller Hille FMS 80 Siemens
2. 3. 4. 5. 6. 7. 8. 9. 10.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS:	Caterpillar Gosselies Hueller Hille FMS 80 Siemens Wheel loader lift arms
2. 3. 4. 5. 6. 7. 8. 9. 10. 11.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS:	Caterpillar Gosselies Hueller Hille FMS 80 Siemens
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS:	Caterpillar Gosselies Hueller Hille FMS 80 Siemens Wheel loader lift arms
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES:	Caterpillar Gosselies Hueller Hille FMS 80 Siemens Wheel loader lift arms
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE:	Caterpillar Gosselies Hueller Hille FMS 80 Siemens Wheel loader lift arms
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE:	Caterpillar Gosselies Hueller Hille FMS 80 Siemens Wheel loader lift arms Steel
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE:	Caterpillar Gosselies Hueller Hille FMS 80 Siemens Wheel loader lift arms
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE:	Caterpillar Gosselies Hueller Hille FMS 80 Siemens Wheel loader lift arms Steel
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE:	Caterpillar Gosselies Hueller Hille FMS 80 Siemens Wheel loader lift arms Steel
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION	Caterpillar Gosselies Hueller Hille FMS 80 Siemens Wheel loader lift arms Steel
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING:	Caterpillar Gosselies  Hueller Hille FMS 80  Siemens Wheel loader lift arms Steel  Prismatic
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE:	Caterpillar Gosselies  Hueller Hille FMS 80  Siemens Wheel loader lift arms Steel  Prismatic
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING:	Caterpillar Gosselies  Hueller Hille FMS 80  Siemens Wheel loader lift arms Steel  Prismatic
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING:	Caterpillar Gosselies  Hueller Hille FMS 80  Siemens Wheel loader lift arms Steel  Prismatic
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING:	Caterpillar Gosselies  Hueller Hille FMS 80  Siemens Wheel loader lift arms Steel  Prismatic

```
COUNTRY:
1.
                      Belgium 
2.
    COMPANY:
                      Caterpillar
3.
   LOCATION:
                      Gosselies
4. DIVISION:
5.
   SUPPLIER:
                      Scharmann
6.
   CLASS:
                      FMS
7.
   YEAR:
                      80
   FINANCIAL DATA:
8.
9. COMPUTER:
                      Dual DEC PDP 11/34's
10. CONTROLS:
                      Siemens
11. PRODUCTS:
                      Wheel loader engine frames
12. MATERIALS:
                      Stee1
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE: 2.5 hrs./part
16. PART CUBE:
                      3 x 1.5 x .8 m
17. PART SHAPE:
                      Prismatic
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                     4 MC, 1 NM, 1 NB (vertical), 5 NB (duplex), 6 meas. sta.
21. MATL. HANDLING:
                     Rail guided cart
22. TOOLING:
                      ATC: 70 tool capacity
                      Inspection, probing, and adaptive control
23. FEATURES:
24. REFERENCES:
1.
    COUNTRY:
                     Belgium
2.
   COMPANY:
                      Caterpillar
3.
   LOCATION:
                      Gosselies
4.
   DIVISION:
5.
  SUPPLIER:
                     Pegard
6.
   CLASS:
                      FMS
7.
   YEAR:
                      80
8.
  FINANCIAL DATA:
9.
    COMPUTER:
10. CONTROLS:
                      Siemens
11. PRODUCTS:
                      Wheel loader frames
12. MATERIALS:
                      Stee1
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                     Prismatic
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                     1 NM, 3 MC
21. MATL. HANDLING: Pallet shuttle
22. TOOLING:
23. FEATURES:
                     Probing, adaptive control
24. REFERENCES:
```

14

```
Belgium
1.
   COUNTRY:
                     DAF Trucks
2.
   COMPANY:
   LOCATION:
3.
4. DIVISION:
   SUPPLIER:
                     Comau
5.
                     FMS
6.
   CLASS:
7.
   YEAR:
                     85
   FINANCIAL DATA:
9. COMPUTER:
10. CONTROLS:
11. PRODUCTS:
                     Rear axle parts
12. MATERIALS:
                     Cast iron
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                     Prismatic
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                     2 ND, 1 NB, 1 MC
21. MATL. HANDLING: Cart with towline, robots
22. TOOLING:
23. FEATURES:
                     Automated inspection
24. REFERENCES:
                     14
                     Bulgaria
1.
    COUNTRY:
2.
   COMPANY:
                     ITCR
3.
   LOCATION:
4. DIVISION:
5. SUPPLIER:
6.
   CLASS:
                     MC
7. YEAR:
                     80
   FINANCIAL DATA: 4-6 fold increase in productivity, reduced WIP inventory
9. COMPUTER:
10. CONTROLS:
11. PRODUCTS:
12. MATERIALS:
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE: 20,000 + parts per year
16. PART CUBE:
17. PART SHAPE:
                     Rotational
18. OPERATION
                     Work centers are operated independently, two shift
    SCHEDULING:
                     operation
19. LOT SIZE:
20. MACHINE SET:
                     5 NT, 1 ND, 1 WS
                     AGV, ASRS, manually loaded machines
21. MATL. HANDLING:
22. TOOLING:
23. FEATURES:
24. REFERENCES:
                      83
```

```
1. COUNTRY:
                     Bulgaria
2. COMPANY:
                     ITCR
3. LOCATION:
4. DIVISION:
5. SUPPLIER:
                     MC
6. CLASS:
7. YEAR:
                     80
8. FINANCIAL DATA: 3-7 fold increase in productivity, less than 1% scrap
9. COMPUTER:
10. CONTROLS:
11. PRODUCTS:
                     Gear boxes for machine tools
12. MATERIALS:
                     Cast iron
13. NUMBER OF PARTS: 12
14. PART FAMILIES:
15. PRODUCTION RATE: 1,600 per year
16. PART CUBE:
17. PART SHAPE:
                     Prismatic
18. OPERATION
                     Two shift operation
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                     3 NHM, 2 NVM, 1 CMM
21. MATL. HANDLING: Rail guided vehicle
22. TOOLING:
                     ATC: capacities of 32,48,60, and 90
23. FEATURES:
24. REFERENCES:
                     83
1. COUNTRY:
                     Bulgaria
2. COMPANY:
3. LOCATION:
4. DIVISION:
5. SUPPLIER:
                     Hitachi Seiki, Fanuc
6. CLASS:
                     FMS
7. YEAR:
                     82
8. FINANCIAL DATA:
9. COMPUTER:
10. CONTROLS:
11. PRODUCTS:
12. MATERIALS:
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                     Prismatic
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
                     30 MC
20. MACHINE SET:
21. MATL. HANDLING: Robots
22. TOOLING:
23. FEATURES:
24. REFERENCES:
                     14
```

1. COUNTRY: 2. COMPANY: 3. LOCATION: 4. DIVISION:	Bulgaria
5. SUPPLIER: 6. CLASS: 7. YEAR: 8. FINANCIAL DATA: 9. COMPUTER:	MC 79
10. CONTROLS: 11. PRODUCTS: 12. MATERIALS: 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE:	SSHO System Electric motor shafts Steel
17. PART SHAPE: 18. OPERATION SCHEDULING: 19. LOT SIZE:	Rotational
20. MACHINE SET: 21. MATL. HANDLING: 22. TOOLING:	4 NGR Overhead robot
23. FEATURES: 24. REFERENCES:	86
1. COUNTRY: 2. COMPANY: 3. LOCATION: 4. DIVISION:	Bulgaria
<ul><li>5. SUPPLIER:</li><li>6. CLASS:</li></ul>	MC
7. YEAR:	77
8. FINANCIAL DATA: 9. COMPUTER:	
10. CONTROLS: 11. PRODUCTS: 12. MATERIALS:	ZMM System, Fanuc licensed NC controls
13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE:	
16. PART CUBE:	
17. PART SHAPE: 18. OPERATION SCHEDULING:	Prismatic
19. LOT SIZE:	/ MO
20. MACHINE SET: 21. MATL. HANDLING: 22. TOOLING:	4 MC
23. FEATURES: 24. REFERENCES:	86

```
1.
    COUNTRY:
                     Bulgaria
2. COMPANY:
3. LOCATION:
4. DIVISION:
5. SUPPLIER:
6. CLASS:
                     MC
7. YEAR:
                     76
8. FINANCIAL DATA:
9. COMPUTER:
10. CONTROLS:
                     ZMM System (DNC)
11. PRODUCTS:
12. MATERIALS:
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                     Rotational
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                    4 NT
21. MATL. HANDLING: 2 Robots
22. TOOLING:
23. FEATURES:
24. REFERENCES:
                    86
1. COUNTRY:
                     Czechoslovakia
2. COMPANY:
                     Kovosvit Sezimovo
3. LOCATION:
4. DIVISION:
                     ISTU, N.E.
5. SUPPLIER:
                     Tos Kurim
6. CLASS:
                     MC
7. YEAR:
                     77
8. FINANCIAL DATA:
9. COMPUTER:
                     IVU 320 System
10. CONTROLS:
11. PRODUCTS:
                     Flanges and shafts
12. MATERIALS:
                     Stee1
13. NUMBER OF PARTS: 5,000
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
                     120 mm round x 500 mm long
17. PART SHAPE:
                     Rotational
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
                     Average of 39
                    22 NT, 1 NHM, 1 ND, 1 NHM (off line)
20. MACHINE SET:
21. MATL. HANDLING: Stacker crane
22. TOOLING:
23. FEATURES:
                    41
24. REFERENCES:
```

```
Czechoslovakia
    COUNTRY:
1.
                     Pvazke-Strojirney Works
2.
   COMPANY:
3. LOCATION:
4.
  DIVISION:
                     Tos Kurim
5. SUPPLIER:
                     MC
6.
   CLASS:
7. YEAR:
                     77
8. FINANCIAL DATA:
9.
   COMPUTER:
                     IVU 200 System
10. CONTROLS:
11. PRODUCTS:
12. MATERIALS:
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
                     200 mm
17. PART SHAPE:
                     Prismatic
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
                     1 NHM, 1 NVM, 1 CMM, 1 WS
20. MACHINE SET:
21. MATL. HANDLING: Stacker crane, ASRS
22. TOOLING:
23. FEATURES:
24. REFERENCES:
                     41, 69
1.
   COUNTRY:
                     Czechoslovakia
2.
   COMPANY:
                     Sezimovo Usti
3. LOCATION:
                     Kosovit Plant
4. DIVISION:
                     Tos Kurim
5. SUPPLIER:
   CLASS:
                     MC
6.
7. YEAR:
                     77
8.
  FINANCIAL DATA:
9. COMPUTER:
10. CONTROLS:
                     IVU 320 System
11. PRODUCTS:
                     Flanges and shafts
                     Carbon steel
12. MATERIALS:
13. NUMBER OF PARTS: 5,500
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
                     Shafts: 120 mm round x 500 mm long, flanges 50-320 mm rd.
17. PART SHAPE:
                     Rotational
18. OPERATION
                     Crew of 13
    SCHEDULING:
19. LOT SIZE:
                     Average of 39, minimum of 10
20. MACHINE SET:
                     22 NT, 2 NVM, 1 ND
                     Stacker crane
21. MATL. HANDLING:
22. TOOLING:
23. FEATURES:
```

41

24. REFERENCES:

1. COUNTRY: Czechoslovakia COMPANY: Tos Kurim 3. LOCATION: 4. DIVISION: 5. SUPPLIER: Tos Kurim 6. CLASS: MC 7. YEAR: 77 FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: IVU 800 System 11. PRODUCTS: Machine tool parts 12. MATERIALS: Steel, cast iron 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 800 mm 17. PART SHAPE: Prismatic 18. OPERATION SCHEDULING: 19. LOT SIZE: 25 maximum 20. MACHINE SET: 1 NM, 2 MC, 1 NB 21. MATL. HANDLING: Stacker crane, 2 carts 22. TOOLING: ATC 23. FEATURES: 24. REFERENCES: 41 1. COUNTRY: Czechoslovakia 2. COMPANY: Tos Kurim 3. LOCATION: 4. DIVISION: 5. SUPPLIER: Tos Kurim CLASS: 6. MC 7. YEAR: 77 8. FINANCIAL DATA: COMPUTER: 10. CONTROLS: IVU 1250 System 11. PRODUCTS: Machine tool parts 12. MATERIALS: Steel, cast iron 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 1250 mm 17. PART SHAPE: Prismatic 18. OPERATION SCHEDULING: 19. LOT SIZE: 25 maximum 1 NM, 1 NB, 2 NHM, 1 MC, 2 CMM 20. MACHINE SET: 21. MATL. HANDLING: Stacker crane, 2 carts 22. TOOLING: Manual 23. FEATURES: 24. REFERENCES: 41

COUNTRY: Czechoslovakia 2. COMPANY: Tos Olomonc Olomonc . 3. LOCATION: 4. DIVISION: 5. SUPPLIER: Vusco Research Institute 6. CLASS: **FMS** 7. YEAR: 83 8. FINANCIAL DATA: 9. COMPUTER: ADT 4500 (Czech.) 10. CONTROLS: PVS 400 System, NS Series 750, 850, and 920 controls 11. PRODUCTS: Machine tool parts 12. MATERIALS: Cast iron 13. NUMBER OF PARTS: 40 14. PART FAMILIES: 15. PRODUCTION RATE: 52 parts/24 hours 16. PART CUBE: 400 mm 17. PART SHAPE: Prismatic 18. OPERATION Random flow of parts. One manned shift, 24 hour operation. Parallel machine centers. SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 8 MC, 2 CMM, 2 WS 21. MATL. HANDLING: Stacker crane, ASRS 22. TOOLING: ATC: tool magazines linked by automatic tool transfer 23. FEATURES: Adaptive control 41, 78 24. REFERENCES: 1. COUNTRY: Czechoslovakia 2. Unknown COMPANY: 3. LOCATION: 4. DIVISION: 5. SUPPLIER: SKODA 6. CLASS: MC. 7. YEAR: 77 8. FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: SKODA-NC-N System 11. PRODUCTS: 12. MATERIALS: 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE:  $3.5 \times 2.24 \times 2 m$ 17. PART SHAPE: Prismatic 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 21. MATL. HANDLING: 22. TOOLING: 23. FEATURES:

24. REFERENCES:

86

```
1.
    COUNTRY:
                     Czechoslovakia
2. COMPANY:
                     Vuste Research Institute
3. LOCATION:
                     Prague
4. DIVISION:
5.
   SUPPLIER:
                     Vuste Research Institute
6.
   CLASS:
                     FMS
   YEAR:
7.
                     84
8. FINANCIAL DATA:
   COMPUTER:
10. CONTROLS:
11. PRODUCTS:
12. MATERIALS:
                     Steel, cast iron, and non-ferrous metals
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
                     .25 m cube (prismatic), .16 m rd. x .38 m 1 (rotational)
17. PART SHAPE:
                     Prismatic and rotational
18. OPERATION
                     Computer scheduling of work and material transport.
    SCHEDULING:
                     Central computer downloads NC programs.
19. LOT SIZE:
20. MACHINE SET:
                     2 MC, 2 NT
21. MATL. HANDLING:
                     rail guided cart, robots
22. TOOLING:
23. FEATURES:
24. REFERENCES:
                     23
1.
   COUNTRY:
                     Czechoslovakia
2.
                     ZPS Gottwaldow
   COMPANY:
3. LOCATION:
4. DIVISION:
5.
   SUPPLIER:
                     Tos Kurim
   CLASS:
6.
                     MC
7.
   YEAR:
                     75
8.
   FINANCIAL DATA:
                     15 jobs eliminated, 90% machine utilization acheived
9. COMPUTER:
10. CONTROLS:
                     IVU 400 System
11. PRODUCTS:
                     Machine tool and shoe machinery parts
12. MATERIALS:
                     Cast iron
13. NUMBER OF PARTS: 20,000
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
                     630 mm
17. PART SHAPE:
                     Prismatic
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
                     Average of 50, range of 10 to 100
20. MACHINE SET:
                     10 MC
21. MATL. HANDLING:
                     Stacker Crane
22. TOOLING:
23. FEATURES:
```

24. REFERENCES:

41

1. COUNTRY: East Germany 2. COMPANY: 7 October 3. LOCATION: Niles Group 4. DIVISION: 7 October 5. SUPPLIER: CLASS: MC 6. 7. YEAR: 71 8. FINANCIAL DATA: COMPUTER: 9. 10. CONTROLS: Rota F125 System 11. PRODUCTS: Machine tool parts 12. MATERIALS: Steel, cast iron 13. NUMBER OF PARTS: 400 14. PART FAMILIES: 15. PRODUCTION RATE: 135,000/year 16. PART CUBE: 125 mm diameter 17. PART SHAPE: Rotational 18. OPERATION Batch computer schedules with revisions by operator SCHEDULING: 19. LOT SIZE: 1 NT (rough), 3 NT, 2 NM/D, 1 NGR 20. MACHINE SET: 21. MATL. HANDLING: Overhead carousel (270 part capacity), manual load/unload 22. TOOLING: 23. FEATURES: 24. REFERENCES: 37, 38 1. COUNTRY: East Germany 2. COMPANY: 7 October 3. LOCATION: Zerbst 4. DIVISION: 5. SUPPLIER: 7 October CLASS: FMS 6. 7. YEAR: 73 8. FINANCIAL DATA: 4-5 year payback, 270% increase in productivity Robatron 4000 9. COMPUTER: 10. CONTROLS: Rota FZ200 System 11. PRODUCTS: Gears for machine tools 12. MATERIALS: Stee1 13. NUMBER OF PARTS: 2,000 14. PART FAMILIES: 15. PRODUCTION RATE: 310,000 parts/year 16. PART CUBE: 60-200 mm diameter 17. PART SHAPE: Rotational 18. OPERATION Batch computer schedules with revisions by operator SCHEDULING: 19. LOT SIZE: Range 10 to 500 16 work stations: 3 NV, 1 NT, 2 NM, + ... 20. MACHINE SET: 21. MATL. HANDLING: Stacker crane, robots for machine loading 22. TOOLING: Manual, local to each machine 23. FEATURES: Gear hardening equipment planned for 1978 24. REFERENCES: 14, 37, 38, 39

```
1.
   COUNTRY:
                     East Germany
   COMPANY:
                     Fritz Heckert
2.
   LOCATION:
                     Gruenbach
4. DIVISION:
5. SUPPLIER:
                     Fritz Heckert
6. CLASS:
                     MC
7. YEAR:
8. FINANCIAL DATA:
                     62.8 % cost reduction in sample of 21 parts
9. COMPUTER:
                     KRS 4200
                     Prisma 1 System
10. CONTROLS:
11. PRODUCTS:
                     Machine tool components
12. MATERIALS:
                     Steel, cast iron
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
                     250 mm
17. PART SHAPE:
                     Prismatic
18. OPERATION
                     Fixed sequence of operations for each part
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                     1 NHM, 1 NVM
21. MATL. HANDLING: Carosel at center of cell
22. TOOLING:
                     40 per machine tool
23. FEATURES:
24. REFERENCES:
                     14, 37, 38
1.
   COUNTRY:
                     East Germany
2. COMPANY:
                     Fritz Heckert
3. LOCATION:
                     Auerbach
4. DIVISION:
                     Karl-Marx-Stadt
                     Fritz Heckert
5.
   SUPPLIER:
6. CLASS:
                     FMS
   YEAR:
7.
8. FINANCIAL DATA: 5 year payback, 75 % machine utilization
9. COMPUTER:
10. CONTROLS:
                     Prisma 2 System
11. PRODUCTS:
                     Machine tool parts
12. MATERIALS:
                     Steel, cast iron
13. NUMBER OF PARTS: 12
14. PART FAMILIES:
15. PRODUCTION RATE: 8,000 parts/year
                     1 x 1 x 1.5 m
16. PART CUBE:
17. PART SHAPE:
                     Prismatic
18. OPERATION
                     Multiple routings with alternate operations generated by
    SCHEDULING:
                     computer to balance the work load, crew of 11
19. LOT SIZE:
20. MACHINE SET:
                     1 NM (rough), 2 NVM, 3 MC, 2 CMM, 2 WS
21. MATL. HANDLING:
                    Air cushion conveyor positions pallet to w/i 3 um
22. TOOLING:
                     Local to MT, up to 138/MT
23. FEATURES:
                     Adaptive control: tool wear, casting dim., plt. position
                     14, 37, 38, 39
24. REFERENCES:
```

East Germany COUNTRY: 1. Herbert Warnke 2. COMPANY: Erfurt 3. LOCATION: 4. DIVISION: SUPPLIER: Fritz Heckert CLASS: MC 6. 7. YEAR: 78 FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: PC 1 System 11. PRODUCTS: Very large parts for metal forming machines 12. MATERIALS: Cast iron 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 2 NVM (200 mm spindle), 1 NVM (250 mm spindle) 21. MATL. HANDLING: Overhead crane 22. TOOLING: 23. FEATURES: 24. REFERENCES: 39 East Germany 1. COUNTRY: 2. COMPANY: Herbert Warnke 3. LOCATION: Erfurt 4. DIVISION: 5. SUPPLIER: Fritz Heckert, Svoda 6. CLASS: FMS 7. YEAR: 77 8. FINANCIAL DATA: Labor savings of 55,000 man-hrs./year, 66% MT utilization 9. COMPUTER: Robatron 4000 10. CONTROLS: PC 3 System 11. PRODUCTS: Large parts for metal presses & brakes 12. MATERIALS: Cast iron, steel 13. NUMBER OF PARTS: 120 14. PART FAMILIES: 15. PRODUCTION RATE: 625 parts/ year 4 - 7 m16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION Works to a monthly plan, infrequent changes made by the operator, simulation is used in developing the schedule SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 5 NVM (250 mm & 160 mm spindles) 21. MATL. HANDLING: Rail guided cart with 57 m track and 14 stations 22. TOOLING: ATC for each machine 23. FEATURES:

23, 38, 39

24. REFERENCES:

```
1.
   COUNTRY:
                     East Germany
2. COMPANY:
                     Hermann Matern
   LOCATION:
                     Zerbst
4. DIVISION:
5. SUPPLIER:
                     7 October
6.
   CLASS:
                     FMS
7. YEAR:
                     73
8. FINANCIAL DATA:
9.
   COMPUTER:
                     2 - KRS 4201's
10. CONTROLS:
                     FZ 200 System
                     Spur gears for lathes
11. PRODUCTS:
12. MATERIALS:
                     Steel
13. NUMBER OF PARTS: 200
14. PART FAMILIES:
15. PRODUCTION RATE: 180,000 parts/year
                     60-200 mm round
16. PART CUBE:
17. PART SHAPE:
                     Rotational
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
                     400 maximum
20. MACHINE SET:
                     5 NT, 3 NGR, 1 Broaching MT, 9 NG, 1 Burnishing MT
21. MATL. HANDLING:
22. TOOLING:
23. FEATURES:
24. REFERENCES:
                     86
1.
    COUNTRY:
                     East Germany
2. COMPANY:
                     Saalfeld
3. LOCATION:
4. DIVISION:
5.
   SUPPLIER:
                     MC
6. CLASS:
7.
   YEAR:
                     80
8. FINANCIAL DATA:
9. COMPUTER:
10. CONTROLS:
                     MAPK 500 System
                     Drill gearbox, spindle, and base
11. PRODUCTS:
12. MATERIALS:
                     Steel, cast iron
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
                     500 mm
17. PART SHAPE:
                     Prismatic
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                     2 MC
21. MATL. HANDLING:
                     1 Rail guided cart, 2 carousels
                     Head changer
22. TOOLING:
23. FEATURES:
24. REFERENCES:
                     39
```

2.	COUNTRY: COMPANY:	East Germany USSR Import
4. 5. 6. 7.	LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA:	VEB Rawema Fritz Heckert FMS 85
10. 11. 12. 13.	COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES:	FMS 1000 System
15. 16. 17. 18.	PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING:	1000 mm Prismatic
20. 21. 22.	LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING: FEATURES:	
	REFERENCES:	24
2. 3. 4. 5. 6. 7. 8.	COUNTRY: COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA:	East Germany Umformtechnik Erfurt Forschungszentrum FMS 77
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS:	Umformtechnik Erfurt Forschungszentrum FMS
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING:	Umformtechnik Erfurt Forschungszentrum FMS 77
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION	Umformtechnik Erfurt  Forschungszentrum FMS 77  PC 3 System  1000 mm, 24000 kps

1. COUNTRY: East Germany 2. COMPANY: 3. LOCATION: Dresden 4. DIVISION: Agricultural Machinery 5. SUPPLIER: Fritz Heckert 6. CLASS: FMS 7. YEAR: 84 8. FINANCIAL DATA: 480 % increase in productivity 9. COMPUTER: 10. CONTROLS: 11. PRODUCTS: Gear boxes 12. MATERIALS: Cast iron 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 8 MC, 1 WS 21. MATL. HANDLING: Rail guided cart, ASRS 22. TOOLING: 23. FEATURES: 24. REFERENCES: 24 1. COUNTRY: East Germany 2. COMPANY: Veb Robur 3. LOCATION: 4. DIVISION: 5. SUPPLIER: Comau 6. CLASS: **FMS** 7. YEAR: 83 8. FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: 11. PRODUCTS: 12. MATERIALS: 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 21. MATL. HANDLING: 22. TOOLING: 23. FEATURES: 24. REFERENCES:

14

East Germany

COUNTRY:

1.

Werkzeugmaschinenkombinat 2. COMPANY: 3. LOCATION: 4. DIVISION: 7 October SUPPLIER: **FMS** 6. CLASS: 7. YEAR: 73 8. FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: 11. PRODUCTS: 12. MATERIALS: 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: Rotational 17. PART SHAPE: 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 3 NV, 1 NT, 2 NM 21. MATL. HANDLING: 22. TOOLING: 23. FEATURES: 24. REFERENCES: 14 1. COUNTRY: France 2. COMPANY: Alsthom Atlantique 3. LOCATION: Saint Nazaire 4. DIVISION: 5. SUPPLIER: Mandelli 6. CLASS: **FMS** 7. YEAR: 84 8. FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: 11. PRODUCTS: Diesel engine parts 12. MATERIALS: Cast iron, steel 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 2 MC, 1 MT, plus 2 auxilliary modules 21. MATL. HANDLING: 22. TOOLING: 23. FEATURES: 24. REFERENCES: 14. 20

1.	COUNTRY:	France
۷. ع	COUNTRY: COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA:	Alsthom Unelec Orleans
4.	DIVISION:	Of Teams
5.	SUPPLIER:	Mandelli
6.	CLASS:	FMS
7.	YEAR:	83
8.	FINANCIAL DATA:	
9.	COMPUTER:	DEC PDP 11/24
	CONTROLS:	
	PRODUCTS:	AC electric motor parts
	MATERIALS:	
	NUMBER OF PARTS:	
		4
15.	PRODUCTION RATE:	7,000 parts/year
	PART CUBE:	
	PART SHAPE:	Rotational
	OPERATION	Crew of 2
	SCHEDULING:	
	LOT SIZE:	2 1/2 1 1/2
	MACHINE SET: MATL. HANDLING:	3 MC, 1 WS
	TOOLING:	l rail guided cart ATC 60 tool capacity
	FEATURES:	Probing Probing
	REFERENCES:	14, 15, 20
27.	KEI EKEKOED.	14, 13, 20
	COUNTRY:	France
2.	COMPANY:	France Caterpillar
2.	COMPANY: LOCATION:	
2. 3. 4.	COMPANY: LOCATION: DIVISION:	Caterpillar Grenoble
2. 3. 4. 5.	COMPANY: LOCATION: DIVISION: SUPPLIER:	Caterpillar Grenoble Mandelli
2. 3. 4. 5.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS:	Caterpillar Grenoble Mandelli FMS
2. 3. 4. 5. 6. 7.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR:	Caterpillar Grenoble Mandelli
2. 3. 4. 5. 6. 7. 8.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA:	Caterpillar Grenoble Mandelli FMS
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER:	Caterpillar Grenoble Mandelli FMS
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS:	Caterpillar Grenoble Mandelli FMS 84
2. 3. 4. 5. 6. 7. 8. 9. 10.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS:	Caterpillar Grenoble  Mandelli FMS 84  Track links
2. 3. 4. 5. 6. 7. 8. 9. 10. 11.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS:	Caterpillar Grenoble Mandelli FMS 84
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS:	Caterpillar Grenoble  Mandelli FMS 84  Track links
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES:	Caterpillar Grenoble  Mandelli FMS 84  Track links
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE:	Caterpillar Grenoble  Mandelli FMS 84  Track links
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE:	Caterpillar Grenoble  Mandelli FMS 84  Track links Cast steel
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE:	Caterpillar Grenoble  Mandelli FMS 84  Track links
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION	Caterpillar Grenoble  Mandelli FMS 84  Track links Cast steel
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE:	Caterpillar Grenoble  Mandelli FMS 84  Track links Cast steel
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING:	Caterpillar Grenoble  Mandelli FMS 84  Track links Cast steel
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE:	Caterpillar Grenoble  Mandelli FMS 84  Track links Cast steel  Prismatic
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING:	Caterpillar Grenoble  Mandelli FMS 84  Track links Cast steel  Prismatic
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING: FEATURES:	Caterpillar Grenoble  Mandelli FMS 84  Track links Cast steel  Prismatic  2 MC 2 rototraversing units
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING:	Caterpillar Grenoble  Mandelli FMS 84  Track links Cast steel  Prismatic

1.	COUNTRY:	France
	COMPANY:	Caterpillar
3.	LOCATION:	Grenoble
4.	DIVISION:	
5.	SUPPLIER:	Renault/Mandelli
6.	CLASS:	FMS
7.	YEAR:	84
8.	FINANCIAL DATA:	
	COMPUTER:	
	CONTROLS:	Renault/Mandelli
	PRODUCTS:	Track roller frames
	MATERIALS:	Steel
	NUMBER OF PARTS:	
	PART FAMILIES: PRODUCTION RATE:	
	PART CUBE:	
	PART SHAPE:	Prismatic
	OPERATION	TIDMOUL
	SCHEDULING:	
19.	LOT SIZE:	
		4 MC
21.	MATL. HANDLING:	Pallet transfer
	TOOLING:	
	FEATURES:	Probing, adaptive control
24.	REFERENCES:	14
1.	COUNTRY:	France
	COUNTRY:	France Caterpillar
2.	COMPANY:	France Caterpillar Grenoble
2. 3.		Caterpillar
2. 3. 4.	COMPANY: LOCATION:	Caterpillar
2. 3. 4. 5.	COMPANY: LOCATION: DIVISION:	Caterpillar Grenoble
2. 3. 4. 5. 6. 7.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR:	Caterpillar Grenoble Wotan/Line
2. 3. 4. 5. 6. 7. 8.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA:	Caterpillar Grenoble Wotan/Line FMS
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER:	Caterpillar Grenoble Wotan/Line FMS 81
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS:	Caterpillar Grenoble  Wotan/Line FMS 81  Bosh, Bendix
2. 3. 4. 5. 6. 7. 8. 9. 10.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS:	Caterpillar Grenoble  Wotan/Line FMS 81  Bosh, Bendix Track type loader frames
2. 3. 4. 5. 6. 7. 8. 9. 10. 11.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS:	Caterpillar Grenoble  Wotan/Line FMS 81  Bosh, Bendix
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS:	Caterpillar Grenoble  Wotan/Line FMS 81  Bosh, Bendix Track type loader frames
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES:	Caterpillar Grenoble  Wotan/Line FMS 81  Bosh, Bendix Track type loader frames
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE:	Caterpillar Grenoble  Wotan/Line FMS 81  Bosh, Bendix Track type loader frames
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE:	Caterpillar Grenoble  Wotan/Line FMS 81  Bosh, Bendix Track type loader frames Steel
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE:	Caterpillar Grenoble  Wotan/Line FMS 81  Bosh, Bendix Track type loader frames
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE:	Caterpillar Grenoble  Wotan/Line FMS 81  Bosh, Bendix Track type loader frames Steel
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE:	Caterpillar Grenoble  Wotan/Line FMS 81  Bosh, Bendix Track type loader frames Steel  Prismatic
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET:	Caterpillar Grenoble  Wotan/Line FMS 81  Bosh, Bendix Track type loader frames Steel
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING:	Caterpillar Grenoble  Wotan/Line FMS 81  Bosh, Bendix Track type loader frames Steel  Prismatic
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING:	Caterpillar Grenoble  Wotan/Line FMS 81  Bosh, Bendix Track type loader frames Steel  Prismatic
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING:	Caterpillar Grenoble  Wotan/Line FMS 81  Bosh, Bendix Track type loader frames Steel  Prismatic

```
1.
    COUNTRY:
                     France
2.
    COMPANY:
                     Caterpillar
3. LOCATION:
                     Grenoble
4. DIVISION:
5.
   SUPPLIER:
                     Pegard
6.
   CLASS:
                     FMS
7.
   YEAR:
                     85
    FINANCIAL DATA:
8.
    COMPUTER:
10. CONTROLS:
                     Siemens
11. PRODUCTS:
                     Track type case & frame
12. MATERIALS:
                     Cast iron, steel
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                     Prismatic
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                     2 MC
21. MATL. HANDLING:
                     Cart with tow line
22. TOOLING:
23. FEATURES:
                     Probing, adaptive control
                     14, 18
24. REFERENCES:
   COUNTRY:
1.
                     France
2.
    COMPANY:
                     Citroen
3. LOCATION:
                     Meudon
4. DIVISION:
5. SUPPLIER:
                     Comau
   CLASS:
6.
                     FMS
7.
   YEAR:
                     84
8. FINANCIAL DATA:
                     3.1 year payback period
9.
    COMPUTER:
10. CONTROLS:
11. PRODUCTS:
                     Cylinder heads, transmission & differential housings
12. MATERIALS:
                     Steel, cast iron
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                     Prismatic
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                     2 MC (five axis), 1 CMM, 1 WS
21. MATL. HANDLING: 4 AGV's
22. TOOLING:
23. FEATURES:
```

14, 69

24. REFERENCES:

```
France
1.
    COUNTRY:
   COMPANY:
                     Citroen
2.
   LOCATION:
                     Meudon
3.
   DIVISION:
4.
                     Automatique Industriel
5.
   SUPPLIER:
   CLASS:
                     FMS
6.
7.
   YEAR:
                     82
   FINANCIAL DATA:
                     Machine utilization 75-80 %
8.
                     Thompson (French Mfg.)
9.
   COMPUTER:
10. CONTROLS:
11. PRODUCTS:
                      Automobile engine parts
                      Cast iron, steel, aluminum
12. MATERIALS:
13. NUMBER OF PARTS: 80
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
                      500 mm
17. PART SHAPE:
                     Prismatic
18. OPERATION
                      24 hour operation, parts may be processed in random order
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                      2 MC (5 axis), surface treatment station, 1 CMM, 1 WS
21. MATL. HANDLING:
                     AGV
                     ATC, central magazine with 600 tools
22. TOOLING:
23. FEATURES:
24. REFERENCES:
                     65, 66
1.
    COUNTRY:
                     France
2.
   COMPANY:
                     Citroen Construction Mechanique
3.
   LOCATION:
4. DIVISION:
5.
   SUPPLIER:
                      Automatique Industriel
6.
   CLASS:
                     FMS
7.
   YEAR:
                     83
8.
   FINANCIAL DATA:
                     Labor savings, 20 workers vs. 73
9.
   COMPUTER:
10. CONTROLS:
11. PRODUCTS:
                      Cylinder heads, gear, differential, and clutch housings
12. MATERIALS:
                      Cast iron
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
                      500 mm
17. PART SHAPE:
                      Prismatic
18. OPERATION
                      24 hour operation, third shift has 1 worker (10 hrs.),
    SCHEDULING:
                      random processing capability, crew size of 9, 8, and 1
19. LOT SIZE:
20. MACHINE SET:
                      3 MC, 1 WS, 1 CMM, 1 surface treating station
                      5 AGV's
21. MATL. HANDLING:
22. TOOLING:
                      ATC, central magazine with 600 tools
23. FEATURES:
24. REFERENCES:
                      66
```

```
1. COUNTRY:
                     France
2. COMPANY:
                     Iveco
3. LOCATION:
4. DIVISION:
5. SUPPLIER:
                     Berardi S.P.A.
6.
   CLASS:
                     FMS
7. YEAR:
                     84
   FINANCIAL DATA:
9.
   COMPUTER:
10. CONTROLS:
11. PRODUCTS:
12. MATERIALS:
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                     Prismatic
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                     6 MC
21. MATL. HANDLING:
22. TOOLING:
23. FEATURES:
24. REFERENCES:
                     14
1. COUNTRY:
                     France
2. COMPANY:
                     Renault
3. LOCATION:
                     Saint Priest
4. DIVISION:
                     Vehicles Industriels
5. SUPPLIER:
                     Renault
6. CLASS:
                     FMS
   YEAR:
7.
                     82
8. FINANCIAL DATA:
9. COMPUTER:
10. CONTROLS:
11. PRODUCTS:
12. MATERIALS:
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                     Prismatic
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                 9 work stations
21. MATL. HANDLING: Roller conveyor
22. TOOLING:
23. FEATURES:
                     14, 18
24. REFERENCES:
```

```
COUNTRY:
                     France
   COMPANY:
                     Renault
2.
                     Le Mans
3. LOCATION:
                     Renault Materiel Agricole
4. DIVISION:
5. SUPPLIER:
                     Renault
6. CLASS:
                     FMS
                     82
7. YEAR:
8.
  FINANCIAL DATA:
9.
   COMPUTER:
10. CONTROLS:
11. PRODUCTS:
                     Agricultural machinery parts
                     Cast iron, steel
12. MATERIALS:
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                     Prismatic
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                     5 MT
21. MATL. HANDLING: Rail guided cart
22. TOOLING:
23. FEATURES:
24. REFERENCES:
                     14, 18
   COUNTRY:
                     France
2.
   COMPANY:
                     Renault Machines Outils
3. LOCATION:
                     Boutheon
4. DIVISION:
                     Renault Vehicles Industriels
                     Renault/Graffenstaden
5. SUPPLIER:
6. CLASS:
                     FMS
7. YEAR:
                     82
  FINANCIAL DATA: Reduced WIP
8.
9.
   COMPUTER:
                     Solar 16.4
10. CONTROLS:
                     Renault (SMC)
                     Gear boxes for trucks
11. PRODUCTS:
12. MATERIALS:
                     Cast iron, aluminum
13. NUMBER OF PARTS: 3
14. PART FAMILIES:
15. PRODUCTION RATE: 300/day
16. PART CUBE:
                     600 mm
17. PART SHAPE:
                     Prismatic
18. OPERATION
                     Alternate routings for machine failure in real time
    SCHEDULING:
19. LOT SIZE:
                     100
20. MACHINE SET:
                     4 MC (4-axis), 1 NM, 1 WS
21. MATL. HANDLING:
                     8 AGV's
22. TOOLING:
                     2 Head changers
                     Adaptive control: tool wear adjustment
23. FEATURES:
24. REFERENCES:
                     18, 19
```

1.	COUNTRY:	France
2.	COMPANY:	Unic
	LOCATION:	0.120
	DIVISION:	
5.	SUPPLIER:	Comau
6.	CLASS:	FMS
	YEAR:	85
		03
	FINANCIAL DATA:	
	COMPUTER:	
10.	CONTROLS:	
11.	PRODUCTS:	Engine base
	MATERIALS:	Steel
	NUMBER OF PARTS:	5 6 6 6 2
	PART FAMILIES:	
	PRODUCTION RATE:	
16.	PART CUBE:	
17.	PART SHAPE:	Prismatic
	OPERATION	
10.	SCHEDULING:	
10		
	LOT SIZE:	
	MACHINE SET:	2 special machines
21.	MATL. HANDLING:	Cart with towline, robots
	TOOLING:	
	FEATURES:	Automoted improprian
		Automated inspection
24.	REFERENCES:	14
1.	COUNTRY:	Hungary
1.	COUNTRY:	Hungary Rudapost Tochnical University
2.	COMPANY:	Budapest Technical University
2.	COMPANY: LOCATION:	
2. 3. 4.	COMPANY: LOCATION: DIVISION:	Budapest Technical University
2.	COMPANY: LOCATION:	Budapest Technical University
2. 3. 4. 5.	COMPANY: LOCATION: DIVISION: SUPPLIER:	Budapest Technical University
2. 3. 4. 5. 6.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS:	Budapest Technical University Budapest MC
2. 3. 4. 5. 6. 7.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR:	Budapest Technical University Budapest
2. 3. 4. 5. 6. 7. 8.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA:	Budapest Technical University Budapest MC
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER:	Budapest Technical University Budapest  MC 83
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS:	Budapest Technical University Budapest MC
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER:	Budapest Technical University Budapest  MC 83
2. 3. 4. 5. 6. 7. 8. 9. 10.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS:	Budapest Technical University Budapest  MC 83
2. 3. 4. 5. 6. 7. 8. 9. 10. 11.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS:	Budapest Technical University Budapest  MC 83
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS:	Budapest Technical University Budapest  MC 83
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES:	Budapest Technical University Budapest  MC 83
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE:	Budapest Technical University Budapest  MC 83
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE:	Budapest Technical University Budapest  MC 83  CONY 16 System
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE:	Budapest Technical University Budapest  MC 83
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE:	Budapest Technical University Budapest  MC 83  CONY 16 System
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION	Budapest Technical University Budapest  MC 83  CONY 16 System
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING:	Budapest Technical University Budapest  MC 83  CONY 16 System
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE:	Budapest Technical University Budapest  MC 83  CONY 16 System  Prismatic & rotational
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET:	Budapest Technical University Budapest  MC 83  CONY 16 System  Prismatic & rotational  4 MC, 4 NT, 1 CMM
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING:	Budapest Technical University Budapest  MC 83  CONY 16 System  Prismatic & rotational  4 MC, 4 NT, 1 CMM
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING:	Budapest Technical University Budapest  MC 83  CONY 16 System  Prismatic & rotational  4 MC, 4 NT, 1 CMM
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING:	Budapest Technical University Budapest  MC 83  CONY 16 System  Prismatic & rotational  4 MC, 4 NT, 1 CMM
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING:	Budapest Technical University Budapest  MC 83  CONY 16 System  Prismatic & rotational  4 MC, 4 NT, 1 CMM

1. COUNTRY: Hungary Csepel Machine Tool Company 2. COMPANY: Budapest 3. LOCATION: 4. DIVISION: 5. Csepel SUPPLIER: 6. CLASS: MC 78 7. YEAR: FINANCIAL DATA: 8. 9. COMPUTER: KFKI (Hungarian) 10. CONTROLS: CONY 16 System 11. PRODUCTS: Machine tool parts Cast iron, steel 12. MATERIALS: 13. NUMBER OF PARTS: 33 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION Alternate routings SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 1 WS, 1 CMM, 2 NHM, 1 NVM, 1 NM 21. MATL. HANDLING: Rail guided cart, 30 queue buffer, ASRS (400 part cap.) 22. TOOLING: ATC 23. FEATURES: 24. REFERENCES: 67, 86 1. COUNTRY: Hungary 2. COMPANY: EVIG 3. LOCATION: 4. DIVISION: 5. SUPPLIER: 6. CLASS: MC 7. YEAR: 79 8. FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: 11. PRODUCTS: Electric motor housings 12. MATERIALS: 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 4 MT 21. MATL. HANDLING: 22. TOOLING: 23. FEATURES:

24. REFERENCES:

86

2.	COUNTRY: COMPANY:	Hungary HAFE
3.	LOCATION:	
4. 5.	DIVISION: SUPPLIER:	HAFE
	CLASS:	MC
7.	YEAR:	82
	FINANCIAL DATA:	
	COMPUTER: CONTROLS:	
	PRODUCTS:	Gear boxes
	MATERIALS:	Cast iron
	NUMBER OF PARTS:	
	PART FAMILIES:	
	PRODUCTION RATE: PART CUBE:	
	PART SHAPE:	Prismatic
	OPERATION	111000010
	SCHEDULING:	
	LOT SIZE:	0 Vm
	MACHINE SET: MATL. HANDLING:	8 MT
	TOOLING:	
	FEATURES:	
24.	REFERENCES:	86
1.	COUNTRY:	Hungary
1.	COUNTRY: COMPANY:	Hungary Szim
2. 3.	COMPANY: LOCATION:	
2. 3. 4.	COMPANY: LOCATION: DIVISION:	
2. 3. 4. 5.	COMPANY: LOCATION: DIVISION: SUPPLIER:	Szim
2. 3. 4. 5. 6.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS:	Szim MC
2. 3. 4. 5.	COMPANY: LOCATION: DIVISION: SUPPLIER:	Szim
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER:	Szim MC
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS:	Szim MC 81
2. 3. 4. 5. 6. 7. 8. 9. 10.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS:	Szim  MC 81  Machine tool parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS:	Szim MC 81
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS:	Szim  MC 81  Machine tool parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE:	Szim  MC 81  Machine tool parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE:	MC 81  Machine tool parts Steel, cast iron
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE:	Szim  MC 81  Machine tool parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION	MC 81  Machine tool parts Steel, cast iron
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE:	MC 81  Machine tool parts Steel, cast iron
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET:	MC 81  Machine tool parts Steel, cast iron
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING:	MC 81  Machine tool parts Steel, cast iron  Prismatic
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING:	MC 81  Machine tool parts Steel, cast iron  Prismatic
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING:	MC 81  Machine tool parts Steel, cast iron  Prismatic

	COUNTRY: COMPANY:	Hungary
	LOCATION:	
	DIVISION:	
	SUPPLIER:	V0
	CLASS:	MC 78
	YEAR: FINANCIAL DATA:	70
	COMPUTER:	
	CONTROLS:	BME System
	PRODUCTS:	
	MATERIALS:	
	NUMBER OF PARTS: PART FAMILIES:	
	PRODUCTION RATE:	
	PART CUBE:	
	PART SHAPE:	Prismatic
	OPERATION	
	SCHEDULING:	
	LOT SIZE: MACHINE SET:	
	MATL. HANDLING:	
	TOOLING:	
23.	FEATURES:	
24.	REFERENCES:	86
1.	COUNTRY:	Hungary
	COUNTRY: COMPANY:	Hungary
2. 3.	COMPANY: LOCATION:	Hungary
2. 3. 4.	COMPANY: LOCATION: DIVISION:	Hungary
2. 3. 4. 5.	COMPANY: LOCATION: DIVISION: SUPPLIER:	
2. 3. 4. 5. 6.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS:	МС
2. 3. 4. 5. 6. 7.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR:	
2. 3. 4. 5. 6. 7.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS:	МС
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA:	МС
2. 3. 4. 5. 6. 7. 8. 9. 10.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS:	MC 81
2. 3. 4. 5. 6. 7. 8. 9. 10. 11.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS:	MC 81
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS:	MC 81
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES:	MC 81
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE:	MC 81
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE:	MC 81
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION	MC 81 Diagon 500 System
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING:	MC 81 Diagon 500 System
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE:	MC 81 Diagon 500 System
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET:	MC 81 Diagon 500 System
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE:	MC 81 Diagon 500 System

86

3.	COUNTRY: COMPANY: LOCATION:	Hungary
	DIVISION:	
	SUPPLIER: CLASS:	MC
	YEAR:	MC 73
	FINANCIAL DATA:	75
	COMPUTER:	
	CONTROLS:	DNC-73 System
	PRODUCTS:	·
	MATERIALS:	
	NUMBER OF PARTS:	
	PART FAMILIES:	
	PRODUCTION RATE:	
	PART CUBE:	D-4-41
	PART SHAPE:	Rotational
	OPERATION SCHEDULING:	
	LOT SIZE:	
	MACHINE SET:	
	MATL. HANDLING:	
	TOOLING:	
	FEATURES:	
	REFERENCES:	86
	COUNTRY:	Hungary
	COMPANY:	
3.		
4.		
	SUPPLIER:	<b>W</b> 0
	CLASS:	MC
	YEAR:	79
	FINANCIAL DATA: COMPUTER:	
	CONTROLS:	FIG System
	PRODUCTS:	110 byscem
	MATERIALS:	
	NUMBER OF PARTS:	
	PART FAMILIES:	
15.	PRODUCTION RATE:	
	PART CUBE:	
	PART SHAPE:	Prismatic
18.	OPERATION	
10	SCHEDULING:	
	LOT SIZE:	
20.	LOT SIZE: MACHINE SET:	
20. 21.	LOT SIZE: MACHINE SET: MATL. HANDLING:	
20. 21. 22.	LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING:	
20. 21. 22. 23.	LOT SIZE: MACHINE SET: MATL. HANDLING:	86

3. 4.	COUNTRY: COMPANY: LOCATION: DIVISION: SUPPLIER:	Hungary
6. 7. 8.	CLASS: YEAR: FINANCIAL DATA: COMPUTER:	MC 80
11. 12. 13. 14. 15.	CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE:	IGYR 630 System
17. 18. 19. 20. 21. 22.	PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING: FEATURES:	Prismatic
	REFERENCES:	86
2. 3. 4. 5. 6.	COUNTRY: COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS:	Italy Bonfiglioli Bologna
	YEAR: FINANCIAL DATA:	FMS 84
8. 9. 10.	YEAR: FINANCIAL DATA: COMPUTER: CONTROLS:	84
8. 9. 10. 11. 12. 13. 14.	YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE:	
8. 9. 10. 11. 12. 13. 14. 15. 16. 17.	YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING:	84 Vehicle parts
8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21.	YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET:	Vehicle parts Steel, cast iron

```
1. COUNTRY:
                     Italy
2. COMPANY:
                     Cessna
3. LOCATION:
                     Treviglio
4. DIVISION:
5. SUPPLIER:
                     Olivetti
6. CLASS:
                     FMS
7. YEAR:
                     84
8. FINANCIAL DATA:
9. COMPUTER:
10. CONTROLS:
                     Plasma
                     Engine Heads
11. PRODUCTS:
12. MATERIALS:
                     Cast iron
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE: 100,000 parts/year
16. PART CUBE:
17. PART SHAPE:
                     Prismatic
18. OPERATION
   SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                     4 MC, 1 NB, 1 WS
21. MATL. HANDLING: Robots
22. TOOLING:
23. FEATURES:
                     Adaptive control, automated inspection
24. REFERENCES:
1. COUNTRY:
                     Italy
2. COMPANY:
                     Ferrari
3. LOCATION:
                     Maranello
4. DIVISION:
5. SUPPLIER:
                     Mandelli
6. CLASS:
                     FMS
7. YEAR:
                     84
8. FINANCIAL DATA:
9. COMPUTER:
10. CONTROLS:
                     Plasma
11. PRODUCTS:
                     Automobile engine components
12. MATERIALS:
                     Cast iron, steel
13. NUMBER OF PARTS: 29
14. PART FAMILIES:
15. PRODUCTION RATE: 13 engines/day
16. PART CUBE:
17. PART SHAPE:
                     Prismatic
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                     9 MC, 2 WS
21. MATL. HANDLING: 2 rail guided carts, 2 carousels (14 pallets each)
22. TOOLING:
                     ATC
23. FEATURES:
                     14, 20
```

1.	COUNTRY:	Italy
	COMPANY:	Fiat
3.	LOCATION:	Brescia
4.	DIVISION:	Iveco Truck Plant
5.	LOCATION: DIVISION: SUPPLIER:	Jobs
6.	CLASS:	MC
7.	YEAR:	81
8	YEAR: FINANCIAL DATA:	<b>01</b>
۵.	COMPUTER:	
10	CONTROLS:	
	PRODUCTS:	Drive Shafts
	MATERIALS:	Steel
	NUMBER OF PARTS:	
	PART FAMILIES:	15/5
	PRODUCTION RATE:	15 parts/nour
	PART CUBE:	B
	PART SHAPE:	Rotational
	OPERATION	
	SCHEDULING:	
	LOT SIZE:	
	MACHINE SET:	
	MATL. HANDLING:	Robot
	TOOLING:	
	FEATURES:	
24.	REFERENCES:	14, 20
1.	COUNTRY:	Italy
2.	COMPANY:	Fiat
2. 3.	COMPANY: LOCATION:	
2. 3. 4.	COMPANY: LOCATION: DIVISION:	Fiat
2. 3. 4. 5.	COMPANY: LOCATION: DIVISION: SUPPLIER:	Fiat
2. 3. 4. 5. 6.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS:	Fiat Turin
2. 3. 4. 5. 6.	COMPANY: LOCATION: DIVISION: SUPPLIER:	Fiat Turin Comau
2. 3. 4. 5. 6. 7.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS:	Fiat Turin Comau FMS
2. 3. 4. 5. 6. 7.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR:	Fiat Turin Comau FMS
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER:	Fiat Turin Comau FMS
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS:	Fiat Turin Comau FMS 84
2. 3. 4. 5. 6. 7. 8. 9. 10.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS:	Fiat Turin Comau FMS 84 Wheel hubs
2. 3. 4. 5. 6. 7. 8. 9. 10. 11.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS:	Fiat Turin Comau FMS 84
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS:	Fiat Turin Comau FMS 84 Wheel hubs
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES:	Fiat Turin Comau FMS 84 Wheel hubs
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE:	Fiat Turin Comau FMS 84 Wheel hubs
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE:	Fiat Turin  Comau FMS 84  Wheel hubs Cast iron
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE:	Fiat Turin Comau FMS 84 Wheel hubs
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION	Fiat Turin  Comau FMS 84  Wheel hubs Cast iron
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING:	Fiat Turin  Comau FMS 84  Wheel hubs Cast iron
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE:	Fiat Turin  Comau FMS 84  Wheel hubs Cast iron  Rotational
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET:	Fiat Turin  Comau FMS 84  Wheel hubs Cast iron  Rotational
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING:	Fiat Turin  Comau FMS 84  Wheel hubs Cast iron  Rotational
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING:	Fiat Turin  Comau FMS 84  Wheel hubs Cast iron  Rotational
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING: FEATURES:	Fiat Turin  Comau FMS 84  Wheel hubs Cast iron  Rotational  2 NV Robot Automated inspection
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING:	Fiat Turin  Comau FMS 84  Wheel hubs Cast iron  Rotational

1. COUNTRY: Italy 2. COMPANY: Fiat 3. LOCATION: Turin 4. DIVISION: 5. SUPPLIER: Comau 6. CLASS: **FMS** 7. YEAR: 84 8. FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: 11. PRODUCTS: Universal joints 12. MATERIALS: Steel 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Rotational 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 6 NV 21. MATL. HANDLING: Robots, cart with towline 22. TOOLING: 23. FEATURES: Automated inspection 24. REFERENCES: 14 1. COUNTRY: Italy 2. COMPANY: Fiat Trattori 3. LOCATION: Modena 4. DIVISION: 5. SUPPLIER: Comau 6. CLASS: **FMS** 7. YEAR: 84 8. FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: 11. PRODUCTS: Transmission housing 12. MATERIALS: Steel 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION SCHEDULING: 19. LOT SIZE: 4 MC 20. MACHINE SET: 21. MATL. HANDLING: Robots 22. TOOLING: 23. FEATURES: Automated inspection 24. REFERENCES: 14

```
COUNTRY:
                     Italy
2.
    COMPANY:
                     Goldoni
3. LOCATION:
                     Capri
4. DIVISION:
5.
    SUPPLIER:
                      Berardi
                      FMS
6. CLASS:
7. YEAR:
                     84
8. FINANCIAL DATA:
9. COMPUTER:
10. CONTROLS:
                     Tractor body parts
11. PRODUCTS:
                     Steel, cast iron
12. MATERIALS:
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE: 9 parts/3.5 hours
16. PART CUBE:
17. PART SHAPE:
                     Prismatic
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                     2 MC
21. MATL. HANDLING: Roller conveyor
22. TOOLING:
23. FEATURES:
24. REFERENCES:
                     14
  COUNTRY:
                     Italy
2. COMPANY:
                     IBM Italia
3. LOCATION:
                     Milan
4. DIVISION:
5. SUPPLIER:
                     Mandelli
6. CLASS:
                     FMS
7. YEAR:
                     83
8. FINANCIAL DATA:
9. COMPUTER:
10. CONTROLS:
11. PRODUCTS:
                     Terminal parts
12. MATERIALS:
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                     Prismatic
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                     2 MC
21. MATL. HANDLING:
22. TOOLING:
23. FEATURES:
24. REFERENCES:
                     14
```

1. COUNTRY: Italy 2. Iveco Brescia COMPANY: 3. LOCATION: 4. DIVISION: 5. SUPPLIER: Comau 6. CLASS: **FMS** 7. YEAR: 82 8. FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: 11. PRODUCTS: Covers and gear boxes 12. MATERIALS: Aluminum, cast iron 13. NUMBER OF PARTS: 7 14. PART FAMILIES: 15. PRODUCTION RATE: 220 parts/15 hours 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 10 MT, 1 WS 21. MATL. HANDLING: Robots 22. TOOLING: Head changer 23. FEATURES: Automated inspection 24. REFERENCES: 14, 70 1. COUNTRY: Italy 2. COMPANY: Lamborghini 3. LOCATION: Pieve di Centro 4. DIVISION: 5. SUPPLIER: Berardi 6. CLASS: FMS 7. YEAR: 84 8. FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: 11. PRODUCTS: Engine parts 12. MATERIALS: Cast iron, steel 13. NUMBER OF PARTS: 44 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 2 MC 21. MATL. HANDLING: AGV 22. TOOLING: 23. FEATURES: 24. REFERENCES: 14

1. COUNTRY: Italy Mandelli 2. COMPANY: 3. LOCATION: 4. DIVISION: 5. SUPPLIER: Mandelli 6. CLASS: **FMS** 7. YEAR: 85 8. FINANCIAL DATA: 9. DEC PDP 11/23,24,34 COMPUTER: 10. CONTROLS: 11. PRODUCTS: Machine tool parts 12. MATERIALS: 13. NUMBER OF PARTS: 62 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE:  $1.85 \times 1.2 \times .45 \text{ m}$ 17. PART SHAPE: Prismatic 18. OPERATION Two shifts with crew of 4, one shift unmanned SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 5 MC, 1 WS, 1 CMM 21. MATL. HANDLING: 1 rail guided cart, carousel with 20 pallet capacity ATC: 120 tool capacity 22. TOOLING: 23. FEATURES: Automated inspection 24. REFERENCES: 20 COUNTRY: 1. Italy 2. COMPANY: Maserati 3. LOCATION: Modena 4. DIVISION: 5. SUPPLIER: Olivetti 6. CLASS: **FMS** 7. YEAR: 81 8. FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: 11. PRODUCTS: Engine components 12. MATERIALS: Cast iron, steel 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 200 parts/day 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 10 MC, 1 WS 21. MATL. HANDLING: Rail guided cart 22. TOOLING: 23. FEATURES: Automated inspection, probing 24. REFERENCES: 14

COUNTRY: Italy 2. COMPANY: Nuova Innocenti 3. LOCATION: Milan 4. DIVISION: 5. SUPPLIER: Berardi 6. CLASS: FMS 7. YEAR: 80 8. FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: 11. PRODUCTS: Engine heads 12. MATERIALS: Cast iron 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 4 MC 21. MATL. HANDLING: Roller conveyor 22. TOOLING: 23. FEATURES: Automated inspection, probing 24. REFERENCES: 14 1. COUNTRY: Italy 2. COMPANY: Nuovo Pignone 3. LOCATION: Florence 4. DIVISION: 5. SUPPLIER: Mandelli 6. CLASS: **FMS** 7. YEAR: 84 8. FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: 11. PRODUCTS: Turbine impellers 12. MATERIALS: 13. NUMBER OF PARTS: 17 14. PART FAMILIES: 15. PRODUCTION RATE: 1 part/3 hours 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION SCHEDULING: 19. LOT SIZE: 3 MC 20. MACHINE SET: 21. MATL. HANDLING: 22. TOOLING: 23. FEATURES:

24. REFERENCES:

14

	COUNTRY:	Italy
	COMPANY:	OM
	LOCATION:	Brescia
	DIVISION: SUPPLIER:	Jobs
	CLASS:	FMS
	YEAR:	84
	FINANCIAL DATA:	
	COMPUTER:	
10.	CONTROLS:	
	PRODUCTS:	Beveling shaft gears
	MATERIALS:	
	NUMBER OF PARTS:	
	PART FAMILIES: PRODUCTION RATE:	120 parts/hour
	PART CUBE:	120 parts/ nour
	PART SHAPE:	Rotational
	OPERATION	
	SCHEDULING:	
	LOT SIZE:	
	MACHINE SET:	3 SP
	MATL. HANDLING:	AGV, Robot
	TOOLING: FEATURES:	Automated inspection, probing
	REFERENCES:	14
	THE LINE OF CO.	
1	COLINTRY	Ta. 1
	COUNTRY:	Italy Piaggio Cilora
2.	COMPANY:	Piaggio Gilera
2. 3.	COMPANY: LOCATION:	
2. 3. 4.	COMPANY:	Piaggio Gilera
2. 3. 4. 5. 6.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS:	Piaggio Gilera Genoa
2. 3. 4. 5. 6. 7.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR:	Piaggio Gilera Genoa Berardi
2. 3. 4. 5. 6. 7. 8.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA:	Piaggio Gilera Genoa Berardi FMS
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER:	Piaggio Gilera Genoa Berardi FMS
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS:	Piaggio Gilera Genoa Berardi FMS 83
2. 3. 4. 5. 6. 7. 8. 9. 10.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS:	Piaggio Gilera Genoa Berardi FMS
2. 3. 4. 5. 6. 7. 8. 9. 10. 11.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS:	Piaggio Gilera Genoa Berardi FMS 83
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS:	Piaggio Gilera Genoa Berardi FMS 83
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS:	Piaggio Gilera Genoa Berardi FMS 83
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE:	Piaggio Gilera Genoa Berardi FMS 83
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE:	Piaggio Gilera Genoa Berardi FMS 83
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION	Piaggio Gilera Genoa  Berardi FMS 83  Motorcycle castings
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING:	Piaggio Gilera Genoa  Berardi FMS 83  Motorcycle castings
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE:	Piaggio Gilera Genoa  Berardi FMS 83  Motorcycle castings  Prismatic
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET:	Piaggio Gilera Genoa  Berardi FMS 83  Motorcycle castings  Prismatic  3 MC, 1 WS
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING:	Piaggio Gilera Genoa  Berardi FMS 83  Motorcycle castings  Prismatic
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET:	Piaggio Gilera Genoa  Berardi FMS 83  Motorcycle castings  Prismatic  3 MC, 1 WS
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING:	Piaggio Gilera Genoa  Berardi FMS 83  Motorcycle castings  Prismatic  3 MC, 1 WS Roller conveyor

```
1. COUNTRY:
                     Italy
2. COMPANY:
                     Piaggio Gilera
3. LOCATION:
                     Genoa
4. DIVISION:
5. SUPPLIER:
                     Berardi
6. CLASS:
                     FTL
7. YEAR:
                     84
8. FINANCIAL DATA:
9. COMPUTER:
10. CONTROLS:
11. PRODUCTS:
                     Engine heads
12. MATERIALS:
                     Cast iron
13. NUMBER OF PARTS: 4
14. PART FAMILIES:
15. PRODUCTION RATE: 1 part/2 hours
16. PART CUBE:
17. PART SHAPE:
                     Prismatic
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                     8 MC
21. MATL. HANDLING: Roller conveyor
22. TOOLING:
23. FEATURES:
24. REFERENCES:
                     14
1. COUNTRY:
                     Italy
2. COMPANY:
                     Rockwell CVC Omevi
3. LOCATION:
                     Cameri
4. DIVISION:
5. SUPPLIER:
                     Mandelli
6. CLASS:
                     FTL
7. YEAR:
                     84
8. FINANCIAL DATA:
9. COMPUTER:
10. CONTROLS:
11. PRODUCTS:
                     Truck differential carriers
12. MATERIALS:
                     Cast iron
13. NUMBER OF PARTS: 2
14. PART FAMILIES:
15. PRODUCTION RATE: 7.6/hour
16. PART CUBE:
17. PART SHAPE:
                     Prismatic
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                 4 MC, 1 CMM, 1 WS
21. MATL. HANDLING: 2 rail guided carts, robots, carousel with 18 pallets
22. TOOLING:
23. FEATURES:
24. REFERENCES:
                     14, 20
```

1. COUNTRY: Italy 2. Rockwell Iveco COMPANY: 3. LOCATION: Novara 4. DIVISION: 5. SUPPLIER: Mandelli 6. CLASS: FMS 7. YEAR: 85 8. FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: Truck differential carriers 11. PRODUCTS: 12. MATERIALS: Cast iron 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 21. MATL. HANDLING: 22. TOOLING: 23. FEATURES: 24. REFERENCES: 15 1. COUNTRY: Italy 2. COMPANY: Rockwell Italia 3. LOCATION: Cameri 4. DIVISION: 5. SUPPLIER: Comau 6. CLASS: **FMS** 7. YEAR: 84 8. FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: 11. PRODUCTS: Differential parts 12. MATERIALS: Cast Iron 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 62,300 parts/year 16. PART CUBE: 17. PART SHAPE: Rotational 18. OPERATION SCHEDULING: 19. LOT SIZE: 2 NV 20. MACHINE SET: 21. MATL. HANDLING: Cart with towline, robot 22. TOOLING: 23. FEATURES: Automated inspection

14

```
1.
    COUNTRY:
                     Italy
2.
    COMPANY:
                     Rockwell Italia
3. LOCATION:
                     Cameri
4. DIVISION:
5. SUPPLIER:
                     Comau
6. CLASS:
                     FMS
7. YEAR:
                     83
8. FINANCIAL DATA:
9. COMPUTER:
10. CONTROLS:
11. PRODUCTS:
                     Bearing boxes
12. MATERIALS:
                     Cast iron
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE: 44,500 parts/year
16. PART CUBE:
17. PART SHAPE:
                     Rotational
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                     2 NV
21. MATL. HANDLING: Cart with towline, robot
22. TOOLING:
23. FEATURES:
                     Automated inspection
24. REFERENCES:
                     14
1. COUNTRY:
                     Italy
2.
    COMPANY:
                     Savio
3. LOCATION:
                     Genoa
4. DIVISION:
5. SUPPLIER:
                     Berardi
6. CLASS:
                     FMS
7.
   YEAR:
                     84
8. FINANCIAL DATA:
9. COMPUTER:
10. CONTROLS:
11. PRODUCTS:
12. MATERIALS:
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                     Prismatic
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
                   4 MC, 1 WS
20. MACHINE SET:
21. MATL. HANDLING: Roller conveyor
22. TOOLING:
23. FEATURES:
                     Cental coolant
```

14

	COUNTRY: COMPANY:	Italy
3.	LOCATION: DIVISION:	Di Tomazo
5.	SUPPLIER: CLASS:	Berardi FMS
7.	YEAR:	82
8.	FINANCIAL DATA: COMPUTER:	
	CONTROLS:	
	PRODUCTS:	
	MATERIALS: NUMBER OF PARTS:	
14.	PART FAMILIES:	
	PRODUCTION RATE: PART CUBE:	
17.	PART SHAPE:	Prismatic
18.	OPERATION SCHEDULING:	
19.	LOT SIZE:	0.149
20.	MACHINE SET: MATL. HANDLING:	8 MC Roller conveyor, 8 robots
22.	TOOLING:	
	FEATURES: REFERENCES:	18
	COUNTRY:	Italy
2.	COMPANY:	VM
2. 3. 4.	COMPANY: LOCATION: DIVISION:	VM Ceto
2. 3. 4. 5.	COMPANY: LOCATION: DIVISION: SUPPLIER:	VM Ceto Jobs
2. 3. 4. 5. 6. 7.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR:	VM Ceto
2. 3. 4. 5. 6. 7. 8.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA:	VM Ceto Jobs FMS
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR:	VM Ceto Jobs FMS
2. 3. 4. 5. 6. 7. 8. 9. 10.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS:	VM Ceto Jobs FMS 82 Drive shafts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS:	VM Ceto Jobs FMS 82
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES:	VM Ceto Jobs FMS 82 Drive shafts Steel
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES:	VM Ceto Jobs FMS 82 Drive shafts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE:	VM Ceto Jobs FMS 82 Drive shafts Steel
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE:	VM Ceto Jobs FMS 82 Drive shafts Steel 4 parts/2.5 minutes
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE:	VM Ceto  Jobs FMS 82  Drive shafts Steel  4 parts/2.5 minutes Rotational
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE:	VM Ceto  Jobs FMS 82  Drive shafts Steel  4 parts/2.5 minutes Rotational
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING:	VM Ceto  Jobs FMS 82  Drive shafts Steel  4 parts/2.5 minutes  Rotational  2 NV, 2 NM Robots
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING:	VM Ceto  Jobs FMS 82  Drive shafts Steel  4 parts/2.5 minutes Rotational

```
COUNTRY:
1.
                     Japan
                     Asian Kogyo
2. COMPANY:
3. LOCATION:
                     Anjyo
4.
   DIVISION:
5.
   SUPPLIER:
   CLASS:
                     MC
6.
7.
   YEAR:
                     82
8. FINANCIAL DATA:
    COMPUTER:
10. CONTROLS:
11. PRODUCTS:
12. MATERIALS:
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                     6 NC piercing machines
21. MATL. HANDLING:
                     2 robots
22. TOOLING:
23. FEATURES:
24. REFERENCES:
                     14
1.
    COUNTRY:
                     Japan
2.
    COMPANY:
                     Atsugi Jidasha Buhin
3. LOCATION:
                     Akita
4. DIVISION:
5. SUPPLIER:
6. CLASS:
                     FMS
7. YEAR:
                     81
   FINANCIAL DATA:
8.
9. COMPUTER:
10. CONTROLS:
11. PRODUCTS:
12. MATERIALS:
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                     Prismatic
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
                     1 MC, 2 MT
20. MACHINE SET:
21. MATL. HANDLING:
22. TOOLING:
23. FEATURES:
24. REFERENCES:
                     14
```

```
1.
    COUNTRY:
                      Japan
                      Brother Industries
2. COMPANY:
3. LOCATION:
   DIVISION:
5.
   SUPPLIER:
                      Toshiba
    CLASS:
                      FMS
6.
                      80
7.
   YEAR:
8. FINANCIAL DATA:
   COMPUTER:
10. CONTROLS:
11. PRODUCTS:
                      Typewriter, sewing machine parts
12. MATERIALS:
13. NUMBER OF PARTS: 6
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                      Prismatic
                      Crew of 2
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
                      50 average
20. MACHINE SET:
                      22 DNC MT's
21. MATL. HANDLING:
22. TOOLING:
23. FEATURES:
24. REFERENCES:
                      14, 86
1.
    COUNTRY:
                      Japan
2. COMPANY:
                      Cannon
3. LOCATION:
4. DIVISION:
5.
   SUPPLIER:
                      Okuma
6.
   CLASS:
                     MC
                      84
7. YEAR:
8. FINANCIAL DATA:
9. COMPUTER:
10. CONTROLS:
11. PRODUCTS:
                      Camera and VCR parts
12. MATERIALS:
                      Aluminum
13. NUMBER OF PARTS: 40
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                      Rotational
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                      6 NT (2 duplicate cells)
21. MATL. HANDLING:
22. TOOLING:
23. FEATURES:
24. REFERENCES:
                      75
```

1	COUNTRY.	Inner
	COUNTRY:	Japan
	COMPANY:	Daifu Kiko
3.	LOCATION:	Osaka
4.	DIVISION:	
	SUPPLIER:	
	CLASS:	FMS
	YEAR:	82
8.	FINANCIAL DATA:	
9.	COMPUTER:	
10.	CONTROLS:	
	PRODUCTS:	
	MATERIALS:	
	NUMBER OF PARTS:	
	PART FAMILIES:	
15.	PRODUCTION RATE:	
16.	PART CUBE:	
	PART SHAPE:	Prismatic
	OPERATION	11100000
	SCHEDULING:	
	LOT SIZE:	
20.	MACHINE SET:	4 MC
21.	MATL. HANDLING:	AGV, ASRS
	TOOLING:	·
	FEATURES:	
	REFERENCES:	14
24.	KELEKENCES:	14
,	COLINEDA	T
	COUNTRY:	Japan
2.	COUNTRY: COMPANY:	Japan Fuji Denki Seico
2.		
2. 3.	COMPANY: LOCATION:	Fuji Denki Seico
2. 3. 4.	COMPANY: LOCATION: DIVISION:	Fuji Denki Seico
2. 3. 4. 5.	COMPANY: LOCATION: DIVISION: SUPPLIER:	Fuji Denki Seico Suzuka
2. 3. 4. 5. 6.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS:	Fuji Denki Seico Suzuka FMS
2. 3. 4. 5. 6. 7.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR:	Fuji Denki Seico Suzuka
2. 3. 4. 5. 6. 7.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA:	Fuji Denki Seico Suzuka FMS
2. 3. 4. 5. 6. 7. 8.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER:	Fuji Denki Seico Suzuka FMS
2. 3. 4. 5. 6. 7. 8.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER:	Fuji Denki Seico Suzuka FMS
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS:	Fuji Denki Seico Suzuka FMS
2. 3. 4. 5. 6. 7. 8. 9. 10.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS:	Fuji Denki Seico Suzuka FMS
2. 3. 4. 5. 6. 7. 8. 9. 10. 11.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS:	Fuji Denki Seico Suzuka FMS
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS:	Fuji Denki Seico Suzuka FMS
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES:	Fuji Denki Seico Suzuka FMS
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE:	Fuji Denki Seico Suzuka FMS
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES:	Fuji Denki Seico Suzuka FMS
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE:	Fuji Denki Seico Suzuka FMS
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE:	Fuji Denki Seico Suzuka FMS 84
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION	Fuji Denki Seico Suzuka FMS 84
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING:	Fuji Denki Seico Suzuka FMS 84
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE:	Fuji Denki Seico Suzuka FMS 84
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET:	Fuji Denki Seico Suzuka  FMS 84  Rotational
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING:	Fuji Denki Seico Suzuka FMS 84
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING:	Fuji Denki Seico Suzuka  FMS 84  Rotational
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING:	Fuji Denki Seico Suzuka  FMS 84  Rotational
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING:	Fuji Denki Seico Suzuka  FMS 84  Rotational

1. COUNTRY: 2. COMPANY: 3. LOCATION: 4. DIVISION:	Japan Fuji Xerox Ebina
<ul><li>5. SUPPLIER:</li><li>6. CLASS:</li><li>7. YEAR:</li><li>8. FINANCIAL DATA:</li></ul>	FMS 84
9. COMPUTER: 10. CONTROLS: 11. PRODUCTS: 12. MATERIALS: 13. NUMBER OF PARTS:	Parts for copy machines
14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE:	Prismatic
18. OPERATION SCHEDULING: 19. LOT SIZE:	
20. MACHINE SET: 21. MATL. HANDLING: 22. TOOLING: 23. FEATURES:	5 MC Cart with towline
24. REFERENCES:	14
1. COUNTRY: 2. COMPANY: 3. LOCATION: 4. DIVISION:	Japan Fujitsu Fanuc Fuji
<ul><li>5. SUPPLIER:</li><li>6. CLASS:</li><li>7. YEAR:</li><li>8. FINANCIAL DATA:</li></ul>	Fuji Electric FMS 80
9. COMPUTER: 10. CONTROLS:	
11. PRODUCTS: 12. MATERIALS: 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE:	Robots, EDM machines, small CNC lathes Steel, cast iron 450
16. PART CUBE: 17. PART SHAPE:	Prismatic and rotational
18. OPERATION SCHEDULING:	Unmanned night shift, crew of 4
19. LOT SIZE: 20. MACHINE SET: 21. MATL. HANDLING:	30 MT's, CO2 laser for hardening 4 AGV's, ASRS, robots, and carousels
22. TOOLING: 23. FEATURES: 24. REFERENCES:	Probing, closed circuit TV 7, 12, 14, 18, 51

```
COUNTRY:
                     Japan
1.
                     Fujutsu Fanuc
2.
   COMPANY:
3.
  LOCATION:
                     Fuji
4. DIVISION:
5. SUPPLIER:
                     Fanuc
                     FMS
   CLASS:
6.
                     82
7. YEAR:
                     $37 million plant, labor savings: 60 workers vs. 300
8. FINANCIAL DATA:
9.
   COMPUTER:
10. CONTROLS:
11. PRODUCTS:
                     Electric motors
12. MATERIALS:
13. NUMBER OF PARTS: 900
14. PART FAMILIES:
15. PRODUCTION RATE: 120,000 parts/year
16. PART CUBE:
17. PART SHAPE:
                     Prismatic and rotational
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
                     Range of 20 to 1,000
20. MACHINE SET:
                     60 MT's
21. MATL. HANDLING: AGV's, 52 robots (plus 49 used in assembly), ASRS
22. TOOLING:
23. FEATURES:
                     7, 12, 69
24. REFERENCES:
1.
    COUNTRY:
                     Japan
2. COMPANY:
                     Fujitsu Fanuc
3. LOCATION:
                     Oshino
4. DIVISION:
5.
   SUPPLIER:
                     Fanuc
   CLASS:
                     FMS
6.
7.
   YEAR:
                     84
8. FINANCIAL DATA:
   COMPUTER:
10. CONTROLS:
11. PRODUCTS:
                     Plastic injection molding machine parts
12. MATERIALS:
                     Steel, cast iron
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                     Prismatic
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                     11 NHM (Makino), 2 NVM (Makino)
21. MATL. HANDLING: AGV's
22. TOOLING:
23. FEATURES:
```

7, 14

1. COUNTRY: Japan 2. Fujitsu Fanuc COMPANY: Oshino 3. LOCATION: 4. DIVISION: 5. SUPPLIER: Fanuc CLASS: FMS 6. YEAR: 81 7. FINANCIAL DATA: 90 % savings in number of MT's and number of workers 8. 9. COMPUTER: 10. CONTROLS: 11. PRODUCTS: Plastic injection molding machine parts 12. MATERIALS: Steel, cast iron 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Rotational 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 6 NT, 1 GR, 1 NM, 1 SP, 1 ND 21. MATL. HANDLING: Robots, AGV's 22. TOOLING: 23. FEATURES: 24. REFERENCES: 7, 12, 14, 18 1. COUNTRY: Japan 2. COMPANY: Fukushimo Seisakusha 3. LOCATION: 4. DIVISION: 5. SUPPLIER: Hitachi Seiki 6. CLASS: **FMS** 7. YEAR: 84 8. FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: 11. PRODUCTS: Low pressure hydraulic devices 12. MATERIALS: 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Rotational and prismatic 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 3 MC, 1 NT, 1 NV, 1 NM 21. MATL. HANDLING: 22. TOOLING: 23. FEATURES:

24. REFERENCES:

14

```
COUNTRY:
1.
                      Japan
2. COMPANY:
                      Hitachi Seiki
3. LOCATION:
                      Abiko
4.
   DIVISION:
5.
   SUPPLIER:
                      Hitachi Seiki
   CLASS:
                      FMS
6.
                      83
7.
   YEAR:
8. FINANCIAL DATA:
                      3.7 year payback period, jobs reduced from 9 to 4
                      NEC MS8
   COMPUTER:
10. CONTROLS:
                      Fanuc 6MB CNC's
11. PRODUCTS:
                      Machine tool parts
12. MATERIALS:
                      Stee1
13. NUMBER OF PARTS: 79
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
                      60 \times 100 in plate
17. PART SHAPE:
                      Prismatic
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                      4 NHM (Hitachi, # 112 line)
21. MATL. HANDLING:
                     1 rail guided cart
22. TOOLING:
23. FEATURES:
24. REFERENCES:
                      7, 14
1.
    COUNTRY:
                      Japan
2. COMPANY:
                      Hitachi Seiki
3. LOCATION:
                      Abiko
4. DIVISION:
5.
   SUPPLIER:
                      Hitachi Seiki
6. CLASS:
                      FMS
   YEAR:
7.
                      83
   FINANCIAL DATA:
                     4.1 year payback period, 4 MT's vs 8
9. COMPUTER:
10. CONTROLS:
11. PRODUCTS:
                      Machine tool parts
12. MATERIALS:
                      Steel, cast iron
13. NUMBER OF PARTS: 131
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
                      500 \text{ mm } \times 500 \text{ mm pallets}
17. PART SHAPE:
                      Prismatic
18. OPERATION
                      3 shift operation with 2,000 machine hours per month
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                      2 NHM, 2 NVM (# 113 line)
21. MATL. HANDLING:
                     AGV, ASRS
22. TOOLING:
                      ATC with a robot, 528 tools in the system
23. FEATURES:
                      7, 14
24. REFERENCES:
```

```
1. COUNTRY:
                     Japan
                     Hitachi Seiki
2. COMPANY:
3. LOCATION:
                     Abiko
4. DIVISION:
5. SUPPLIER:
                     Hitachi Seiki
6. CLASS:
                     FMS
7.
   YEAR:
                     83
8. FINANCIAL DATA: 3.6 year payback, 4 MT's vs. 7, jobs reduced from 12 to 5
    COMPUTER:
10. CONTROLS:
11. PRODUCTS:
                     Machine tool parts
                     Steel, cast iron
12. MATERIALS:
13. NUMBER OF PARTS: 468
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                     Rotational
                     1600 machine hours per month
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
                     Maximum of 20
                     3 NT, 1 NHM (# 114 line)
20. MACHINE SET:
21. MATL. HANDLING: 4 robots
22. TOOLING:
23. FEATURES:
24. REFERENCES:
                     7, 14
1. COUNTRY:
                     Japan
2. COMPANY:
                     Hitachi Seiko
3. LOCATION:
                     Ebina
4. DIVISION:
5. SUPPLIER:
                     Hitachi Seiki
   CLASS:
6.
                     FMS
7. YEAR:
                     82
8. FINANCIAL DATA:
9.
   COMPUTER:
                     Hitachi M1002H
10. CONTROLS:
11. PRODUCTS:
                     Machine tool parts
12. MATERIALS:
                     Steel, cast iron
13. NUMBER OF PARTS: 10
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
                     500 \times 500 \text{ mm} pallet
17. PART SHAPE:
                     Prismatic
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                     1 NHM, 1 NVM
21. MATL. HANDLING:
                     1 rail guided cart
                     ATC with capacities of 40 and 60
22. TOOLING:
23. FEATURES:
                     Machine vision, pallet ID
```

24. REFERENCES:

7

1. 2. 3. 4.	LOCATION: DIVISION:	Japan Ishikawajima Harima
7. 8. 9. 10. 11. 12.	CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES:	FMS 84
15. 16. 17.	PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING:	
20. 21. 22.	LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING: FEATURES:	
24.	REFERENCES:	14
1. 2. 3. 4. 5. 6. 7. 8.	COUNTRY: COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER:	Japan Japanese National Project Tsukuba Science City MITI - Agency of Science & Technology FMS 84
11. 12. 13. 14.	CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES:	Gearboxes, diesel engine components Cast iron, steel
16. 17. 18.	PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING:	300 mm Prismatic
20. 21.	LOT SIZE: MACHINE SET: MATL. HANDLING:	3 MC
	TOOLING: FEATURES:	

1. COUNTRY: 2. COMPANY: 3. LOCATION: 4. DIVISION: 5. SUPPLIFE:	Japan Kawakami Seisakusho
5. SUPPLIER: 6. CLASS: 7. YEAR: 8. FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: 11. PRODUCTS: 12. MATERIALS: 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE:	FMS 82
17. PART SHAPE: 18. OPERATION SCHEDULING:	Rotational
19. LOT SIZE: 20. MACHINE SET: 21. MATL. HANDLING: 22. TOOLING: 23. FEATURES:	4 GR, 1 NV, 1 power press Robot for power press
24. REFERENCES:	14
1. COUNTRY: 2. COMPANY: 3. LOCATION: 4. DIVISION: 5. SUPPLIER:	Japan Kawaski Heavy Industries Nishi-Kobi
2. COMPANY: 3. LOCATION: 4. DIVISION: 5. SUPPLIER: 6. CLASS: 7. YEAR: 8. FINANCIAL DATA: 9. COMPUTER:	Kawaski Heavy Industries
2. COMPANY: 3. LOCATION: 4. DIVISION: 5. SUPPLIER: 6. CLASS: 7. YEAR: 8. FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: 11. PRODUCTS: 12. MATERIALS: 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE:	Kawaski Heavy Industries Nishi-Kobi  FMS 75  Valve casting - radial piston engine
2. COMPANY: 3. LOCATION: 4. DIVISION: 5. SUPPLIER: 6. CLASS: 7. YEAR: 8. FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: 11. PRODUCTS: 12. MATERIALS: 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: 18. OPERATION SCHEDULING:	Kawaski Heavy Industries Nishi-Kobi  FMS 75  Valve casting - radial piston engine
2. COMPANY: 3. LOCATION: 4. DIVISION: 5. SUPPLIER: 6. CLASS: 7. YEAR: 8. FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: 11. PRODUCTS: 12. MATERIALS: 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: 18. OPERATION	Kawaski Heavy Industries Nishi-Kobi  FMS 75  Valve casting - radial piston engine

```
1. COUNTRY:
                      Japan
2. COMPANY:
                     Kitagoe Kogyo
3. LOCATION:
4. DIVISION:
5. SUPPLIER:
6. CLASS:
                      FMS
7.
   YEAR:
                      80
8. FINANCIAL DATA:
9. COMPUTER:
10. CONTROLS:
11. PRODUCTS:
                     Compressor parts
12. MATERIALS:
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                     Prismatic
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                      2 MC
21. MATL. HANDLING:
22. TOOLING:
23. FEATURES:
24. REFERENCES:
                     14
  COUNTRY:
1.
                     Japan
2.
    COMPANY:
                     Komatsu Seisakusho
3. LOCATION:
                     Awazu
4. DIVISION:
                     Komatsu
5. SUPPLIER:
6.
   CLASS:
                     FMS
7. YEAR:
                     76
8. FINANCIAL DATA:
9. COMPUTER:
10. CONTROLS:
11. PRODUCTS:
                     Bulldozer transmission parts
12. MATERIALS:
                     Steel
13. NUMBER OF PARTS: 106
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                     Rotational
                     Crew of 6
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
                     Average of 16
20. MACHINE SET:
                     1 NM, 2 NV, 4 spline hobbing machines
21. MATL. HANDLING:
22. TOOLING:
23. FEATURES:
```

14, 86

1. COUNTRY: Japan Makino Milling Machine Co. 2. COMPANY: 3. LOCATION: Atsugi 4. DIVISION: 5. SUPPLIER: Makino 6. CLASS: FMS 7. YEAR: 84 8. FINANCIAL DATA: 9. COMPUTER: Univac AGS2400F 10. CONTROLS: 11. PRODUCTS: Machine tool parts 12. MATERIALS: Steel, cast iron 13. NUMBER OF PARTS: 500 14. PART FAMILIES: 15. PRODUCTION RATE: 270 parts/day 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION 3 shift operation SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 10 MC (Makino) 21. MATL. HANDLING: 5 AGV's, ASRS 22. TOOLING: 23. FEATURES: Probing 24. REFERENCES: 7, 14 1. COUNTRY: Japan Mike Pulley 2. COMPANY: 3. LOCATION: 4. DIVISION: 5. SUPPLIER: 6. CLASS: MC 7. YEAR: 79 8. FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: 11. PRODUCTS: Conveyor parts 12. MATERIALS: Stee1 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Rotational 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 1 NV, 1 GR 21. MATL. HANDLING: 22. TOOLING: 23. FEATURES: 24. REFERENCES: 14

```
1. COUNTRY:
                     Japan
2. COMPANY:
                     Mitsubishi Electric Co.
3. LOCATION:
                     Inagwa
4. DIVISION:
5. SUPPLIER:
                     Mitsubishi
6. CLASS:
                     FMS
7. YEAR:
                     84
8.
  FINANCIAL DATA:
9. COMPUTER:
10. CONTROLS:
11. PRODUCTS:
                     Machined sheet metal parts
12. MATERIALS:
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                     Prismatic
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
21. MATL. HANDLING:
22. TOOLING:
23. FEATURES:
24. REFERENCES:
                     14
1. COUNTRY:
                     Japan
2. COMPANY:
                     Mitsubishi Heavy Industries
3. LOCATION:
                     Kyoto
4. DIVISION:
5. SUPPLIER:
6. CLASS:
                     FMS
7. YEAR:
                     84
8. FINANCIAL DATA:
9. COMPUTER:
10. CONTROLS:
11. PRODUCTS:
                     Machine tool parts
12. MATERIALS:
                     Steel, cast iron
13. NUMBER OF PARTS: 120
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                     Prismatic
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                     5 MC
21. MATL. HANDLING: Air cushion AGV, air cushion conveyor
22. TOOLING:
                     ATC with capacities of 60 and 90, 100 tools in system
23. FEATURES:
```

24. REFERENCES:

7

```
Japan
1.
  COUNTRY:
                     Mitsubishi Heavy Industries
2. COMPANY:
3. LOCATION:
                     Kyoto
4. DIVISION:
5. SUPPLIER:
                     FMS
6. CLASS:
7. YEAR:
                     84
8. FINANCIAL DATA:
  COMPUTER:
10. CONTROLS:
11. PRODUCTS:
                     Machine tool parts
12. MATERIALS:
                     Steel, cast iron
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                     Rotational
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                     12 CNC (boring, turning, and grinding operations)
21. MATL. HANDLING: Robots
22. TOOLING:
23. FEATURES:
24. REFERENCES:
                     7
  COUNTRY:
                     Japan
1.
2. COMPANY:
                     Mori Seiki
3. LOCATION:
                     Iga
4. DIVISION:
5. SUPPLIER:
                     Mori Seiki
                     FMS
6. CLASS:
7. YEAR:
                     82
8. FINANCIAL DATA:
                     Machine utilization 93%, 13 MT's vs. 54
9. COMPUTER:
                     Hitachi E800
10. CONTROLS:
11. PRODUCTS:
                     Machine tool parts
12. MATERIALS:
                     Steel, cast iron
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                     Prismatic
18. OPERATION
                     22 24-hour days are scheduled every month, 3 workers on
    SCHEDULING:
                     first shift, none on second or third
19. LOT SIZE:
                     9 NVM (Mori Seiki), 4 NHM (Toyada)
20. MACHINE SET:
21. MATL. HANDLING: 16 AGV's, ASRS, linear 14 station queue
22. TOOLING:
23. FEATURES:
                     Probing
```

1. COUNTRY: Japan Murata Machinery 2. COMPANY: 3. LOCATION: Nihon Denki 4. DIVISION: Tamagwa 5. Murata SUPPLIER: 6. CLASS: **FMS** 7. YEAR: 84 8. FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: 11. PRODUCTS: Sheet metal chasis cover 12. MATERIALS: 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 4 turret presses, 2 cutting machines 21. MATL. HANDLING: AGV, ASRS 22. TOOLING: 23. FEATURES: 24. REFERENCES: 14 1. COUNTRY: Japan 2. COMPANY: Murata Machinery 3. LOCATION: Inuyama 4. DIVISION: 5. SUPPLIER: CLASS: **FMS** 6. YEAR: 81 260 % increase in productivity, 20 to 30 workers vs. 100 8. FINANCIAL DATA: COMPUTER: 10. CONTROLS: 11. PRODUCTS: Textile machinery, AGV's Steel, cast iron 12. MATERIALS: 13. NUMBER OF PARTS: 150 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Prismatic 2 10-hour shifts 18. OPERATION SCHEDULING: 19. LOT SIZE: 3 NHM, 4 NVM 20. MACHINE SET: 21. MATL. HANDLING: Robots, ASRS 22. TOOLING: 23. FEATURES:

7, 69

Japan COUNTRY: Niigata Engineering COMPANY: Niigata LOCATION: Diesel Engine Works 4. DIVISION: 5. Niigata Engineering SUPPLIER: **FMS** 6. CLASS: 79 7. YEAR: 8. FINANCIAL DATA: 9. COMPUTER: Hitachi 10. CONTROLS: 11. PRODUCTS: Cylinder heads Cast iron 12. MATERIALS: 13. NUMBER OF PARTS: 80 14. PART FAMILIES: 15. PRODUCTION RATE: 36 x 24 x 12 in 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION 3 shifts, 21 hours per day, in event of machine breakdown SCHEDULING: the computer assigns alternate operations in real time 19. LOT SIZE: 20. MACHINE SET: 5 MC 21. MATL. HANDLING: Roller conveyor, 1 rail guided cart 22. TOOLING: 23. FEATURES: Acoustic emmissions for adaptive control 24. REFERENCES: 7, 14, 45 1. COUNTRY: Japan 2. COMPANY: Niigata Engineering 3. LOCATION: Niigata 4. DIVISION: Niigata Machine Tool Works 5. SUPPLIER: Niigata 6. CLASS: **FMS** 7. YEAR: 83 FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: 11. PRODUCTS: Machine tool parts 12. MATERIALS: Steel, cast iron 13. NUMBER OF PARTS: 70 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 5 NHM, 1 NM, 1 NV (all Toshiba) 21. MATL. HANDLING: 2 AGV's, ASRS 22. TOOLING: ATC with capacities of 60 & 90, 700 tools in system 23. FEATURES:

7, 14

```
1. COUNTRY:
                      Japan
2. COMPANY:
                      Okuma
3. LOCATION:
                      Oguchi
4. DIVISION:
5. SUPPLIER:
                      Okuma
6. CLASS:
                      FMS
7.
   YEAR:
                      82
8. FINANCIAL DATA:
                      1.9 year payback, 60% labor savings, 75 % utilization
9. COMPUTER:
                      Campus 5000
10. CONTROLS:
11. PRODUCTS:
                      Machine tool headstocks, taulstocks, and saddles
12. MATERIALS:
                      Cast iron
13. NUMBER OF PARTS: 95
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                     Prismatic
18. OPERATION
                      3 shifts with crew of 3, 1 shift unmanned
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                      7 MC (Okuma)
21. MATL. HANDLING:
                      1 AGV
22. TOOLING:
                      ATC
23. FEATURES:
                     Adaptive control
24. REFERENCES:
                      7, 51, 69, 75
    COUNTRY:
                      Japan
1.
2. COMPANY:
                      Osaka Kiko
3. LOCATION:
                      Inuyama
4. DIVISION:
5. SUPPLIER:
6. CLASS:
                      FMS
7.
   YEAR:
                      82
8. FINANCIAL DATA:
9. COMPUTER:10. CONTROLS:
11. PRODUCTS:
                     Machine tool parts
12. MATERIALS:
                      Steel, cast iron
13. NUMBER OF PARTS: 65
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                      Prismatic
18. OPERATION
                      2 shifts plus
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                      2 NHM, 1 NVM, (all OKK)
21. MATL. HANDLING:
                      1 rail guided cart
22. TOOLING:
                      ATC with capacity of 120 tools per machine
23. FEATURES:
                      Acoustic emmissions monitoring for adaptive control
24. REFERENCES:
```

COUNTRY: Japan 1. 2. COMPANY: Shin Nippon Koki 3. LOCATION: 0saka DIVISION: Shinodayama Works 4. 5. SUPPLIER: **FMS** 6. CLASS: 7. YEAR: 82 8. FINANCIAL DATA: Mitsubishi Melcom 7030 COMPUTER: 10. CONTROLS: Machine center and planner parts 11. PRODUCTS: 12. MATERIALS: Steel, cast iron 13. NUMBER OF PARTS: 250 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 28 x 28 x 20 in 17. PART SHAPE: Prismatic 3 shifts, with unmanned night shift 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 2 NHM, 2 NVM, 1 CMM, (all SNK) 21. MATL. HANDLING: 1 rail guided cart, ASRS 22. TOOLING: 23. FEATURES: Acoustic emmissions monitoring for adaptive control 24. REFERENCES: 1. COUNTRY: Japan 2. COMPANY: Shinmeiwa Kogyo 3. LOCATION: Takarazuka 4. DIVISION: 5. SUPPLIER: Shinmeiwa 6. CLASS: **FMS** 7. YEAR: 82 8. FINANCIAL DATA: COMPUTER: 10. CONTROLS: 11. PRODUCTS: Robot and machine tool parts 12. MATERIALS: Steel, cast iron 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION Unmanned night shift SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 2 MC 21. MATL. HANDLING: Rail guided cart 22. TOOLING: 23. FEATURES:

14, 51

1. COUNTRY: Japan Shinmeiwa Kogyo 2. COMPANY: Takarazuka 3. LOCATION: 4. DIVISION: SUPPLIER: Shinmeiwa 6. CLASS: **FMS** 7. YEAR: 82 FINANCIAL DATA: COMPUTER: 9. 10. CONTROLS: 11. PRODUCTS: Machine tool, aircraft parts 12. MATERIALS: Steel, cast iron, and aluminum 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION Unmanned operation at night SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 4 MC 21. MATL. HANDLING: Rail guided cart 22. TOOLING: 23. FEATURES: Adaptive control 24. REFERENCES: 14, 51 1. COUNTRY: Japan Shinodayama COMPANY: 3. LOCATION: 0saka 4. DIVISION: 5. SUPPLIER: Shi Nippon Koki 6. CLASS: **FMS** YEAR: 7. 82 FINANCIAL DATA: COMPUTER: 10. CONTROLS: Melcon 70/30 11. PRODUCTS: 12. MATERIALS: 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 4 MC 21. MATL. HANDLING: Rail guided cart, ASRS 22. TOOLING: 23. FEATURES: Automated inspection

14

1.	COUNTRY:	Japan
	COMPANY:	•
-		Ob the second
	LOCATION:	China
4.	DIVISION:	
5.	SUPPLIER:	Sunitomo Jyuki Kogyo
	CLASS:	FMS
		79
	YEAR:	79
8.	FINANCIAL DATA:	
9.	COMPUTER:	
	CONTROLS:	
		D 1 1 .
11.	PRODUCTS:	Power shovel parts
12.	MATERIALS:	Steel, cast iron
13.	NUMBER OF PARTS:	
	PART FAMILIES:	
	PRODUCTION RATE:	
16.	PART CUBE:	
	PART SHAPE:	Prismatic
		TIIBMACIC
10.	OPERATION	
	SCHEDULING:	
19.	LOT SIZE:	
	MACHINE SET:	4 MC
	MATL. HANDLING:	4 110
	TOOLING:	
23.	FEATURES:	1 welding robot
24.	REFERENCES:	14
27.	KBI BREMODD:	• •
1.	COUNTRY:	Japan
1.		Japan Takigaya Machina Taal
2.	COMPANY:	Takisawa Machine Tool
2. 3.	COMPANY: LOCATION:	
2. 3.	COMPANY:	Takisawa Machine Tool
2. 3. 4.	COMPANY: LOCATION: DIVISION:	Takisawa Machine Tool Okayama
2. 3. 4. 5.	COMPANY: LOCATION: DIVISION: SUPPLIER:	Takisawa Machine Tool Okayama Takisawa
2. 3. 4. 5. 6.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS:	Takisawa Machine Tool Okayama Takisawa FMS
2. 3. 4. 5. 6. 7.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR:	Takisawa Machine Tool Okayama Takisawa
2. 3. 4. 5. 6. 7.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS:	Takisawa Machine Tool Okayama Takisawa FMS
2. 3. 4. 5. 6. 7. 8.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA:	Takisawa Machine Tool Okayama Takisawa FMS 83
2. 3. 4. 5. 6. 7. 8.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER:	Takisawa Machine Tool Okayama Takisawa FMS 83 IBM System 38
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS:	Takisawa Machine Tool Okayama  Takisawa FMS 83  IBM System 38 IBM S-1 Process Computer
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER:	Takisawa Machine Tool Okayama  Takisawa FMS 83  IBM System 38 IBM S-1 Process Computer
2. 3. 4. 5. 6. 7. 8. 9. 10.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS:	Takisawa Machine Tool Okayama  Takisawa FMS 83  IBM System 38 IBM S-1 Process Computer Machine tool parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS:	Takisawa Machine Tool Okayama  Takisawa FMS 83  IBM System 38 IBM S-1 Process Computer
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS:	Takisawa Machine Tool Okayama  Takisawa FMS 83  IBM System 38 IBM S-1 Process Computer Machine tool parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES:	Takisawa Machine Tool Okayama  Takisawa FMS 83  IBM System 38 IBM S-1 Process Computer Machine tool parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS:	Takisawa Machine Tool Okayama  Takisawa FMS 83  IBM System 38 IBM S-1 Process Computer Machine tool parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE:	Takisawa Machine Tool Okayama  Takisawa FMS 83  IBM System 38 IBM S-1 Process Computer Machine tool parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE:	Takisawa Machine Tool Okayama  Takisawa FMS 83  IBM System 38 IBM S-1 Process Computer Machine tool parts Steel, cast iron
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE:	Takisawa Machine Tool Okayama  Takisawa FMS 83  IBM System 38 IBM S-1 Process Computer Machine tool parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION	Takisawa Machine Tool Okayama  Takisawa FMS 83  IBM System 38 IBM S-1 Process Computer Machine tool parts Steel, cast iron
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE:	Takisawa Machine Tool Okayama  Takisawa FMS 83  IBM System 38 IBM S-1 Process Computer Machine tool parts Steel, cast iron
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING:	Takisawa Machine Tool Okayama  Takisawa FMS 83  IBM System 38 IBM S-1 Process Computer Machine tool parts Steel, cast iron
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE:	Takisawa Machine Tool Okayama  Takisawa FMS 83  IBM System 38 IBM S-1 Process Computer Machine tool parts Steel, cast iron  Prismatic
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET:	Takisawa Machine Tool Okayama  Takisawa FMS 83  IBM System 38 IBM S-1 Process Computer Machine tool parts Steel, cast iron  Prismatic  3 MC (Takisawa)
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING:	Takisawa Machine Tool Okayama  Takisawa FMS 83  IBM System 38 IBM S-1 Process Computer Machine tool parts Steel, cast iron  Prismatic  3 MC (Takisawa)
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET:	Takisawa Machine Tool Okayama  Takisawa FMS 83  IBM System 38 IBM S-1 Process Computer Machine tool parts Steel, cast iron  Prismatic  3 MC (Takisawa)
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING:	Takisawa Machine Tool Okayama  Takisawa FMS 83  IBM System 38 IBM S-1 Process Computer Machine tool parts Steel, cast iron  Prismatic  3 MC (Takisawa)
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING: FEATURES:	Takisawa Machine Tool Okayama  Takisawa FMS 83  IBM System 38 IBM S-1 Process Computer Machine tool parts Steel, cast iron  Prismatic  3 MC (Takisawa) 1 AGV
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING:	Takisawa Machine Tool Okayama  Takisawa FMS 83  IBM System 38 IBM S-1 Process Computer Machine tool parts Steel, cast iron  Prismatic  3 MC (Takisawa)

Japan Takisawa Machine Tool

1. COUNTRY:

		COUNTRY:	Japan
2		COMPANY:	Takisawa Machine Tool
2	}	LOCATION:	Okayama
		DIVISION:	ond y a ma
			m 1 ·
		SUPPLIER:	Takisawa
		CLASS:	FMS
7	7.	YEAR:	83
۶	}.	FINANCIAL DATA:	
		COMPUTER:	IBM System 38
		CONTROLS:	IBM S-1 Process Computer
		PRODUCTS:	Machine tool parts
1	.2.	MATERIALS:	Steel, cast iron
1	.3.	NUMBER OF PARTS:	
1	4.	PART FAMILIES:	
		PRODUCTION RATE:	
		PART CUBE:	
			D
		PART SHAPE:	Prismatic
1	.8.	OPERATION	
		SCHEDULING:	
1	9.	LOT SIZE:	
		MACHINE SET:	2 MC (Takisawa)
		MATL. HANDLING:	1 AGV, ASRS with 570 locations
2	22.	TOOLING:	
2	23.	FEATURES:	
2	24.	REFERENCES:	7
_	•		•
,		COLDIMDA	
		COUNTRY:	Japan
2	2.	COMPANY:	Japan Tokyo Shibaura Denki
2	2.		-
2	3.	COMPANY: LOCATION:	Tokyo Shibaura Denki
3	?. }.	COMPANY: LOCATION: DIVISION:	Tokyo Shibaura Denki Fuchu
3 4 5	}. }. }.	COMPANY: LOCATION: DIVISION: SUPPLIER:	Tokyo Shibaura Denki Fuchu Toshiba
34 5	3.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS:	Tokyo Shibaura Denki Fuchu Toshiba FMS
2 3 4 5 6 7	3.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR:	Tokyo Shibaura Denki Fuchu Toshiba
2 3 4 5 6 7	3.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS:	Tokyo Shibaura Denki Fuchu Toshiba FMS
2 3 4 5 6 7 8	2. 3. 5. 7.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA:	Tokyo Shibaura Denki Fuchu Toshiba FMS
2 3 4 5 6 7 8 9	3. 3. 5. 7.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER:	Tokyo Shibaura Denki Fuchu Toshiba FMS
2 3 4 5 6 7 8 9	3.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS:	Tokyo Shibaura Denki Fuchu Toshiba FMS 84
2 3 4 5 6 7 8 9 1 1	3.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS:	Tokyo Shibaura Denki Fuchu Toshiba FMS
2 3 4 5 6 7 8 9 1 1 1	3.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS:	Tokyo Shibaura Denki Fuchu Toshiba FMS 84
2 3 4 5 6 7 8 9 1 1 1	3.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS:	Tokyo Shibaura Denki Fuchu Toshiba FMS 84
2 3 4 5 6 7 8 9 1 1 1	3.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS:	Tokyo Shibaura Denki Fuchu Toshiba FMS 84
2 3 4 5 6 7 8 9 1 1 1 1	2. 3. 3. 3. .0. .1. .12.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES:	Tokyo Shibaura Denki Fuchu Toshiba FMS 84
2 3 4 5 6 7 8 9 1 1 1 1 1 1	2. 3. 3. 5. 0. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE:	Tokyo Shibaura Denki Fuchu Toshiba FMS 84
2 3 4 5 6 7 8 9 1 1 1 1 1 1 1	2	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE:	Tokyo Shibaura Denki Fuchu  Toshiba FMS 84  Switches
22 33 46 57 88 99 11 11 11 11 11	2. 3. 5. 5. 6. 12. 13. 14. 15.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE:	Tokyo Shibaura Denki Fuchu Toshiba FMS 84
22 33 46 57 88 99 11 11 11 11 11	2. 3. 5. 5. 6. 12. 13. 14. 15.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION	Tokyo Shibaura Denki Fuchu  Toshiba FMS 84  Switches
22 34 5 6 7 8 9 11 11 11 11 11	2. 3. 5. 6. 7. 8. 0. 12. 13. 14. 15.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING:	Tokyo Shibaura Denki Fuchu  Toshiba FMS 84  Switches
22 34 5 6 7 8 9 11 11 11 11 11	2. 3. 5. 6. 7. 8. 0. 12. 13. 14. 15.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION	Tokyo Shibaura Denki Fuchu  Toshiba FMS 84  Switches
22 34 56 78 9 11 11 11 11 11 11	2. 3. 5. 7. 3. .0. .1. .12. .13. .14. .15.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE:	Tokyo Shibaura Denki Fuchu  Toshiba FMS 84  Switches  Prismatic and rotational
22 34 5 6 7 8 9 11 11 11 11 11 11 12	3	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET:	Tokyo Shibaura Denki Fuchu  Toshiba FMS 84  Switches  Prismatic and rotational  6 MC, 8 NV
22 34 56 77 89 91 11 11 11 11 11 12 22	2. 2. 3. 5. 6. 7. 13. 12. 13. 14. 15. 16. 17. 18. 19. 120. 121.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING:	Tokyo Shibaura Denki Fuchu  Toshiba FMS 84  Switches  Prismatic and rotational
22 34 45 67 89 11 11 11 11 11 11 12 22 22	2	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING:	Tokyo Shibaura Denki Fuchu  Toshiba FMS 84  Switches  Prismatic and rotational  6 MC, 8 NV
23 24 5 6 7 8 9 11 11 11 11 11 11 12 22 22 22	2. 3. 4. 5. 12. 13. 14. 15. 16. 17. 18. 19. 221. 222. 223.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING: FEATURES:	Tokyo Shibaura Denki Fuchu  Toshiba FMS 84  Switches  Prismatic and rotational  6 MC, 8 NV AGV, robots, ASRS
23 24 5 6 7 8 9 11 11 11 11 11 11 12 22 22 22	2. 3. 4. 5. 12. 13. 14. 15. 16. 17. 18. 19. 221. 222. 223.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING:	Tokyo Shibaura Denki Fuchu  Toshiba FMS 84  Switches  Prismatic and rotational  6 MC, 8 NV
23 24 5 6 7 8 9 11 11 11 11 11 11 12 22 22 22	2. 3. 4. 5. 12. 13. 14. 15. 16. 17. 18. 19. 221. 222. 223.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING: FEATURES:	Tokyo Shibaura Denki Fuchu  Toshiba FMS 84  Switches  Prismatic and rotational  6 MC, 8 NV AGV, robots, ASRS

1.	COUNTRY:	Japan
2.	COMPANY:	Toshiba Machine Co.
3.	LOCATION:	Fuchu
4	DIVISION:	
5	SUPPLIER:	Toshiba
J.	CLASS:	FMS
0.	CLASS:	
/•	YEAR:	83
8.	FINANCIAL DATA:	Labor savings: 7 workers vs. 75
9.	COMPUTER:	Toshiba
	CONTROLS:	
11.	PRODUCTS:	Machine tool parts
12.	MATERIALS:	Steel, cast iron
	NUMBER OF PARTS:	
	PART FAMILIES:	
	PRODUCTION RATE:	
	PART CUBE:	
		Determine and make the design of
	PART SHAPE:	Prismatic and rotational
	OPERATION	
	SCHEDULING:	
19.	LOT SIZE:	
20.	MACHINE SET:	6 MC, 8 NT
21.	MATL. HANDLING:	1 AGV, 2 robots, ASRS
	TOOLING:	,
	FEATURES:	
	REFERENCES:	69
	THE LITER OLD !	
1 .	COUNTRY:	Japan
	COUNTRY:	Japan Toshi ha
2.	COMPANY:	Toshiba
2. 3.	COMPANY: LOCATION:	
2. 3. 4.	COMPANY: LOCATION: DIVISION:	Toshiba
2. 3. 4. 5.	COMPANY: LOCATION: DIVISION: SUPPLIER:	Toshiba Numazu
2. 3. 4. 5.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS:	Toshiba Numazu FMS
2. 3. 4. 5.	COMPANY: LOCATION: DIVISION: SUPPLIER:	Toshiba Numazu
2. 3. 4. 5. 6. 7.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS:	Toshiba Numazu FMS
2. 3. 4. 5. 6. 7.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR:	Toshiba Numazu FMS
2. 3. 4. 5. 6. 7. 8.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER:	Toshiba Numazu FMS 82 FMS T5003
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS:	Toshiba Numazu FMS 82 FMS T5003 Tosunuc 500
2. 3. 4. 5. 6. 7. 8. 9. 10.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS:	Toshiba Numazu  FMS 82  FMS T5003 Tosunuc 500 Machine tool and textile parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS:	Toshiba Numazu  FMS 82  FMS T5003 Tosunuc 500 Machine tool and textile parts Steel, cast iron
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARIS:	Toshiba Numazu  FMS 82  FMS T5003 Tosunuc 500 Machine tool and textile parts Steel, cast iron
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARIS: PART FAMILIES:	Toshiba Numazu  FMS 82  FMS T5003 Tosunuc 500 Machine tool and textile parts Steel, cast iron
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARIS: PART FAMILIES: PRODUCTION RATE:	Toshiba Numazu  FMS 82  FMS T5003 Tosunuc 500 Machine tool and textile parts Steel, cast iron
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARIS: PART FAMILIES: PRODUCTION RATE: PART CUBE:	Toshiba Numazu  FMS 82  FMS T5003 Tosunuc 500 Machine tool and textile parts Steel, cast iron
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE:	Toshiba Numazu  FMS 82  FMS T5003 Tosunuc 500 Machine tool and textile parts Steel, cast iron
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARIS: PART FAMILIES: PRODUCTION RATE: PART CUBE:	Toshiba Numazu  FMS 82  FMS T5003 Tosunuc 500 Machine tool and textile parts Steel, cast iron
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE:	Toshiba Numazu  FMS 82  FMS T5003 Tosunuc 500 Machine tool and textile parts Steel, cast iron
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING:	Toshiba Numazu  FMS 82  FMS T5003 Tosunuc 500 Machine tool and textile parts Steel, cast iron
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARIS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE:	Toshiba Numazu  FMS 82  FMS T5003 Tosunuc 500 Machine tool and textile parts Steel, cast iron  Prismatic
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARIS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET:	Toshiba Numazu  FMS 82  FMS T5003 Tosunuc 500 Machine tool and textile parts Steel, cast iron  Prismatic
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARIS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING:	Toshiba Numazu  FMS 82  FMS T5003 Tosunuc 500 Machine tool and textile parts Steel, cast iron  Prismatic
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARIS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING:	Toshiba Numazu  FMS 82  FMS T5003 Tosunuc 500 Machine tool and textile parts Steel, cast iron  Prismatic
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING: FEATURES:	Toshiba Numazu  FMS 82  FMS T5003 Tosunuc 500 Machine tool and textile parts Steel, cast iron  Prismatic  1 NHM, 1 NVM ASRS, carousel (16 locations)
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARIS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING:	Toshiba Numazu  FMS 82  FMS T5003 Tosunuc 500 Machine tool and textile parts Steel, cast iron  Prismatic

3. 4.	COUNTRY: COMPANY: LOCATION: DIVISION: SUPPLIER:	Japan Toshiba Machine Company Numazu
6. 7.	CLASS: YEAR:	FMS 82
9. 10.	FINANCIAL DATA: COMPUTER: CONTROLS:	Toshiba
12. 13.	PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES:	Machine tool parts Steel, cast iron
15. 16.	PRODUCTION RATE: PART CUBE: PART SHAPE:	1 m Prismatic
18.	OPERATION SCHEDULING: LOT SIZE:	
20. 21.	MACHINE SET: MATL. HANDLING: TOOLING:	2 NHM, 1 CMM, 1 WS, honing machine ASRS ATC 120 tool capacity
23.	FEATURES: REFERENCES:	Automated inspection 7
1.	COUNTRY: COMPANY:	Japan Tashiha Mashina Camana
3. 4.	LOCATION: DIVISION:	Toshiba Machine Company Numazu
6. 7.	SUPPLIER: CLASS: YEAR:	FMS 82
8. 9. 10.	FINANCIAL DATA: COMPUTER: CONTROLS:	
12.	PRODUCTS: MATERIALS: NUMBER OF PARTS:	Machine tool parts Steel, cast iron
15.	PART FAMILIES: PRODUCTION RATE: PART CUBE:	630 x 630 mm pallet
17.		Prismatic
20. 21.	LOT SIZE:	2 NHM, 1 NVM AGV
	FEATURES: REFERENCES:	7

1.	COUNTRY:	Japan
2.	COMPANY:	Toshiba Machine Tool Company
3.	LOCATION:	Numazu
4.	DIVISION:	
5.	SUPPLIER:	
6.	CLASS:	FMS
7.	YEAR:	80
8.	FINANCIAL DATA:	00
	COMPUTER:	T-5003 System
		1-3003 System
	CONTROLS:	
	PRODUCTS:	
	MATERIALS:	
	NUMBER OF PARTS:	
	PART FAMILIES:	
	PRODUCTION RATE:	
16.	PART CUBE:	630 x 630 mm pallet
17.	PART SHAPE:	Prismatic
18.	OPERATION	
	SCHEDULING:	
19.	LOT SIZE:	
	MACHINE SET:	2 NHM
		Carousel with 20 positions
	TOOLING:	odrodoci wien zo poblożono
	FEATURES:	
	REFERENCES:	7
44.	VEL EVENCEO:	/
,	COINTRY.	Tanan
1.	COUNTRY:	Japan Company
2.	COMPANY:	Toshiba Machine Company
2. 3.	COMPANY: LOCATION:	
2. 3. 4.	COMPANY: LOCATION: DIVISION:	Toshiba Machine Company Numazu
2. 3. 4. 5.	COMPANY: LOCATION: DIVISION: SUPPLIER:	Toshiba Machine Company Numazu Toshiba Machine
2. 3. 4. 5. 6.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS:	Toshiba Machine Company Numazu Toshiba Machine FMS
2. 3. 4. 5.	COMPANY: LOCATION: DIVISION: SUPPLIER:	Toshiba Machine Company Numazu Toshiba Machine
2. 3. 4. 5. 6.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS:	Toshiba Machine Company Numazu Toshiba Machine FMS
2. 3. 4. 5. 6. 7.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR:	Toshiba Machine Company Numazu Toshiba Machine FMS
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA:	Toshiba Machine Company Numazu Toshiba Machine FMS
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS:	Toshiba Machine Company Numazu Toshiba Machine FMS 84
2. 3. 4. 5. 6. 7. 8. 9. 10.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS:	Toshiba Machine Company Numazu  Toshiba Machine FMS 84  Injection molding machine parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS:	Toshiba Machine Company Numazu Toshiba Machine FMS 84
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS:	Toshiba Machine Company Numazu  Toshiba Machine FMS 84  Injection molding machine parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES:	Toshiba Machine Company Numazu  Toshiba Machine FMS 84  Injection molding machine parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE:	Toshiba Machine Company Numazu  Toshiba Machine FMS 84  Injection molding machine parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE:	Toshiba Machine Company Numazu  Toshiba Machine FMS 84  Injection molding machine parts Steel, cast iron
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE:	Toshiba Machine Company Numazu  Toshiba Machine FMS 84  Injection molding machine parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION	Toshiba Machine Company Numazu  Toshiba Machine FMS 84  Injection molding machine parts Steel, cast iron
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING:	Toshiba Machine Company Numazu  Toshiba Machine FMS 84  Injection molding machine parts Steel, cast iron
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE:	Toshiba Machine Company Numazu  Toshiba Machine FMS 84  Injection molding machine parts Steel, cast iron  Prismatic
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET:	Toshiba Machine Company Numazu  Toshiba Machine FMS 84  Injection molding machine parts Steel, cast iron  Prismatic  6 MC
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING:	Toshiba Machine Company Numazu  Toshiba Machine FMS 84  Injection molding machine parts Steel, cast iron  Prismatic  6 MC
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET:	Toshiba Machine Company Numazu  Toshiba Machine FMS 84  Injection molding machine parts Steel, cast iron  Prismatic  6 MC

24. REFERENCES:

14

COUNTRY: Japan 2. COMPANY: Toshiba Tungaloy Company 3. LOCATION: 4. DIVISION: 5. SUPPLIER: Toshiba Machine 6. CLASS: FMS 7. YEAR: 80 8. 6 MT vs. 50, 16 workers vs. 70, and 4 vs. 16 wk lead time FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: 11. PRODUCTS: Carbide cutting tools 12. MATERIALS: Carbide tool materials 13. NUMBER OF PARTS: 3600 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Prismatic and rotational 18. OPERATION Crew of 8, unmanned night shift SCHEDULING: 19. LOT SIZE: Average of 5 4 MC, 1 GR, 1 NV 20. MACHINE SET: 21. MATL. HANDLING: No inter-machine transfer, multiple pallets on machine 22. TOOLING: 23. FEATURES: Automated inspection, tool wear monitoring 24. REFERENCES: 14, 19, 51, 86 1. COUNTRY: Japan Toyada Machine Works 2. COMPANY: 3. LOCATION: Kariya 4. DIVISION: 5. SUPPLIER: CLASS: **FMS** 6. YEAR: 86 FINANCIAL DATA: 8. COMPUTER: 9. 10. CONTROLS: 11. PRODUCTS: Machine tool parts 12. MATERIALS: Steel, cast iron 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 21. MATL. HANDLING: 22. TOOLING: 23. FEATURES:

Japan 1. COUNTRY: 2. COMPANY: Toyada Machine Works **Okazaka** LOCATION: 3. DIVISION: 4. 5. SUPPLIER: MC 6. CLASS: YEAR: 81 7. FINANCIAL DATA: 8. COMPUTER: 10. CONTROLS: 11. PRODUCTS: Machine tool parts 12. MATERIALS: Steel, cast iron 13. NUMBER OF PARTS: 1,500 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION Crew of 12 SCHEDULING: 19. LOT SIZE: Average of 5 20. MACHINE SET: 21. MATL. HANDLING: 15 DNC 22. TOOLING: 23. FEATURES: 24. REFERENCES: 7, 12, 86 1. COUNTRY: Japan 2. COMPANY: Toyota Tipros 3. LOCATION: DIVISION: 5. SUPPLIER: Toyota 6. CLASS: **FMS** 7. YEAR: 73 FINANCIAL DATA: 8. COMPUTER: 10. CONTROLS: 11. PRODUCTS: Engine components 12. MATERIALS: Cast iron, steel 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 9,600 parts/year 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION Each part stops at each spur in the conveyor SCHEDULING: Crew of 4 19. LOT SIZE: 100 20. MACHINE SET: 1 MC, 8 MT's 21. MATL. HANDLING: Roller conveyor 22. TOOLING: 23. FEATURES:

35, 38

```
1.
    COUNTRY:
                      Japan
2.
    COMPANY:
                      Tsugami
3.
   LOCATION:
                      Nagaoka
    DIVISION:
5.
    SUPPLIER:
                      Tsugami
6.
    CLASS:
                      FMS
7.
    YEAR:
                      86
8.
    FINANCIAL DATA:
    COMPUTER:
10. CONTROLS:
11. PRODUCTS:
                      Machine tool parts
12. MATERIALS:
                      Steel, cast iron
13. NUMBER OF PARTS: 200
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                      Prismatic
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                      3 NHM (Tsugami)
21. MATL. HANDLING:
                      Overhead conveyor
22. TOOLING:
                      ATC with capacity of 164
23. FEATURES:
                      7
24. REFERENCES:
    COUNTRY:
1.
                      Japan
2.
    COMPANY:
3.
   LOCATION:
                      Inuyama
4.
   DIVISION:
5.
    SUPPLIER:
                      Osaka Kiko
6.
    CLASS:
                      FMS
7.
    YEAR:
                      82
    FINANCIAL DATA:
    COMPUTER:
10. CONTROLS:
11. PRODUCTS:
12. MATERIALS:
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                      Prismatic
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                      3 MC
21. MATL. HANDLING:
                      Rail guided cart
22. TOOLING:
23. FEATURES:
                      Probing
24. REFERENCES:
                      14
```

1. COUNTRY: Japan 2. COMPANY: Yamatake Honeywell LOCATION: 4. DIVISION: 5. SUPPLIER: Hitachi Seiki CLASS: **FMS** 6. 7. YEAR: 72 Job reduction from 40 to 5 FINANCIAL DATA: 8. Fujutsu Fanuc COMPUTER: 10. CONTROLS: 11. PRODUCTS: 1.5 - 6 inch flow control valve housings 12. MATERIALS: Cast iron, steel, stainless steel 13. NUMBER OF PARTS: 400 14. PART FAMILIES: 15. PRODUCTION RATE: 4,000 parts/month 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION Parts designed for equal cycle times, fixed path flows SCHEDULING: 19. LOT SIZE: 10 7 MC, 1 WS 20. MACHINE SET: 21. MATL. HANDLING: Roller conveyor, ASRS 22. TOOLING: 23. FEATURES: Probing 24. REFERENCES: 14, 35, 51, 86 1. COUNTRY: Japan 2. COMPANY: Yamazaki Machinery LOCATION: Aichi 4. DIVISION: 5. SUPPLIER: Yamazaki 6. CLASS: **FMS** 7. 82 YEAR: 2.5 year payback FINANCIAL DATA: 8. COMPUTER: DEC PDP 11 10. CONTROLS: 11. PRODUCTS: Large MT parts for NT, MC 12. MATERIALS: Cast iron, steel 13. NUMBER OF PARTS: 74 14. PART FAMILIES: 15. PRODUCTION RATE: 5,400 parts/year 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION 24 hour, 6 day schedule, with 3rd shift unmanned, SCHEDULING: crew of 3 19. LOT SIZE: 20. MACHINE SET: 8 MT (A line) 2 AGV's 21. MATL. HANDLING: 22. TOOLING: ATC, 2 drums per MT 23. FEATURES:

51, 69

1. COUNTRY: Japan 2. COMPANY: Yamazaki Machinery Works Aichi 3. LOCATION: 4. DIVISION: SUPPLIER: Yamazaki 6. CLASS: FMS 7. YEAR: 82 FINANCIAL DATA: 2.5 year payback DEC PDP 11 COMPUTER: 10. CONTROLS: 11. PRODUCTS: Large machine tool parts 12. MATERIALS: Cast iron, steel 13. NUMBER OF PARTS: 74 14. PART FAMILIES: 15. PRODUCTION RATE: 6,744 parts/year 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION 24 hour, 6 day schedule with 3rd shift unmanned, crew of 3 SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 10 MT's (B line) 21. MATL. HANDLING: 22. TOOLING: 23. FEATURES: 24. REFERENCES: 51, 69 COUNTRY: Japan 2. Yamazaki Machinery Works COMPANY: 3. Mino-Kamo LOCATION: 4. DIVISION: 5. SUPPLIER: Yamazaki **FMS** CLASS: 6. 7. YEAR: 81 8. FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: 11. PRODUCTS: CNC lathes 12. MATERIALS: Cast iron, steel 13. NUMBER OF PARTS: 543 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Prismatic and rotational 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 88 MT, 60 of which are CNC 30 robots, AGV's 21. MATL. HANDLING: 22. TOOLING: 23. FEATURES: Adaptive control using acoustic emmissions

7, 14, 69

COUNTRY: Japan 2. COMPANY: Yamazaki Machinery Works 3. LOCATION: Oguchi DIVISION: 5. SUPPLIER: Yamazaki 6. **FMS** CLASS: 7. YEAR: 81 75 % reduction in the number of MT's needed FINANCIAL DATA: 8. DEC PDP 11 9. COMPUTER: 10. CONTROLS: 11. PRODUCTS: Headstocks for MC's 12. MATERIALS: Cast iron 13. NUMBER OF PARTS: 23 14. PART FAMILIES: 15. PRODUCTION RATE: 800 parts/month 16. PART CUBE: 40 x 40 in pallet 17. PART SHAPE: Prismatic 18. OPERATION 3 shift operation, 3rd shift unmanned, crew of 2 SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 8 NHM (Yamazaki) 21. MATL. HANDLING: Rail guided carts, robots 22. TOOLING: 23. FEATURES: 24. REFERENCES: 7, 12, 14 1. COUNTRY: Japan 2. COMPANY: Yamazaki Machinery Works 3. LOCATION: Oguchi 4. DIVISION: 5. SUPPLIER: 6. CLASS: **FMS** 7. YEAR: 81 8. FINANCIAL DATA: COMPUTER: DEC PDP 11 10. CONTROLS: 11. PRODUCTS: Beds, bases, columns for MT's 12. MATERIALS: Cast iron 13. NUMBER OF PARTS: 350 14. PART FAMILIES: 15. PRODUCTION RATE: 650 parts/month 16. PART CUBE: 63 x 118 inch pallet 17. PART SHAPE: Prismatic 3 shift operation, crew of 4 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 7 NVM, 3 NHM, (all Yamazaki) 21. MATL. HANDLING: 22. TOOLING: 23. FEATURES:

24. REFERENCES:

7, 14

COUNTRY: Japan Yanmar Diesel 2. COMPANY: 3. LOCATION: Amagaski DIVISION: 4. 5. SUPPLIER: Hitachi Seiki 6. CLASS: FTL YEAR: 7. Labor reduction 12 to 1, cost reduction of 23 % 8. FINANCIAL DATA: 9. COMPUTER:10. CONTROLS: Fujitsu Fanuc T-0 K-0 11. PRODUCTS: Cylinder heads 12. MATERIALS: Cast iron 13. NUMBER OF PARTS: 8 14. PART FAMILIES: 1 15. PRODUCTION RATE: 10,800 2 x 1.5 x 2 ft 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION Fixed sequence determined by operator at time of loading, crew of 1 SCHEDULING: 19. LOT SIZE: Average of 3 20. MACHINE SET: 5 MC 21. MATL. HANDLING: Roller conveyor loop with spurs 22. TOOLING: ATC with capacity of 160 23. FEATURES: 35, 38, 86 24. REFERENCES: 1. COUNTRY: Japan 2. COMPANY: Yanmar Group 3. LOCATION: 4. DIVISION: 5. SUPPLIER: Makino 6. CLASS: **FMS** 7. YEAR: 84 FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: 11. PRODUCTS: 12. MATERIALS: 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 21. MATL. HANDLING: 22. TOOLING: 23. FEATURES:

24. REFERENCES:

14

4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15.	COUNTRY: COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE:	Japan Yanmar Group FMS 84
18. 19. 20. 21. 22. 23.	PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING: FEATURES: REFERENCES:	14
7. 8. 9. 10. 11.	COUNTRY: COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS:	Norway University of Trondheim SINTEF University of Trondheim MC 78
14. 15. 16. 17. 18. 19. 20. 21. 22. 23.	PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET:	Prismatic and rotational Control computer attempts to optimize operations  1 MC, 1 NM, 1 NT, 1 ND 1 robot at the center of the cell

Poland COUNTRY: Stalowa Wola 2. COMPANY: 3. LOCATION: DIVISION: 5. SUPPLIER: 7 October CLASS: 6. **FMS** 7. YEAR: 81 FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: Rota FZ200 11. PRODUCTS: Gears for trucks, construction, and agricultural uses 12. MATERIALS: Steel 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 400,000 parts/year 16. PART CUBE: 17. PART SHAPE: Rotational 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 52 work stations (see East German Rota FZ200 systems) 21. MATL. HANDLING: Stacker crane, roller conveyor 22. TOOLING: 23. FEATURES: 24. REFERENCES: 37, 86 COUNTRY: Poland [ ] 1. 2. COMPANY: LOCATION: DIVISION: SUPPLIER: CBKO (Design & Research Center for Machine Tools) CLASS: 6. MC 77 7. YEAR: 8. FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: KOR-1 System 11. PRODUCTS: Machine tool parts 12. MATERIALS: Steel, cast iron 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 2 to 5 MC's 21. MATL. HANDLING: 22. TOOLING: 23. FEATURES: 24. REFERENCES:

86

```
Poland
   COUNTRY:
2.
   COMPANY:
3.
   LOCATION:
   DIVISION:
5.
    SUPPLIER:
                      7 October
                      FMS
6.
    CLASS:
7.
   YEAR:
                      80
8.
   FINANCIAL DATA:
9.
    COMPUTER:
                      Rota FZ200 System
10. CONTROLS:
11. PRODUCTS:
                      Gears
12. MATERIALS:
                      Stee1
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                      Rotational
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
                      (See East German Systems)
20. MACHINE SET:
21. MATL. HANDLING:
22. TOOLING:
23. FEATURES:
                      37
24. REFERENCES:
    COUNTRY:
1.
                      Poland
2.
   COMPANY:
3.
   LOCATION:
   DIVISION:
4.
5.
   SUPPLIER:
                      CBKO (Design & Research Center for Machine Tools)
   CLASS:
                      MC
6.
   YEAR:
                      79
7.
8.
   FINANCIAL DATA:
9.
    COMPUTER:
10. CONTROLS:
                      TOR-1 System
11. PRODUCTS:
                      Shafts
12. MATERIALS:
                      Stee1
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                      Rotational
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                      3 NT
21. MATL. HANDLING:
22. TOOLING:
23. FEATURES:
24. REFERENCES:
                      86
```

COUNTRY: Poland. 1. 2. COMPANY: 3. LOCATION: DIVISION: 5. SUPPLIER: CBKO (Design & Research Center for Machine Tools) 6. CLASS: 78 7. YEAR: 8. FINANCIAL DATA: COMPUTER: 10. CONTROLS: TOR-1M System 11. PRODUCTS: Shafts 12. MATERIALS: Stee1 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Rotational 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 2 NT 21. MATL. HANDLING: 22. TOOLING: 23. FEATURES: 24. REFERENCES: 86 1. COUNTRY: Rumania 2. COMPANY: Bucharest R & D Institute for Automation 3. LOCATION: Bucharest 4. DIVISION: SUPPLIER: Bucharest R & D Institute CLASS: FMS 6. 7. YEAR: 79 FINANCIAL DATA: 9. COMPUTER: Felix C32 (Rumanian under French license) 10. CONTROLS: AEC, GE, Cesla, and Sperry 11. PRODUCTS: 12. MATERIALS: 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 7 MT 21. MATL. HANDLING: 22. TOOLING: 23. FEATURES: 24. REFERENCES: 86

```
COUNTRY:
                      South Korea
                      Tongil Company
2.
   COMPANY:
3.
                      Kyungnam
   LOCATION:
   DIVISION:
5.
    SUPPLIER:
                      Fanuc
                      FMS
6.
   CLASS:
7.
   YEAR:
                      85
    FINANCIAL DATA:
8.
9.
    COMPUTER:
10. CONTROLS:
                      Fanuc
11. PRODUCTS:
                      Machine tool and automative parts
12. MATERIALS:
                      Cast iron
13. NUMBER OF PARTS: 30
14. PART FAMILIES:
15. PRODUCTION RATE: 4,500 parts/year
16. PART CUBE:
17. PART SHAPE:
                      Prismatic
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
21. MATL. HANDLING:
                     Roller conveyor
22. TOOLING:
23. FEATURES:
                      Probing, self contained coolant
24. REFERENCES:
                      14
1.
    COUNTRY:
                      Sweeden
2.
    COMPANY:
                      AB Hydron
3.
   LOCATION:
4.
   DIVISION:
5.
   SUPPLIER:
                      MC
6.
   CLASS:
   YEAR:
7.
                      84
   FINANCIAL DATA:
9.
    COMPUTER:
10. CONTROLS:
11. PRODUCTS:
12. MATERIALS:
13. NUMBER OF PARTS: 50
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                      Rotational
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
                      175 minimum
                      2 NT, 2 ND, 1 WS, 1 Press
20. MACHINE SET:
21. MATL. HANDLING: Robot, conveyor
22. TOOLING:
23. FEATURES:
24. REFERENCES:
                      69
```

Sweeden

ASEA

1. COUNTRY:

2. COMPANY:

	LOCATION:	Ludvika
	DIVISION:	
	SUPPLIER:	
	CLASS:	FMS
	YEAR:	84
	FINANCIAL DATA:	
	COMPUTER:	
	CONTROLS:	
	PRODUCTS:	
	MATERIALS:	
	NUMBER OF PARTS:	
	PART FAMILIES:	
	PRODUCTION RATE:	
	PART CUBE:	
		Prismatic
18.	OPERATION	
	SCHEDULING:	
	LOT SIZE:	
		6 MC
	MATL. HANDLING:	
	TOOLING:	
	FEATURES:	
24.	REFERENCES:	23
	COUNTRY:	Sweeden
2.	COMPANY:	ASEA
2. 3.	COMPANY: LOCATION:	
2. 3. 4.	COMPANY: LOCATION: DIVISION:	ASEA
2. 3. 4. 5.	COMPANY: LOCATION: DIVISION: SUPPLIER:	ASEA Vastarras
2. 3. 4. 5. 6.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS:	ASEA Vastarras FMS
2. 3. 4. 5. 6. 7.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR:	ASEA Vastarras
2. 3. 4. 5. 6. 7. 8.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA:	ASEA Vastarras FMS
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER:	ASEA Vastarras FMS
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS:	ASEA Vastarras FMS 79
2. 3. 4. 5. 6. 7. 8. 9. 10.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS:	ASEA Vastarras FMS
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS:	ASEA Vastarras  FMS 79  Electric motor parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS:	ASEA Vastarras  FMS 79  Electric motor parts 18
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES:	ASEA Vastarras  FMS 79  Electric motor parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE:	ASEA Vastarras  FMS 79  Electric motor parts 18
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE:	ASEA Vastarras  FMS 79  Electric motor parts 18 3
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE:	ASEA Vastarras  FMS 79  Electric motor parts 18 3
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION	ASEA Vastarras  FMS 79  Electric motor parts 18 3
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING:	ASEA Vastarras  FMS 79  Electric motor parts 18 3  Rotational 1 manned shift, 2 unmanned shifts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE:	ASEA Vastarras  FMS 79  Electric motor parts 18 3  Rotational 1 manned shift, 2 unmanned shifts 200 minimum
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET:	ASEA Vastarras  FMS 79  Electric motor parts 18 3  Rotational 1 manned shift, 2 unmanned shifts 200 minimum 1 NT, 1 rotary grinder, 2 turret drills
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING:	ASEA Vastarras  FMS 79  Electric motor parts 18 3  Rotational 1 manned shift, 2 unmanned shifts 200 minimum
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING:	ASEA Vastarras  FMS 79  Electric motor parts 18 3  Rotational 1 manned shift, 2 unmanned shifts 200 minimum 1 NT, 1 rotary grinder, 2 turret drills
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING: FEATURES:	ASEA Vastarras  FMS 79  Electric motor parts 18 3  Rotational 1 manned shift, 2 unmanned shifts 200 minimum 1 NT, 1 rotary grinder, 2 turret drills Conveyor with internal storage, 1 robot
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING:	ASEA Vastarras  FMS 79  Electric motor parts 18 3  Rotational 1 manned shift, 2 unmanned shifts 200 minimum 1 NT, 1 rotary grinder, 2 turret drills

1.	COUNTRY:	Sweeden
2.	COMPANY:	Alo-Maskine
	LOCATION:	
	DIVISION:	
	SUPPLIER:	
	CLASS:	FMS
	YEAR:	84
	FINANCIAL DATA:	04
	COMPUTER:	
	CONTROLS:	
	PRODUCTS:	
	MATERIALS:	
	NUMBER OF PARTS:	
	PART FAMILIES:	
	PRODUCTION RATE:	
	PART CUBE:	
	PART SHAPE:	
	OPERATION	
	SCHEDULING:	
19.	LOT SIZE:	
20.	MACHINE SET:	
21.	MATL. HANDLING:	
	TOOLING:	
23.	FEATURES:	
	REFERENCES:	14
1.	COUNTRY:	Sweeden
	COUNTRY: COMPANY:	
2.	COMPANY:	Sweeden Atlas-Copco
2. 3.	COMPANY: LOCATION:	
2. 3. 4.	COMPANY: LOCATION: DIVISION:	
2. 3. 4. 5.	COMPANY: LOCATION: DIVISION: SUPPLIER:	Atlas-Copco
2. 3. 4. 5.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS:	Atlas-Copco FMS
2. 3. 4. 5. 6.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR:	Atlas-Copco
2. 3. 4. 5. 6. 7.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA:	Atlas-Copco FMS
2. 3. 4. 5. 6. 7. 8.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER:	Atlas-Copco FMS
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS:	Atlas-Copco FMS
2. 3. 4. 5. 6. 7. 8. 9. 10.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS:	Atlas-Copco FMS
2. 3. 4. 5. 6. 7. 8. 9. 10. 11.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS:	Atlas-Copco FMS
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS:	Atlas-Copco FMS
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES:	Atlas-Copco FMS
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE:	Atlas-Copco FMS
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE:	Atlas-Copco FMS
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE:	Atlas-Copco FMS
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION	Atlas-Copco FMS
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING:	Atlas-Copco FMS
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE:	Atlas-Copco FMS
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET:	Atlas-Copco FMS
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING:	Atlas-Copco FMS
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING:	Atlas-Copco FMS
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET:	Atlas-Copco FMS

Sweeden 1. COUNTRY: 2. COMPANY: BT (AB BYGG-och Transport) 3. LOCATION: Mjo1by 4. DIVISION: 5. SUPPLIER: 6. CLASS: **FMS** 7. YEAR: 83 8. FINANCIAL DATA: DEC PDP 11 9. COMPUTER: 10. CONTROLS: 11. PRODUCTS: Materials handling, ASRS, and AGV systems 12. MATERIALS: Stee1 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION Pallets enter system following operator request via CRT SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 20 NC MT's, 23 CNC MT's 21. MATL. HANDLING: Stacker crane, ASRS 22. TOOLING: 23. FEATURES: 24. REFERENCES: 3, 4, 69 1. COUNTRY: Sweeden 2. COMPANY: Benzler Production AB 3. LOCATION: Norrkoping DIVISION: 4. 5. SUPPLIER: Sajo, Benzler provided the systems integration 6. CLASS: **FMS** YEAR: 84 7. 8. FINANCIAL DATA: COMPUTER: 9. 10. CONTROLS: 11. PRODUCTS: 12. MATERIALS: 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 2 MC, 1 MT, 1 cutting machine 21. MATL. HANDLING: Benzler AGV 22. TOOLING: 23. FEATURES: 24. REFERENCES: 14, 69

1.	COUNTRY:	Sweeden
	COMPANY:	Bofors
3	LOCATION:	
٨.	DIVISION:	
	SUPPLIER:	
6.	CLASS:	FMS
7.	YEAR:	84
8.	YEAR: FINANCIAL DATA:	
9	COMPUTER:	
	CONTROLS:	
	PRODUCTS:	
	MATERIALS:	
	NUMBER OF PARTS:	
	PART FAMILIES:	
15.	PRODUCTION RATE:	
16.	PART CUBE:	
17.	PART SHAPE:	Prismatic
	OPERATION	
10.	SCHEDULING:	
10	LOT SIZE:	
		/ 1/0
	MACHINE SET:	4 MC
	MATL. HANDLING:	
	TOOLING:	
23.	FEATURES:	
24.	REFERENCES:	23
1.	COUNTRY:	Sweeden
	COUNTRY:	
2.	COMPANY:	Sweeden Bygg & Transportekonomi DB BT
2. 3.	COMPANY: LOCATION:	
2. 3. 4.	COMPANY: LOCATION: DIVISION:	Bygg & Transportekonomi DB BT
2. 3. 4. 5.	COMPANY: LOCATION: DIVISION: SUPPLIER:	Bygg & Transportekonomi DB BT  Japanese MC's, West German NV's
2. 3. 4. 5. 6.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS:	Bygg & Transportekonomi DB BT  Japanese MC's, West German NV's FMS
2. 3. 4. 5. 6.	COMPANY: LOCATION: DIVISION: SUPPLIER:	Bygg & Transportekonomi DB BT  Japanese MC's, West German NV's
2. 3. 4. 5. 6. 7.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS:	Bygg & Transportekonomi DB BT  Japanese MC's, West German NV's FMS
2. 3. 4. 5. 6. 7. 8.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA:	Bygg & Transportekonomi DB BT  Japanese MC's, West German NV's FMS
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER:	Bygg & Transportekonomi DB BT  Japanese MC's, West German NV's FMS 78
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS:	Bygg & Transportekonomi DB BT  Japanese MC's, West German NV's FMS 78  Saab
2. 3. 4. 5. 6. 7. 8. 9. 10.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS:	Bygg & Transportekonomi DB BT  Japanese MC's, West German NV's FMS 78  Saab Material handling systems parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS:	Bygg & Transportekonomi DB BT  Japanese MC's, West German NV's FMS 78  Saab Material handling systems parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS:	Bygg & Transportekonomi DB BT  Japanese MC's, West German NV's FMS 78  Saab Material handling systems parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES:	Bygg & Transportekonomi DB BT  Japanese MC's, West German NV's FMS 78  Saab Material handling systems parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE:	Bygg & Transportekonomi DB BT  Japanese MC's, West German NV's FMS 78  Saab Material handling systems parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE:	Bygg & Transportekonomi DB BT  Japanese MC's, West German NV's FMS 78  Saab Material handling systems parts Steel
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE:	Bygg & Transportekonomi DB BT  Japanese MC's, West German NV's FMS 78  Saab Material handling systems parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE:	Bygg & Transportekonomi DB BT  Japanese MC's, West German NV's FMS 78  Saab Material handling systems parts Steel
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE:	Bygg & Transportekonomi DB BT  Japanese MC's, West German NV's FMS 78  Saab Material handling systems parts Steel
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION	Bygg & Transportekonomi DB BT  Japanese MC's, West German NV's FMS 78  Saab Material handling systems parts Steel
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE:	Bygg & Transportekonomi DB BT  Japanese MC's, West German NV's FMS 78  Saab Material handling systems parts Steel  Prismatic
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET:	Bygg & Transportekonomi DB BT  Japanese MC's, West German NV's FMS 78  Saab Material handling systems parts Steel  Prismatic 3 MC, 1 NV
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING:	Bygg & Transportekonomi DB BT  Japanese MC's, West German NV's FMS 78  Saab Material handling systems parts Steel  Prismatic 3 MC, 1 NV
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING:	Bygg & Transportekonomi DB BT  Japanese MC's, West German NV's FMS 78  Saab Material handling systems parts Steel  Prismatic 3 MC, 1 NV
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING:	Bygg & Transportekonomi DB BT  Japanese MC's, West German NV's FMS 78  Saab Material handling systems parts Steel  Prismatic 3 MC, 1 NV

7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COUNTRY: COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING: FEATURES:	Sweeden C. E. Johansson Aktiebolag FFV-CEJ  FMS 84
24.	REFERENCES:	14
12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23.	COUNTRY: COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING: FEATURES: REFERENCES:	Sweeden Electrolux AB  FMS 84

```
Sweeden
1.
   COUNTRY:
                     Esab AB
2. COMPANY:
3. LOCATION:
                     Laxa
  DIVISION:
5.
  SUPPLIER:
                     FMS
6.
  CLASS:
7.
  YEAR:
                     80
8.
  FINANCIAL DATA:
   COMPUTER:
10. CONTROLS:
11. PRODUCTS:
12. MATERIALS:
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                     Prismatic and rotational
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
                     2 MC, 2 NT, 2 NM
20. MACHINE SET:
21. MATL. HANDLING: AGV, ASRS
22. TOOLING:
23. FEATURES:
24. REFERENCES:
                     3, 4, 14
   COUNTRY:
                      Sweeden
1.
                     Hiab Foco
2.
   COMPANY:
  LOCATION:
3.
                     Skelleftea
4. DIVISION:
5. SUPPLIER:
                     SMT Machine Company
6.
  CLASS:
                     MC
7.
                     81
  YEAR:
                     45 % cost reduction
8.
   FINANCIAL DATA:
                     No host
9.
    COMPUTER:
10. CONTROLS:
                      NC for each machine
11. PRODUCTS:
                     Cylinder heads, pistons
12. MATERIALS:
                      Cast iron, steel
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE: 22 parts/hour
16. PART CUBE:
                      45-160 mm
17. PART SHAPE:
                     Rotational
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
                      175 minimum
                      2 NT, 1 ND, 1 WS, 1 CMM, 1 hydraulic press
20. MACHINE SET:
21. MATL. HANDLING:
                     Conveyor, Electrolux robots
22. TOOLING:
23. FEATURES:
                      Press fit of bearing
24. REFERENCES:
                      31
```

1.	COUNTRY:	Sweeden	
	COMPANY:	Kochums Mekaniska Verkstads AB	
		ROCHUMS HERAILISKA VELKSTAUS AD	
٥.	LOCATION:		
	DIVISION:		
5.	SUPPLIER:		
	CLASS:	FMS	
7.	YEAR:	84	
8	FINANCIAL DATA:		
0	COMPUTER:		
10	COMPOLE:		
10.	CONTROLS:		
	PRODUCTS:		
	MATERIALS:		
13.	NUMBER OF PARTS:		
14.	PART FAMILIES:		
	PRODUCTION RATE:		
	PART CUBE:		
	PART SHAPE:		
18.	OPERATION		
	SCHEDULING:		
19.	LOT SIZE:		
20.	MACHINE SET:		
21.	MATL. HANDLING:		
	TOOLING:		
	FEATURES:		
	REFERENCES:	14	
24.	KIII IIKIIKOIIO.	14	
1	COUNTRY:	Sweeden	
	COMPANY:		
		Saab-Scania AB	
	LOCATION:	Sodertalje	
	DIVISION:		
5.	SUPPLIER:		
6.	CLASS:	FMS	
7.		82	
8.		3 year payback	
9.	COMPUTER:	o jour pajouch	
111			
	CONTROLS:	Coorboy mainshafts	
11.	CONTROLS: PRODUCTS:	Gearbox mainshafts	
11. 12.	CONTROLS: PRODUCTS: MATERIALS:	Stee1	
11. 12. 13.	CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS:	Stee1	
11. 12. 13. 14.	CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES:	Stee1	
11. 12. 13. 14. 15.	CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE:	Stee1	
11. 12. 13. 14. 15. 16.	CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE:	Stee1	
11. 12. 13. 14. 15. 16.	CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE:	Stee1	
11. 12. 13. 14. 15. 16.	CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE:	Steel 8	
11. 12. 13. 14. 15. 16.	CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION	Steel 8	
11. 12. 13. 14. 15. 16. 17.	CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING:	Steel 8 Rotational	
11. 12. 13. 14. 15. 16. 17. 18.	CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE:	Steel 8  Rotational 300-700	
11. 12. 13. 14. 15. 16. 17. 18.	CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET:	Steel 8 Rotational 300-700 1 NT, 2 ND, 2 NG	
11. 12. 13. 14. 15. 16. 17. 18.	CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING:	Steel 8  Rotational  300-700 1 NT, 2 ND, 2 NG	
11. 12. 13. 14. 15. 16. 17. 18.	CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING:	Steel 8 Rotational 300-700 1 NT, 2 ND, 2 NG	
11. 12. 13. 14. 15. 16. 17. 18.	CONTROLS: PRODUCTS: MATERIALS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING: FEATURES:	Steel 8  Rotational  300-700 1 NT, 2 ND, 2 NG Conveyor system	
11. 12. 13. 14. 15. 16. 17. 18.	CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING:	Steel 8 Rotational 300-700 1 NT, 2 ND, 2 NG	

```
Sweeden
    COUNTRY:
1.
2.
                      Samefa
  COMPANY:
3. LOCATION:
4. DIVISION:
5.
  SUPPLIER:
                      Niigata
                      FMS
6. CLASS:
7. YEAR:
                      84
8.
  FINANCIAL DATA:
9.
    COMPUTER:
10. CONTROLS:
11. PRODUCTS:
12. MATERIALS:
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                      Prismatic
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                      2 MC, 1 MT, 1 cutting machine
                      BT AGV
21. MATL. HANDLING:
22. TOOLING:
23. FEATURES:
                      14
24. REFERENCES:
1.
    COUNTRY:
                      Sweeden
2.
                      Seco Tools
  COMPANY:
3. LOCATION:
                      Arbogo
4.
  DIVISION:
5. SUPPLIER:
                      Saab
6. CLASS:
                      MC
7.
  YEAR:
                      84
8.
  FINANCIAL DATA:
    COMPUTER:
10. CONTROLS:
11. PRODUCTS:
                      Special tool for external turning
12. MATERIALS:
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                      Prismatic
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                      1 MC
21. MATL. HANDLING:
                      Rotary table, robot for deburring
22. TOOLING:
23. FEATURES:
                      Probing
24. REFERENCES:
                      14
```

```
2. COMPANY:
                     Sundsvalle Verkstader
3. LOCATION:
                     Orebo
4. DIVISION:
5. SUPPLIER:
                     Japanese MT's, BT installation
6. CLASS:
                     FMS
7. YEAR:
                     84
8. FINANCIAL DATA:
9. COMPUTER:
10. CONTROLS:
11. PRODUCTS:
                     Glass making machinery
12. MATERIALS:
                     Steel, cast iron
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                     Prismatic
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                     3 MC
21. MATL. HANDLING:
22. TOOLING:
23. FEATURES:
24. REFERENCES:
                     14, 69
1. COUNTRY:
                     Sweeden
2. COMPANY:
                     Volvo
3. LOCATION:
                     Koping
4. DIVISION:
                     Heavy Engineering Division
5. SUPPLIER:
                     Volvo
6. CLASS:
                     FMS
7. YEAR:
                     79
8. FINANCIAL DATA:
9. COMPUTER:
10. CONTROLS:
11. PRODUCTS:
                     Truck transmission parts
12. MATERIALS:
                     Cast iron
13. NUMBER OF PARTS: 22 transmissions
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                     Prismatic
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
                     Range from 200 to 600
20. MACHINE SET:
                     4 MC, 1 NM, 1 multi-headed spindle MT
21. MATL. HANDLING: Rail guided cart
22. TOOLING:
23. FEATURES:
24. REFERENCES:
                     14
```

Sweeden

1. COUNTRY:

```
COUNTRY:
                     Sweeden
                     Volvo
2. COMPANY:
3. LOCATION:
                     Skovde
4. DIVISION:
                     Components Division
5. SUPPLIER:
                      Japanese Firm
                     FMS
6. CLASS:
   YEAR:
                      84
7.
8. FINANCIAL DATA:
   COMPUTER:
10. CONTROLS:
11. PRODUCTS:
                      Intake Manifold
                     Cast iron
12. MATERIALS:
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                     Prismatic
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
                      2 SP, 3 MC, 1 ND, drying station
20. MACHINE SET:
21. MATL. HANDLING:
22. TOOLING:
                      2 head indexers
23. FEATURES:
24. REFERENCES:
                     14
  COUNTRY:
                      Sweeden
2. COMPANY:
                     Volvo
3. LOCATION:
                      Skovde
4. DIVISION:
                     Components Division
                     Volvo
5. SUPPLIER:
6. CLASS:
                     FTL
7. YEAR:
                     82
  FINANCIAL DATA:
                     DEC PDP 11
9.
   COMPUTER:
10. CONTROLS:
                     Heavy diesel crank shafts
11. PRODUCTS:
12. MATERIALS:
                      Stee1
13. NUMBER OF PARTS: 2
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                      Rotational
18. OPERATION
    SCHEDULING:
                      2,000
19. LOT SIZE:
20. MACHINE SET:
                      3 NT, 2 NM, balancing machine (4 cells)
21. MATL. HANDLING: 3 AGV's, 3 gantry cranes
22. TOOLING:
23. FEATURES:
24. REFERENCES:
                     14, 47, 69
```

```
1. COUNTRY:
                     Switzerland
2. COMPANY:
                     Bobst & Fils SA
3. LOCATION:
                     Pausanne-Prilly
4. DIVISION:
                     Forest (French)
5. SUPPLIER:
6. CLASS:
                     FMS
                     84
7. YEAR:
8. FINANCIAL DATA:
9. COMPUTER:
10. CONTROLS:
11. PRODUCTS:
                     Printing & packaging machine parts
12. MATERIALS:
                     Stee1
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                     Prismatic
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
                     5 MT
20. MACHINE SET:
21. MATL. HANDLING:
22. TOOLING:
23. FEATURES:
24. REFERENCES:
                     14
1. COUNTRY:
                     Switzerland
2. COMPANY:
                     Brown Boveri
3. LOCATION:
                     Scharmann
4. DIVISION:
5. SUPPLIER:
                     FMS
6. CLASS:
7. YEAR:
                     85
8. FINANCIAL DATA:
                     DEC PDP 11/44
9. COMPUTER:
10. CONTROLS:
                     Sinumeric 8MC
11. PRODUCTS:
                     Turbocharger parts
12. MATERIALS:
                     Cast iron, aluminum
13. NUMBER OF PARTS: 100
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
                     1 x 1 x 1.2 m
17. PART SHAPE:
                     Prismatic
18. OPERATION
                     3 shift operation, 1 man crew
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                     2 MC, 1 WS
21. MATL. HANDLING:
                     2 AGV
22. TOOLING:
                     ATC with capacity of 80
23. FEATURES:
24. REFERENCES:
                     14. 79
```

1. COUNTRY: Switzerland Sulzer Brothers 2. COMPANY: Zuchwil 3. LOCATION: 4. DIVISION: 5. SUPPLIER: Fischer, Burkhardt & Weber 6. CLASS: FMS 7. YEAR: 84 FINANCIAL DATA: 8. 9. COMPUTER: 10. CONTROLS: 11. PRODUCTS: High speed weaving machine parts 12. MATERIALS: Stee1 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 12 MC 21. MATL. HANDLING: 22. TOOLING: 23. FEATURES: 24. REFERENCES: 14, 69 1. COUNTRY: Taiwan 2. COMPANY: Lian Feng Machine 3. LOCATION: Feng Yuan 4. DIVISION: 5. SUPPLIER: 6. CLASS: **FMS** 7. YEAR: 85 8. FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: Fanuc 11. PRODUCTS: Machine tool parts 12. MATERIALS: Steel, cast iron 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 2 MC 21. MATL. HANDLING: Rail guided cart 22. TOOLING: 23. FEATURES:

24. REFERENCES:

14

1.	COUNTRY:	Taiwan
2.	COMPANY:	Mechanical Industries Research Laboratory
3.	LOCATION:	
4.	DIVISION:	
	SUPPLIER:	Mechanical Industries Research Laboratory
	CLASS:	FMS
7.	YEAR:	84
	FINANCIAL DATA:	
	COMPUTER:	
	CONTROLS:	Allen Bradley
	PRODUCTS:	
	MATERIALS:	
	NUMBER OF PARTS:	
	PART FAMILIES:	
	PRODUCTION RATE:	
	PART CUBE:	Dedenation
		Prismatic
10.	OPERATION SCHEDULING:	
10	LOT SIZE:	
	MACHINE SET:	2 NHM
	MATL. HANDLING:	AGV
	TOOLING:	
	FEATURES:	Probing, automated inspection, part washing
	REFERENCES:	14
1.	COUNTRY:	Taiwan
2.	COMPANY:	Taiwan ORC Speicer
2. 3.	COMPANY: LOCATION:	
2. 3. 4.	COMPANY: LOCATION: DIVISION:	ORC Speicer
2. 3. 4. 5.	COMPANY: LOCATION: DIVISION: SUPPLIER:	ORC Speicer Speicer
2. 3. 4. 5. 6.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS:	ORC Speicer Speicer FMS
2. 3. 4. 5. 6. 7.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR:	ORC Speicer Speicer
2. 3. 4. 5. 6. 7. 8.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA:	ORC Speicer Speicer FMS
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER:	ORC Speicer Speicer FMS
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS:	ORC Speicer Speicer FMS
2. 3. 4. 5. 6. 7. 8. 9. 10.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS:	ORC Speicer Speicer FMS
2. 3. 4. 5. 6. 7. 8. 9. 10. 11.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS:	ORC Speicer Speicer FMS
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS:	ORC Speicer Speicer FMS
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES:	ORC Speicer Speicer FMS
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE:	ORC Speicer Speicer FMS
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE:	ORC Speicer Speicer FMS 83
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE:	ORC Speicer Speicer FMS
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE:	ORC Speicer Speicer FMS 83
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION	ORC Speicer Speicer FMS 83
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET:	ORC Speicer Speicer FMS 83  Prismatic
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING:	ORC Speicer Speicer FMS 83  Prismatic
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING:	ORC Speicer Speicer FMS 83  Prismatic  2 MC 2 carriers
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING:	ORC Speicer Speicer FMS 83  Prismatic

1.	COUNTRY:	Taiwan
2.	COMPANY:	Taichung Precision Machinery
3.	LOCATION:	
4.	DIVISION:	
5.	SUPPLIER:	
		FMS
7.	YEAR:	87
8.	FINANCIAL DATA:	
9.	COMPUTER:	
10.	CONTROLS:	
11.	PRODUCTS:	Machine tool parts
12.	MATERIALS:	Steel, cast iron
13.	NUMBER OF PARTS:	
14.	PART FAMILIES:	
15.	PRODUCTION RATE:	
17.	PART SHAPE:	Prismatic and rotational
18.	OPERATION	
	SCHEDULING:	
20.	MACHINE SET:	4 NT, 2 NVM, 1 NHM
		1 robot, conveyor
23.	FEATURES:	
24.	REFERENCES:	14
1	COINTDV	1117
		UK
		Anderson Strathclyde PLC Motherwell, Scotland
		Motherwerr, Scottand
1.		
	DIVISION:	Ciddings & Louis Frager
5.	SUPPLIER:	Giddings & Lewis, Fraser
5. 6.	SUPPLIER: CLASS:	FMS
5. 6. 7.	SUPPLIER: CLASS: YEAR:	
5. 6. 7. 8.	SUPPLIER: CLASS: YEAR: FINANCIAL DATA:	FMS
5. 6. 7. 8. 9.	SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER:	FMS
5. 6. 7. 8. 9.	SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS:	FMS 83
5. 6. 7. 8. 9. 10.	SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS:	FMS 83 Coal cutters
5. 6. 7. 8. 9. 10. 11.	SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS:	FMS 83 Coal cutters Steel castings
5. 6. 7. 8. 9. 10. 11. 12.	SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS:	FMS 83 Coal cutters Steel castings
5. 6. 7. 8. 9. 10. 11. 12. 13.	SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES:	FMS 83 Coal cutters Steel castings
5. 6. 7. 8. 9. 10. 11. 12. 13. 14.	SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE:	FMS 83 Coal cutters Steel castings 14
5. 6. 7. 8. 9. 10. 11. 12. 13. 14.	SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE:	FMS 83 Coal cutters Steel castings 14
5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE:	FMS 83 Coal cutters Steel castings 14
5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION	FMS 83 Coal cutters Steel castings 14
5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING:	FMS 83 Coal cutters Steel castings 14
5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17.	SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE:	FMS 83  Coal cutters Steel castings 14  4 x 6 ft pallet Prismatic
5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET:	FMS 83  Coal cutters Steel castings 14  4 x 6 ft pallet Prismatic  6 MC
5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING:	FMS 83  Coal cutters Steel castings 14  4 x 6 ft pallet Prismatic  6 MC AGV
5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING:	FMS 83  Coal cutters Steel castings 14  4 x 6 ft pallet Prismatic  6 MC
5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING:	FMS 83  Coal cutters Steel castings 14  4 x 6 ft pallet Prismatic  6 MC AGV
	3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	3. LOCATION: 4. DIVISION: 5. SUPPLIER: 6. CLASS: 7. YEAR: 8. FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: 11. PRODUCTS: 12. MATERIALS: 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: 18. OPERATION

1. COUNTRY: UK 2. COMPANY: Babcock Bristol 3. LOCATION: Croydon 4. DIVISION: 5. SUPPLIER: Yamazaki 6. CLASS: FMS 7. YEAR: 83 8. FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: 11. PRODUCTS: Signature transmitter parts 12. MATERIALS: 13. NUMBER OF PARTS: 100 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Rotational 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 1 NV, 1 MC 21. MATL. HANDLING: Robot, conveyor, carousel 22. TOOLING: 23. FEATURES: 24. REFERENCES: 14, 58 1. COUNTRY: UK 2. COMPANY: Black & Decker 3. LOCATION: Spennymoor, County Durham 4. DIVISION: 5. SUPPLIER: Fairey Automation 6. CLASS: FMS 7. YEAR: 84 8. FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: 11. PRODUCTS: 12. MATERIALS: 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 21. MATL. HANDLING: 22. TOOLING: 23. FEATURES:

14

UK 1. COUNTRY: 2. COMPANY: British United Shoe Company 3. LOCATION: Leicester 4. DIVISION: KTM 5. SUPPLIER: 6. CLASS: **FMS** 7. YEAR: 86 8. FINANCIAL DATA: COMPUTER: Siemens 10. CONTROLS: 11. PRODUCTS: Shoe machinery parts 12. MATERIALS: Steel, cast iron 13. NUMBER OF PARTS: 4-5,000 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION SCHEDULING: 19. LOT SIZE: 4 MC 20. MACHINE SET: 21. MATL. HANDLING: Rail guided cart 22. TOOLING: 23. FEATURES: Automated inspection 24. REFERENCES: 14, 58 COUNTRY: UK 1. 2. COMPANY: Caterpillar 3. LOCATION: **Glasgow** 4. DIVISION: 5. SUPPLIER: Scharmann 6. CLASS: FMS 7. YEAR: 84 8. FINANCIAL DATA: COMPUTER: 10. CONTROLS: 11. PRODUCTS: Tractor gearbox parts 12. MATERIALS: Cast iron 13. NUMBER OF PARTS: 9 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 4 MC 21. MATL. HANDLING: Rail guided cart 22. TOOLING: 23. FEATURES:

14

1.	COUNTRY:	UK
	COMPANY:	Caterpillar
3	I OCATION.	Glasgow
1.	LOCATION: DIVISION:	Glasgow
4.	SUPPLIER:	Cahamana
٥.	SUPPLIER:	Scharmann
6.	CLASS:	FMS
7.	YEAR: FINANCIAL DATA:	83
8.	FINANCIAL DATA:	
9.	COMPUTER:	
10.	CONTROLS:	
11.	PRODUCTS:	Large tractor parts
	MATERIALS:	Steel, cast iron
	NUMBER OF PARTS:	8
	PART FAMILIES:	
	PRODUCTION RATE:	
	PART CUBE:	D
	PART SHAPE:	Prismatic
18.	OPERATION	
	SCHEDULING:	
19.	LOT SIZE:	
20.	MACHINE SET:	2 MC
21.	MATL. HANDLING:	
	TOOLING:	
	FEATURES:	
	REFERENCES:	14, 58
•	KDI BKDKODO.	14, 50
1	COUNTRY.	ITK
	COUNTRY:	UK Catornillar
2.	COMPANY:	Caterpillar
2. 3.	COMPANY: LOCATION:	
2. 3. 4.	COMPANY: LOCATION: DIVISION:	Caterpillar Glasgow
2. 3. 4. 5.	COMPANY: LOCATION: DIVISION: SUPPLIER:	Caterpillar Glasgow Comau
2. 3. 4. 5. 6.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS:	Caterpillar Glasgow Comau FMS
2. 3. 4. 5. 6. 7.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR:	Caterpillar Glasgow Comau
2. 3. 4. 5. 6. 7.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS:	Caterpillar Glasgow Comau FMS
2. 3. 4. 5. 6. 7. 8.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA:	Caterpillar Glasgow Comau FMS
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER:	Caterpillar Glasgow Comau FMS
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS:	Caterpillar Glasgow Comau FMS 85
2. 3. 4. 5. 6. 7. 8. 9. 10.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS:	Caterpillar Glasgow  Comau FMS 85  Tractor track parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS:	Caterpillar Glasgow Comau FMS 85
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS:	Caterpillar Glasgow  Comau FMS 85  Tractor track parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES:	Caterpillar Glasgow  Comau FMS 85  Tractor track parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE:	Caterpillar Glasgow  Comau FMS 85  Tractor track parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE:	Caterpillar Glasgow  Comau FMS 85  Tractor track parts Steel
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE:	Caterpillar Glasgow  Comau FMS 85  Tractor track parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION	Caterpillar Glasgow  Comau FMS 85  Tractor track parts Steel
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING:	Caterpillar Glasgow  Comau FMS 85  Tractor track parts Steel
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION	Caterpillar Glasgow  Comau FMS 85  Tractor track parts Steel
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING:	Caterpillar Glasgow  Comau FMS 85  Tractor track parts Steel  Prismatic
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET:	Caterpillar Glasgow  Comau FMS 85  Tractor track parts Steel  Prismatic  2 specially designed MT's
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING:	Caterpillar Glasgow  Comau FMS 85  Tractor track parts Steel  Prismatic
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING:	Caterpillar Glasgow  Comau FMS 85  Tractor track parts Steel  Prismatic  2 specially designed MT's Robot, cart with towline
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING: FEATURES:	Caterpillar Glasgow  Comau FMS 85  Tractor track parts Steel  Prismatic  2 specially designed MT's Robot, cart with towline Automated inspection
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING:	Caterpillar Glasgow  Comau FMS 85  Tractor track parts Steel  Prismatic  2 specially designed MT's Robot, cart with towline

```
UK
   COUNTRY:
2. COMPANY:
                      Cessna
   LOCATION:
                      Glenrothes, Scotland
                     Fluid Power
4. DIVISION:
5. SUPPLIER:
                      Olivetti
6.
   CLASS:
                      FMS
7.
   YEAR:
                      84
8.
  FINANCIAL DATA:
9.
    COMPUTER:
10. CONTROLS:
11. PRODUCTS:
                      Pump gear housing
12. MATERIALS:
13. NUMBER OF PARTS: 18
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                      Prismatic
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                      3 MC
21. MATL. HANDLING: 2 robots
22. TOOLING:
23. FEATURES:
                      Automated inspection
24. REFERENCES:
                     14, 58
  COUNTRY:
                      UK
2. COMPANY:
                      Cincinnati Milicron
3. LOCATION:
                      Birmingham
4. DIVISION:
5. SUPPLIER:
                      Cincinnati Milicron
6. CLASS:
                      FMS
7.
   YEAR:
                      84
8.
   FINANCIAL DATA:
9.
   COMPUTER:
10. CONTROLS:
11. PRODUCTS:
                      Machine tool parts
12. MATERIALS:
                      Steel, cast iron
13. NUMBER OF PARTS: 13
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
21. MATL. HANDLING:
                      AGV
22. TOOLING:
23. FEATURES:
                      Probing, adaptive control, part washing
24. REFERENCES:
                      14
```

1.	COUNTRY:	UK
	COMPANY:	Colechester Lathe
	LOCATION:	Colechester
	DIVISION:	600 Group
	SUPPLIER:	Scamp Systems Limited
	CLASS:	FMS
	YEAR:	83
	FINANCIAL DATA:	
	COMPUTER:	Dual DEC PDP 11/60's
	CONTROLS:	5000E
	PRODUCTS:	Shafts, discs, and gears for machine tools
	MATERIALS:	Steel
	NUMBER OF PARTS:	
	PART FAMILIES:	3
	PRODUCTION RATE:	
	PART CUBE:	220 mm round x 420 mm long
	PART SHAPE:	Rotational
18.	OPERATION	Computer assisted scheduling
	SCHEDULING:	
19.	LOT SIZE:	25–100
20.	MACHINE SET:	4 NT, 3 NG, 1 NGR, 1 SP
21.	MATL. HANDLING:	8 Fanuc robots, roller conveyor
22.	TOOLING:	·
23.	FEATURES:	Automated inspection
	REFERENCES:	14, 57, 68, 69
1.	COUNTRY:	UK
	COMPANY:	Deep Sea Seals
	LOCATION:	Havant
	DIVISION:	navano
	SUPPLIER:	TI Matrix
	CLASS:	MC
	YEAR:	84
		60 % reduction in machining time
	COMPUTER:	DEC PDP 11/23
	CONTROLS:	Fanuc 6MB, Fanuc 6T
	PRODUCTS:	Ship propeller shaft seals
	MATERIALS:	Gunmetal bronze
	NUMBER OF PARTS:	
	PART FAMILIES:	20
	PRODUCTION RATE:	
	PART CUBE:	1.5 m round
	PART SHAPE:	Rotational
18.	OPERATION	16 hours per day
	SCHEDULING:	
	LOT SIZE:	
20.	MACHINE SET:	1 NVM (Matrix V5OLR), 1 NV (Web. & Ben.)
	MATT HANDITMO.	AGV - Babcock FATA
21.	MATL. HANDLING:	AGV - DADCOCK PATA
	TOOLING:	ATC for NVM with 30 tool magazine
22.		
22. 23.	TOOLING:	

1. COUNTRY: UK 2. COMPANY: Dowty Mining Equipment Tewkesbury 3. LOCATION: 4. DIVISION: K & T 5. SUPPLIER: **FMS** 6. CLASS: 83 7. YEAR: FINANCIAL DATA: 8. DEC COMPUTER: 10. CONTROLS: Gemini 11. PRODUCTS: Hydraulic valve manifolds Cast iron 12. MATERIALS: 13. NUMBER OF PARTS: 14. PART FAMILIES: 30 15. PRODUCTION RATE: 16. PART CUBE: Prismatic 17. PART SHAPE: 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 4 MC 21. MATL. HANDLING: AGV 22. TOOLING: 23. FEATURES: Automatic inspection, probing, and adaptive control 24. REFERENCES: 14, 58 1. COUNTRY: UK 2. COMPANY: Ford Motor Company Halewood 3. LOCATION: 4. DIVISION: 5. SUPPLIER: **FMS** 6. CLASS: 7. YEAR: 85 8. FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: 11. PRODUCTS: Cluster gear for automobile transportation 12. MATERIALS: Stee1 13. NUMBER OF PARTS: 9 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Rotational 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 9 NT, 2 ND 21. MATL. HANDLING: AGV 22. TOOLING: 23. FEATURES:

14, 58

1.		UK
	COMPANY:	J. C. Bamford
4.	LOCATION: DIVISION:	
5.	SUPPLIER:	Scharmann
	CLASS:	FMS
	YEAR:	84
	FINANCIAL DATA:	
	COMPUTER:	
	CONTROLS:	
	PRODUCTS:	
12.	MATERIALS:	
13.	NUMBER OF PARTS:	
	PART FAMILIES:	
	PRODUCTION RATE:	
	PART CUBE:	
	PART SHAPE:	
18.	OPERATION	
10	SCHEDULING: LOT SIZE:	
	MACHINE SET:	
	MATL. HANDLING:	
	TOOLING:	
23.	FEATURES:	
	REFERENCES:	14
1.	COUNTRY •	ıık.
1.		UK L. Gardner & Sons
2.	COMPANY:	L. Gardner & Sons
2. 3.	COMPANY: LOCATION:	L. Gardner & Sons Barton Hall
2. 3. 4.	COMPANY: LOCATION: DIVISION:	L. Gardner & Sons
2. 3. 4. 5. 6.	COMPANY: LOCATION:	L. Gardner & Sons Barton Hall Engine Works
2. 3. 4. 5.	COMPANY: LOCATION: DIVISION: SUPPLIER:	L. Gardner & Sons Barton Hall Engine Works KTM
2. 3. 4. 5. 6. 7. 8.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA:	L. Gardner & Sons Barton Hall Engine Works KTM FMS
2. 3. 4. 5. 6. 7. 8.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER:	L. Gardner & Sons Barton Hall Engine Works KTM FMS
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS:	L. Gardner & Sons Barton Hall Engine Works KTM FMS 82
2. 3. 4. 5. 6. 7. 8. 9. 10.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS:	L. Gardner & Sons Barton Hall Engine Works KTM FMS 82  Diesel engine blocks
2. 3. 4. 5. 6. 7. 8. 9. 10. 11.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS:	L. Gardner & Sons Barton Hall Engine Works KTM FMS 82  Diesel engine blocks Cast iron
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS:	L. Gardner & Sons Barton Hall Engine Works KTM FMS 82  Diesel engine blocks Cast iron 4
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES:	L. Gardner & Sons Barton Hall Engine Works KTM FMS 82  Diesel engine blocks Cast iron 4
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE:	L. Gardner & Sons Barton Hall Engine Works KTM FMS 82  Diesel engine blocks Cast iron 4
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE:	L. Gardner & Sons Barton Hall Engine Works KTM FMS 82  Diesel engine blocks Cast iron 4 1 3parts/hour
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE:	L. Gardner & Sons Barton Hall Engine Works KTM FMS 82  Diesel engine blocks Cast iron 4
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE:	L. Gardner & Sons Barton Hall Engine Works KTM FMS 82  Diesel engine blocks Cast iron 4 1 3parts/hour
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION	L. Gardner & Sons Barton Hall Engine Works KTM FMS 82  Diesel engine blocks Cast iron 4 1 3parts/hour
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET:	L. Gardner & Sons Barton Hall Engine Works KTM FMS 82  Diesel engine blocks Cast iron 4 1 3parts/hour
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING:	L. Gardner & Sons Barton Hall Engine Works KTM FMS 82  Diesel engine blocks Cast iron 4 1 3parts/hour
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET:	L. Gardner & Sons Barton Hall Engine Works KTM FMS 82  Diesel engine blocks Cast iron 4 1 3parts/hour

24. REFERENCES: 14, 16

LOCATION: Farington 4. DIVISION: 5. SUPPLIER: KTM 6. CLASS: **FMS** 82 7. YEAR: 8. FINANCIAL DATA: 9. COMPUTER: DEC PDP 11/24 10. CONTROLS: 11. PRODUCTS: Hydraulic transmissions 12. MATERIALS: Aluminum 13. NUMBER OF PARTS: 28 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 3 NHM (KTM) 21. MATL. HANDLING: 22. TOOLING: 23. FEATURES: 24. REFERENCES: 14, 63 COUNTRY: UK 1. 2. COMPANY: Lucas Electrical Telford LOCATION: 4. DIVISION: 5. SUPPLIER: KT 6. CLASS: **FMS** 7. YEAR: 84 FINANCIAL DATA: DEC COMPUTER: 10. CONTROLS: Gemini 11. PRODUCTS: Automotive electrical parts 12. MATERIALS: 13. NUMBER OF PARTS: 130 14. PART FAMILIES: 15. PRODUCTION RATE: 130,000 parts/year 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 7 MC 21. MATL. HANDLING: Rail guided cart 22. TOOLING: 23. FEATURES: Probing, adaptive control 24. REFERENCES: 14, 75

UK

Leyland Bus

COUNTRY:
 COMPANY:

2. 3.	COUNTRY: COMPANY: LOCATION:	UK Normalair Garret
5.	DIVISION: SUPPLIER:	KTM
	CLASS: YEAR:	FMS 81
8.	FINANCIAL DATA:	
	COMPUTER: CONTROLS:	
	PRODUCTS: MATERIALS:	Aircraft components Aluminum
13.	NUMBER OF PARTS:	ATUMINUM
	PART FAMILIES: PRODUCTION RATE:	
16.	PART CUBE:	B
	PART SHAPE: OPERATION	Prismatic
10	SCHEDULING: LOT SIZE:	
20.	MACHINE SET:	2 MC
	MATL. HANDLING: TOOLING:	
23.	FEATURES:	1/ 16 06
24.	REFERENCES:	14, 16, 86
1.	COUNTRY:	UK
2.	COUNTRY: COMPANY:	Rolls Royce
2. 3.		
2. 3. 4. 5.	COMPANY: LOCATION: DIVISION: SUPPLIER:	Rolls Royce Derby
2. 3. 4. 5. 6. 7.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR:	Rolls Royce
2. 3. 4. 5. 6. 7. 8.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA:	Rolls Royce Derby
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS:	Rolls Royce Derby  FMS 85
2. 3. 4. 5. 6. 7. 8. 9. 10.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS:	Rolls Royce Derby  FMS 85  Jet engine parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS:	Rolls Royce Derby  FMS 85
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE:	Rolls Royce Derby  FMS 85  Jet engine parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE:	Rolls Royce Derby  FMS 85  Jet engine parts Nickle alloys, stainless steels
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION	Rolls Royce Derby  FMS 85  Jet engine parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE:	Rolls Royce Derby  FMS 85  Jet engine parts Nickle alloys, stainless steels
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET:	Rolls Royce Derby  FMS 85  Jet engine parts Nickle alloys, stainless steels
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING:	Rolls Royce Derby  FMS 85  Jet engine parts Nickle alloys, stainless steels
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING:	Rolls Royce Derby  FMS 85  Jet engine parts Nickle alloys, stainless steels

```
USA
    COUNTRY:
2.
    COMPANY:
                      Allis Chalmers
3.
  LOCATION:
                      Milwaukee, WI
  DIVISION:
                      KT
5.
   SUPPLIER:
                      FMS
6. CLASS:
7.
   YEAR:
                      71
8.
   FINANCIAL DATA:
   COMPUTER:
10. CONTROLS:
                      Inter Data, Bendix
11. PRODUCTS:
                      Tractor parts
12. MATERIALS:
                      Cast iron
13. NUMBER OF PARTS: 48
14. PART FAMILIES:
15. PRODUCTION RATE: 23,600
16. PART CUBE:
                      3 ft
17. PART SHAPE:
                      Prismatic
18. OPERATION
                      Computer dynamically assigns work stations, product mix
    SCHEDULING:
                      changed significantly during implementation, crew of 9
19. LOT SIZE:
20. MACHINE SET:
                      5 MC, 1 NM
21. MATL. HANDLING:
                      23 carts with towline, complex network
22. TOOLING:
                      4 duplex multi-spindle head indexers, 864 tools, 73 heads
23. FEATURES:
24. REFERENCES:
                      18, 38, 52, 61
1.
    COUNTRY:
                      USA
2.
   COMPANY:
                      Allison-Detroit Diesel
3. LOCATION:
                      Hamtrack, MI
  DIVISION:
5.
  SUPPLIER:
                      White Sunstrand
6. CLASS:
                      FMS
7.
   YEAR:
                      83
8.
  FINANCIAL DATA:
                      DEC
    COMPUTER:
10. CONTROLS:
                      Omni
11. PRODUCTS:
                      Large transmission housings
12. MATERIALS:
                      Cast iron
13. NUMBER OF PARTS: 40
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                      Prismatic
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                      8 MC
21. MATL. HANDLING:
                      Cart with towline
22. TOOLING:
23. FEATURES:
                      Probing
```

14, 22

```
COUNTRY:
                      USA
1.
    COMPANY:
                      Avco Lycoming
2.
   LOCATION:
                      Stratford, Conn
4.
   DIVISION:
                     Lycoming
5.
    SUPPLIER:
                      KT
6.
   CLASS:
                      FMS
7.
   YEAR:
                      81
    FINANCIAL DATA:
    COMPUTER:
                      2 Interdata 8/16E
10. CONTROLS:
                      Allen Bradley 7320's
11. PRODUCTS:
                      XM-1 Tank engine parts
                      Stainless steel castings
12. MATERIALS:
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                      Prismatic
18. OPERATION
                      2 shifts, 3 shifts planned in late 85
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                      7 MC, 3 NV, 4 more MC's planned
21. MATL. HANDLING:
                     Cart with towline
22. TOOLING:
                      ATC with 70 tool magazines, 1,000 + tools in system
23. FEATURES:
                      Probing
                      14, 46, 49
24. REFERENCES:
    COUNTRY:
1.
                      USA
2.
   COMPANY:
                      Avco Lycoming
  LOCATION:
                     Williamsport, PA
   DIVISION:
                     Lycoming
5.
   SUPPLIER:
                     KT
6.
   CLASS:
                      FMS
7.
   YEAR:
                      76
8.
  FINANCIAL DATA:
                      9 MC's replaced 67 MT's
    COMPUTER:
                      2 Microdata Model 70's
10. CONTROLS:
11. PRODUCTS:
                      Aircraft engine crank cases
12. MATERIALS:
                      Aluminum
13. NUMBER OF PARTS:
                     6
14. PART FAMILIES:
15. PRODUCTION RATE: 2,000 parts/month
16. PART CUBE:
                      4 ft square pallet
17. PART SHAPE:
                      Prismatic
18. OPERATION
                      Computer dynamically assigns work stations, each
    SCHEDULING:
                      operation has alternates, crew of 9
19. LOT SIZE:
20. MACHINE SET:
                      9 MC
21. MATL. HANDLING:
                      Cart with towline, simple loop with short spurs
22. TOOLING:
                      2 simplex & 1 duplex multispindle head changers
23. FEATURES:
                      Probing
```

14, 38, 52, 61, 17, 43, 45

```
USA
1.
   COUNTRY:
   COMPANY:
                     Boeing Aerospace
2.
  LOCATION:
                     Kent, WA
3.
4. DIVISION:
                     White Sunstrand
5. SUPPLIER:
                     FMS
6.
  CLASS:
7. YEAR:
                     84
                     61 % reduction in machine hours
   FINANCIAL DATA:
                     DEC PDP 11/44
9.
    COMPUTER:
10. CONTROLS:
                     Omni Microswinc M23
11. PRODUCTS:
                     Housings, covers, fittings, and links for airframes
                      Aluminum (6061-T6), stainless steel 15-5ph, 13-8mo
12. MATERIALS:
13. NUMBER OF PARTS: 15
14. PART FAMILIES:
15. PRODUCTION RATE: 6,000 parts/year
16. PART CUBE:
                      30 x 20 x 22 in
17. PART SHAPE:
                     Prismatic
18. OPERATION
                     Crew of 1
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                      3 MC. 1 WS
21. MATL. HANDLING:
                     195 ft roller conveyor with 5 pallet transfer units
22. TOOLING:
                     ATC with capacity of 48
23. FEATURES:
                     14. 59
24. REFERENCES:
1.
   COUNTRY:
                     USA
2.
   COMPANY:
                     Boeing Aerospace
3. LOCATION:
                     Seattle, WA
4. DIVISION:
5. SUPPLIER:
                      Shin Nippon Koki
6. CLASS:
                     FMS
7. YEAR:
                     85
8.
   FINANCIAL DATA:
9. COMPUTER:
                     DEC
10. CONTROLS:
11. PRODUCTS:
                      Airframe parts
12. MATERIALS:
                      Aluminum (6061-T6), stainless steel 15-5ph, 13-8mo
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                     Prismatic
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                      5 MC
21. MATL. HANDLING: AGV, ASRS
22. TOOLING:
23. FEATURES:
```

24. REFERENCES:

14

COUNTRY: USA 1. 2. COMPANY: Borg-Warner LOCATION: York, PA DIVISION: 5. SUPPLIER: Comau 6. CLASS: **FMS** 7. 84 YEAR: FINANCIAL DATA: Replaced 14 MT's 8. Dual DEC PDP 11/44's COMPUTER: 10. CONTROLS: Allan Bradley 11. PRODUCTS: Air conditioner compressor parts 12. MATERIALS: 13. NUMBER OF PARTS: 85 14. PART FAMILIES: 15. PRODUCTION RATE: 38,500 parts/year 1300 mm 16. PART CUBE: 17. PART SHAPE: Prismatic Random sequencing possible 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 4 MC. 1 NV 21. MATL. HANDLING: Roller conveyor, ASRS, stacker crane 22. TOOLING: ATC 2 tool magazines with 70 tools, 572 tools in system 23. FEATURES: Robotic wash station, adaptive control 24. REFERENCES: 14, 70, 71, 75 1. COUNTRY: USA COMPANY: Caterpillar 3. LOCATION: Aurora, IL DIVISION: 5. SUPPLIER: Giddings & Lewis 6. CLASS: **FMS** 79 YEAR: 8. Labor reduction from 18.7 to 6.4 hours per piece FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: 3 tractor loader frames 11. PRODUCTS: 12. MATERIALS: Stee1 13. NUMBER OF PARTS: 3 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 2 NM. 4 ND 21. MATL. HANDLING: Cart with towline 22. TOOLING: Head indexer 23. FEATURES: Automated inspection

USA 1. COUNTRY: 2. COMPANY: Caterpillar 3. LOCATION: Aurora, IL 4. DIVISION: 5. SUPPLIER: Cincinnati Milicron 6. CLASS: **FMS** 86 7. YEAR: 8. FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: Milicron Excavator sticks & booms 11. PRODUCTS: 12. MATERIALS: Stee1 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION SCHEDULING: 19. LOT SIZE: 2 MC 20. MACHINE SET: 21. MATL. HANDLING: 22. TOOLING: 23. FEATURES: Automated inspection, probing, and adaptive control 14 24. REFERENCES: 1. COUNTRY: USA 2. COMPANY: Caterpillar LOCATION: Davenport, IO 4. DIVISION: 5. SUPPLIER: Cincinnati Milicron 6. CLASS: **FMS** 7. YEAR: 85 8. FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: Milicron 11. PRODUCTS: Tracked loader frames 12. MATERIALS: Steel 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION 100 machining steps SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 3 MC, 1 NB 21. MATL. HANDLING: 22. TOOLING: Head indexer 23. FEATURES: Adaptive control, part washing

24. REFERENCES:

14

```
1. COUNTRY:
                    USA
                    Caterpillar
2. COMPANY:
3. LOCATION:
                    Decatur, IL
4. DIVISION:
5. SUPPLIER:
                    Dearborn
6. CLASS:
                    FMS
7. YEAR:
                    84
8. FINANCIAL DATA:
9. COMPUTER:
10. CONTROLS:
                    Allen Bradley
                    Truck axle banjo housings
11. PRODUCTS:
12. MATERIALS:
                    Cast iron
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                    Prismatic
18. OPERATION
   SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                    3 NB, 5 MC, 1 ND, 1 NM
21. MATL. HANDLING:
22. TOOLING:
23. FEATURES:
24. REFERENCES:
                    14
1. COUNTRY:
                    USA
2. COMPANY:
                    Caterpillar
3. LOCATION:
                    East Peoria, IL
4. DIVISION:
5. SUPPLIER:
                    White Sunstrand
6. CLASS:
                    FTL
7. YEAR:
                    74
8. FINANCIAL DATA: Labor reduced from 13 to 7, machine utilization doubled
9. COMPUTER:
10. CONTROLS:
                    Omnicontrol DNC
11. PRODUCTS:
                    Case & cover for tractor transmissions
12. MATERIALS:
                    Cast iron
13. NUMBER OF PARTS: 6
14. PART FAMILIES:
15. PRODUCTION RATE: 1,200 parts/year
16. PART CUBE:
                     3 ft
17. PART SHAPE:
                    Prismatic
18. OPERATION
                    Fixed sequence, worked to monthly master schedule,
    SCHEDULING:
                   crew of 7
19. LOT SIZE:
20. MACHINE SET: 5 MC, 2 NV, 1 CMM, 3 ND
21. MATL. HANDLING: 2 rail guided carts
22. TOOLING:
                   350 tools in system
23. FEATURES:
```

18, 38, 52, 61, 84

1.	COUNTRY:	USA
	COMPANY:	Caterpillar
	LOCATION:	East Peoria, IL
	DIVISION:	
5.	SUPPLIER:	White Sunstrand
6.	CLASS:	FMS
	YEAR:	83
	FINANCIAL DATA:	
	COMPUTER:	0 4 1 700
	CONTROLS:	Omnicontrol DNC
	PRODUCTS:	Transmission cases & covers
	MATERIALS: NUMBER OF PARTS:	Cast iron
	PART FAMILIES:	
-	PRODUCTION RATE:	
	PART CUBE:	
	PART SHAPE:	Prismatic
	OPERATION	
	SCHEDULING:	
19.	LOT SIZE:	
20.	MACHINE SET:	8 MC, 2 NV, 1 WS, 1 CMM
	MATL. HANDLING:	Shuttle car
	TOOLING:	
	FEATURES:	Automated inspection, probing
24.	REFERENCES:	14, 84
1.	COUNTRY:	IISA
1.	COUNTRY:	USA Caterpillar
2.	COMPANY:	Caterpillar
2. 3.		
2. 3. 4.	COMPANY: LOCATION:	Caterpillar
2. 3. 4. 5.	COMPANY: LOCATION: DIVISION:	Caterpillar Peoria, IL
2. 3. 4. 5. 6. 7.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR:	Caterpillar Peoria, IL Mazak (Yamazaki's US subsidiary)
2. 3. 4. 5. 6. 7. 8.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA:	Caterpillar Peoria, IL Mazak (Yamazaki's US subsidiary) FMS
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER:	Caterpillar Peoria, IL Mazak (Yamazaki's US subsidiary) FMS 84
2. 3. 4. 5. 6. 7. 8. 9. 10.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS:	Caterpillar Peoria, IL  Mazak (Yamazaki's US subsidiary) FMS 84
2. 3. 4. 5. 6. 7. 8. 9. 10.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS:	Caterpillar Peoria, IL  Mazak (Yamazaki's US subsidiary) FMS 84  Mazak Sprocket segments
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS:	Caterpillar Peoria, IL  Mazak (Yamazaki's US subsidiary) FMS 84
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS:	Caterpillar Peoria, IL  Mazak (Yamazaki's US subsidiary) FMS 84  Mazak Sprocket segments
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES:	Caterpillar Peoria, IL  Mazak (Yamazaki's US subsidiary) FMS 84  Mazak Sprocket segments
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE:	Caterpillar Peoria, IL  Mazak (Yamazaki's US subsidiary) FMS 84  Mazak Sprocket segments
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE:	Caterpillar Peoria, IL  Mazak (Yamazaki's US subsidiary) FMS 84  Mazak Sprocket segments Steel
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE:	Caterpillar Peoria, IL  Mazak (Yamazaki's US subsidiary) FMS 84  Mazak Sprocket segments
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE:	Caterpillar Peoria, IL  Mazak (Yamazaki's US subsidiary) FMS 84  Mazak Sprocket segments Steel
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION	Caterpillar Peoria, IL  Mazak (Yamazaki's US subsidiary) FMS 84  Mazak Sprocket segments Steel
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET:	Caterpillar Peoria, IL  Mazak (Yamazaki's US subsidiary) FMS 84  Mazak Sprocket segments Steel  Rotational  3 MC, 1 SP
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING:	Caterpillar Peoria, IL  Mazak (Yamazaki's US subsidiary) FMS 84  Mazak Sprocket segments Steel  Rotational  3 MC, 1 SP
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING:	Caterpillar Peoria, IL  Mazak (Yamazaki's US subsidiary) FMS 84  Mazak Sprocket segments Steel  Rotational  3 MC, 1 SP Robots
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING:	Caterpillar Peoria, IL  Mazak (Yamazaki's US subsidiary) FMS 84  Mazak Sprocket segments Steel  Rotational  3 MC, 1 SP

1.	COUNTRY:	USA
	COMPANY:	Cincinnati Milicron
3.	LOCATION: DIVISION:	Cincinnati, OH
		01 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	SUPPLIER:	Cincinnati Milicron
	CLASS:	FMS
/.	YEAR:	85 Leadtime 20 days to 1 day
	COMPUTER: CONTROLS:	DEC PDP 11/44
	PRODUCTS:	Plastic injection molding machine parts
	MATERIALS:	Steel, cast iron
	NUMBER OF PARTS:	
	PART FAMILIES:	-,
15.	PRODUCTION RATE:	
	PART CUBE:	3 ft
	PART SHAPE:	Prismatic
18.	OPERATION	
• •	SCHEDULING:	
	LOT SIZE:	l possible
		4 MC, 1 CMM 3 Eaton AGV's
	MATL. HANDLING: TOOLING:	5 Laton AGV'S
	FEATURES:	Part washing
	REFERENCES:	14, 62, 75
	1132 231211 0220 1	,,
,	COLDIEDA	TIC A
	COUNTRY:	USA
2.	COMPANY:	Cummins Engine
2. 3.	COMPANY: LOCATION:	
2. 3. 4.	COMPANY: LOCATION: DIVISION:	Cummins Engine Columbus, IL
2. 3. 4. 5.	COMPANY: LOCATION: DIVISION: SUPPLIER:	Cummins Engine Columbus, IL KT
2. 3. 4. 5. 6.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS:	Cummins Engine Columbus, IL  KT FMS
2. 3. 4. 5. 6. 7.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR:	Cummins Engine Columbus, IL KT
2. 3. 4. 5. 6. 7. 8.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS:	Cummins Engine Columbus, IL  KT FMS
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS:	Cummins Engine Columbus, IL  KT FMS 84
2. 3. 4. 5. 6. 7. 8. 9. 10.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS:	Cummins Engine Columbus, IL  KT FMS 84  DEC
2. 3. 4. 5. 6. 7. 8. 9. 10. 11.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS:	Cummins Engine Columbus, IL  KT FMS 84  DEC DEC, Gemini
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS:	Cummins Engine Columbus, IL  KT FMS 84  DEC DEC, Gemini
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES:	Cummins Engine Columbus, IL  KT FMS 84  DEC DEC, Gemini
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE:	Cummins Engine Columbus, IL  KT FMS 84  DEC DEC, Gemini
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE:	Cummins Engine Columbus, IL  KT FMS 84  DEC DEC, Gemini Brake parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE:	Cummins Engine Columbus, IL  KT FMS 84  DEC DEC, Gemini
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION	Cummins Engine Columbus, IL  KT FMS 84  DEC DEC, Gemini Brake parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING:	Cummins Engine Columbus, IL  KT FMS 84  DEC DEC, Gemini Brake parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE:	Cummins Engine Columbus, IL  KT FMS 84  DEC DEC, Gemini Brake parts  Prismatic
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING:	Cummins Engine Columbus, IL  KT FMS 84  DEC DEC, Gemini Brake parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET:	Cummins Engine Columbus, IL  KT FMS 84  DEC DEC, Gemini Brake parts  Prismatic
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING:	Cummins Engine Columbus, IL  KT FMS 84  DEC DEC, Gemini Brake parts  Prismatic
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING:	Cummins Engine Columbus, IL  KT FMS 84  DEC DEC, Gemini Brake parts  Prismatic  6 MC AGV

```
COUNTRY:
                     USA
1.
2.
    COMPANY:
                      Department of Commerce
3. LOCATION:
                     Gaithersburg, MD
   DIVISION:
                     National Bureau of Standards
4.
5. SUPPLIER:
                     Integration by NBS
6. CLASS:
                     FMS
7.
   YEAR:
                     83
8. FINANCIAL DATA:
                     Reaseach facility
9.
    COMPUTER:
                      DEC VAX
                     Hewlett Packard, Allen Bradley, GE
10. CONTROLS:
11. PRODUCTS:
12. MATERIALS:
                     Aluminum, brass, steel
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                     Prismatic and rotational
                     Real time scheduling of machines, robots, and AGV
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                     1 NHM, 1 NVM, 1 NT, 1 CMM
21. MATL. HANDLING:
                     AGV, robot, gantry robot
22. TOOLING:
                     ATC
                     Robotic deburring station
23. FEATURES:
24. REFERENCES:
                     1, 25, 33
   COUNTRY:
1.
                     USA
2.
                     FMC
   COMPANY:
3. LOCATION:
                     Aiken. SC
4.
  DIVISION:
5. SUPPLIER:
                     Cincinnati Milicron
6.
   CLASS:
                     FMS
7.
   YEAR:
                     84
8. FINANCIAL DATA:
                     Leadtime reduced from 90 to 5 days
   COMPUTER:
                     DEC PDP 11/44
10. CONTROLS:
                     Acramatic 900
11. PRODUCTS:
                     Gear housings for the IFV drive train
12. MATERIALS:
                     Aluminum
13. NUMBER OF PARTS: 16
14. PART FAMILIES:
15. PRODUCTION RATE: 15 parts/week
16. PART CUBE:
                      30 in
17. PART SHAPE:
                     Prismatic
18. OPERATION
                     Crew of 5
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                     4 MC, 1 CMM
21. MATL. HANDLING:
                    3 AGV's (Eaton Kenway), 2 10-position carousels
22. TOOLING:
                     ATC with capacity of 90
23. FEATURES:
```

14, 75, 80

USA 1. COUNTRY: 2. COMPANY: **FMC** 3. LOCATION: San Jose, CA 4. DIVISION: Ordinance 5. SUPPLIER: Cincinnati Milicron CLASS: 6. **FMS** 7. YEAR: 85 8. FINANCIAL DATA: 9. DEC PDP 11/24 COMPUTER: 10. CONTROLS: 11. PRODUCTS: Infantry Fighting Vehicle drive train & chasis parts 12. MATERIALS: Steel 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 4 MC, 1 CMM 21. MATL. HANDLING: 22. TOOLING: 23. FEATURES: 24. REFERENCES: 13, 14 1. COUNTRY: USA 2. COMPANY: **GMC** 3. LOCATION: Hamtrack, MI DIVISION: Chevrolet Gear & Axle Plant 5. SUPPLIER: Comau CLASS: **FMS** 6. 7. YEAR: 82 8. FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: 11. PRODUCTS: Dif. housing, suspension tubes, cylinder heads, manifolds 12. MATERIALS: Cast iron, steel 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 70 parts/15 hours 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 3 MC, 1 WS 21. MATL. HANDLING: Roller conveyor, robots 22. TOOLING: 23. FEATURES: Automated inspection, part washing

12, 14, 70

USA COUNTRY: 2. **GMC** COMPANY: 3. LOCATION: Indianapolis, IN 4. DIVISION: Allison Gas Turbine 5. SUPPLIER: 6. CLASS: **FMS** 7. YEAR: 87 8. FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: MAP system 11. PRODUCTS: Precision gears 12. MATERIALS: Stee1 13. NUMBER OF PARTS: 30 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 3 - 14.5 in round 17. PART SHAPE: Rotational 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 10 NT, 1 MC, 11 NGR, 8 NG, 1 Broaching MT 21. MATL. HANDLING: 22. TOOLING: 23. FEATURES: 2 24. REFERENCES: 1. COUNTRY: USA 2. COMPANY: **GMC** 3. LOCATION: Indianapolis, IN 4. DIVISION: Detroit Diesel Allison 5. SUPPLIER: White Sunstrand 6. CLASS: **FMS** 7. YEAR: 80 8. FINANCIAL DATA: Replaced 35 MT's 9. COMPUTER: 10. CONTROLS: Omnicontrol DNC 11. PRODUCTS: Diesel transmissions 12. MATERIALS: Cast iron 13. NUMBER OF PARTS: 44 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 40 x 30 x 18 in 17. PART SHAPE: Prismatic 18. OPERATION Supervisory computer receives input at load/unload sta. SCHEDULING: 3 shift operation, crew of 5 19. LOT SIZE: 4 NHM, 4 NVM, 1 CMM 20. MACHINE SET: 21. MATL. HANDLING: 2 rail guided carts, 240 ft track, 15 stations 22. TOOLING: 23. FEATURES: 24. REFERENCES: 43, 52, 61, 84

1.	COUNTRY:	USA
2.	COMPANY:	General Dynamics
	LOCATION:	Fort Worth, TX
	DIVISION:	1010
	SUPPLIER:	Westinghouse / Dowline
		Westinghouse/Devlieg
	CLASS:	FMS
	YEAR:	86
	FINANCIAL DATA:	
9.	COMPUTER:	
10.	CONTROLS:	
	PRODUCTS:	Aircraft parts
	MATERIALS:	Aluminum
	NUMBER OF PARTS:	ALUMITIUM
	PART FAMILIES:	
	PRODUCTION RATE:	
16.	PART CUBE:	
17.	PART SHAPE:	Prismatic
18.	OPERATION	
	SCHEDULING:	
	LOT SIZE:	
	MACHINE SET:	6 MC
	MATL. HANDLING:	AGV, robots
	TOOLING:	
	FEATURES:	Automated inspection
24.	REFERENCES:	14
1.	COUNTRY:	IISA
	COUNTRY:	USA General Dynamics
2.	COMPANY:	General Dynamics
2. 3.	COMPANY: LOCATION:	
2. 3. 4.	COMPANY: LOCATION: DIVISION:	General Dynamics Fort Worth, TX
2. 3. 4. 5.	COMPANY: LOCATION: DIVISION: SUPPLIER:	General Dynamics
2. 3. 4. 5.	COMPANY: LOCATION: DIVISION:	General Dynamics Fort Worth, TX
2. 3. 4. 5. 6.	COMPANY: LOCATION: DIVISION: SUPPLIER:	General Dynamics Fort Worth, TX Cincinnati Milicron
2. 3. 4. 5. 6. 7.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR:	General Dynamics Fort Worth, TX Cincinnati Milicron FMS
2. 3. 4. 5. 6. 7. 8.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA:	General Dynamics Fort Worth, TX Cincinnati Milicron FMS
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER:	General Dynamics Fort Worth, TX Cincinnati Milicron FMS
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS:	General Dynamics Fort Worth, TX  Cincinnati Milicron FMS 85
2. 3. 4. 5. 6. 7. 8. 9. 10.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS:	General Dynamics Fort Worth, TX  Cincinnati Milicron FMS 85  Aircraft & missle parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS:	General Dynamics Fort Worth, TX  Cincinnati Milicron FMS 85
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS:	General Dynamics Fort Worth, TX  Cincinnati Milicron FMS 85  Aircraft & missle parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS:	General Dynamics Fort Worth, TX  Cincinnati Milicron FMS 85  Aircraft & missle parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS:	General Dynamics Fort Worth, TX  Cincinnati Milicron FMS 85  Aircraft & missle parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE:	General Dynamics Fort Worth, TX  Cincinnati Milicron FMS 85  Aircraft & missle parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE:	General Dynamics Fort Worth, TX  Cincinnati Milicron FMS 85  Aircraft & missle parts Aluminum
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE:	General Dynamics Fort Worth, TX  Cincinnati Milicron FMS 85  Aircraft & missle parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION	General Dynamics Fort Worth, TX  Cincinnati Milicron FMS 85  Aircraft & missle parts Aluminum
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING:	General Dynamics Fort Worth, TX  Cincinnati Milicron FMS 85  Aircraft & missle parts Aluminum
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE:	General Dynamics Fort Worth, TX  Cincinnati Milicron FMS 85  Aircraft & missle parts Aluminum  Prismatic
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET:	General Dynamics Fort Worth, TX  Cincinnati Milicron FMS 85  Aircraft & missle parts Aluminum  Prismatic  6 MC
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING:	General Dynamics Fort Worth, TX  Cincinnati Milicron FMS 85  Aircraft & missle parts Aluminum  Prismatic  6 MC
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET:	General Dynamics Fort Worth, TX  Cincinnati Milicron FMS 85  Aircraft & missle parts Aluminum  Prismatic  6 MC
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING:	General Dynamics Fort Worth, TX  Cincinnati Milicron FMS 85  Aircraft & missle parts Aluminum  Prismatic  6 MC
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING:	General Dynamics Fort Worth, TX  Cincinnati Milicron FMS 85  Aircraft & missle parts Aluminum  Prismatic  6 MC

1. COUNTRY: USA 2. COMPANY: General Dynamics 3. LOCATION: Lynburg, CA 4. DIVISION: Convair Cincinnati Milicron 5. SUPPLIER: 6. CLASS: **FMS** 7. YEAR: 82 FINANCIAL DATA: COMPUTER: 10. CONTROLS: Allen Bradley 11. PRODUCTS: Aircraft & missle parts 12. MATERIALS: Aluminum 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 4 MC 21. MATL. HANDLING: 22. TOOLING: 23. FEATURES: Probing 24. REFERENCES: 14 1. COUNTRY: USA 2. COMPANY: General Dynamics 3. LOCATION: Lynburg, CA 4. DIVISION: Convair 5. SUPPLIER: Cincinnati Milicron 6. CLASS: **FMS** 7. YEAR: 82 FINANCIAL DATA: 8. 9. COMPUTER: 10. CONTROLS: Allen Bradley 11. PRODUCTS: Aircraft & missle parts 12. MATERIALS: Aluminum 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 2 MC 21. MATL. HANDLING: 22. TOOLING: 23. FEATURES: Part washing

14

USA 1. COUNTRY: COMPANY: General Dynamics LOCATION: Lynburg, CA 4. Convair DIVISION: 5. SUPPLIER: Cincinnati Milicron 6. CLASS: **FMS** 7. YEAR: 84 FINANCIAL DATA: COMPUTER: 10. CONTROLS: Allen Bradley 11. PRODUCTS: Aircraft & missle parts 12. MATERIALS: Aluminum. 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 6 MC 21. MATL. HANDLING: 22. TOOLING: 23. FEATURES: Part washing 24. REFERENCES: 14 1. COUNTRY: USA COMPANY: General Dynamics 3. LOCATION: 4. DIVISION: Convair 5. SUPPLIER: White Sunstrand 6. CLASS: FMS 7. YEAR: 80 FINANCIAL DATA: COMPUTER: 10. CONTROLS: 11. PRODUCTS: Aircraft & missle parts 12. MATERIALS: Aluminum 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 4 ft 17. PART SHAPE: Prismatic 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 8 MC 21. MATL. HANDLING: Rail guided cart 22. TOOLING: 23. FEATURES: 24. REFERENCES: 52

1. COUNTRY: USA 2. COMPANY: General Electric 3. LOCATION: Erie, PA 4. DIVISION: Erie Works 5. SUPPLIER: Giddings & Lewis CLASS: 6. **FMS** 7. YEAR: 83 8. FINANCIAL DATA: Leadtime from 16 to 1 day Dual DEC PDP 11/44's 9. COMPUTER: 10. CONTROLS: GE 1050 CNC 11. PRODUCTS: Locomotive motor frames and gear boxes 12. MATERIALS: Steel 13. NUMBER OF PARTS: 6 14. PART FAMILIES: 15. PRODUCTION RATE: 1 part/hour, 5,500 parts/year 16. PART CUBE: 4 x 4 x 5 ft 17. PART SHAPE: Prismatic 18. OPERATION Computer schedules in real time, can reschedule around SCHEDULING: down unit, crew of 2 19. LOT SIZE: 1 20. MACHINE SET: 2 NVM, 4 NB, 3 NHM, 1 SP Cart with towline, robot, ASRS 21. MATL. HANDLING: 22. TOOLING: ATC 23. FEATURES: Automated inspection, probing 24. REFERENCES: 8, 12, 14, 49, 69 1. COUNTRY: USA 2. COMPANY: General Electric 3. LOCATION: Evandale, OH 4. DIVISION: 5. SUPPLIER: Cincinnati Milicron 6. CLASS: **FMS** 7. YEAR: 85 8. FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: 11. PRODUCTS: 12. MATERIALS: 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Rotational 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 4 NT 21. MATL. HANDLING: Robots 22. TOOLING: 23. FEATURES: Automated inspection

24. REFERENCES:

14

```
1. COUNTRY:
                     USA
2. COMPANY:
                     General Electric
3. LOCATION:
                     Pittsfield, MA
4. DIVISION:
                     Ordinance Systems
5. SUPPLIER:
                     Ex-Ce11-0
6. CLASS:
                     FMS
7. YEAR:
                     82
8. FINANCIAL DATA:
9. COMPUTER:
10. CONTROLS:
11. PRODUCTS:
                     Infantry Fighting Vehicle turret stabilization system
12. MATERIALS:
                     Steel
13. NUMBER OF PARTS: 11
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                     Prismatic
18. OPERATION
   SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                     5 MC
21. MATL. HANDLING:
22. TOOLING:
23. FEATURES:
24. REFERENCES:
                     22, 52, 53
1. COUNTRY:
                     USA
2. COMPANY:
                     Georgetown Manufacturing
3. LOCATION:
                     Georgetown, KY
4. DIVISION:
5. SUPPLIER:
                     KT
6. CLASS:
                     FMS
7. YEAR:
                     84
8. FINANCIAL DATA:
9. COMPUTER:
                     DEC
10. CONTROLS:
                     Gemini
                     Manifolds, spindles, housings
11. PRODUCTS:
12. MATERIALS:
                     Cast iron, steel
13. NUMBER OF PARTS: 150
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                     Prismatic
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                     6 MC
21. MATL. HANDLING: Stacker crane
22. TOOLING:
23. FEATURES:
                     Adaptive control, probing
```

14, 53

```
1. COUNTRY:
                     USA
2. COMPANY:
                     Harris Press
3. LOCATION:
                    Fort Worth, TX
4. DIVISION:
5. SUPPLIER:
                     Harris Press
6. CLASS:
                     FMS
7. YEAR:
                     81
8. FINANCIAL DATA: Cost reduction of from 25 - 57 %
9. COMPUTER:
10. CONTROLS:
11. PRODUCTS:
                     Precision printing press cylinder parts
12. MATERIALS:
13. NUMBER OF PARTS: 700
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
                    1.5 - 8 in round x 120 in long
17. PART SHAPE:
                    Rotational
18. OPERATION
   SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                     NC saw, 2MC, 2NT, 1 MC, 2NGR, balancing, straightening
21. MATL. HANDLING: 3 robots, roller conveyor
22. TOOLING:
                    Automated inspection, part washing, inertial welding sta.
23. FEATURES:
24. REFERENCES:
                    14, 55, 69
1. COUNTRY:
                     USA
2. COMPANY:
                     Hughes Aircraft
3. LOCATION:
                   El Segundo, CA
4. DIVISION:
                     Electro-Optical & Data Systems Group
5. SUPPLIER:
                     KT
6. CLASS:
                     FMS
7. YEAR:
                     82
8. FINANCIAL DATA: 9 MT's vs. 25, 87 % labor savings
9. COMPUTER:
                    Dual DEC PDP 11/44's
10. CONTROLS:
                     KT, Gemini DNC
11. PRODUCTS:
                     Housings for laser range finder
12. MATERIALS:
                     Aluminum
13. NUMBER OF PARTS: 5
14. PART FAMILIES:
15. PRODUCTION RATE: 1,200 + parts/year
                     24 x 24 in pallet
16. PART CUBE:
17. PART SHAPE:
                    Prismatic
                     Crew of 3
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                    9 MC, 1 CMM
21. MATL. HANDLING: Cart with towline
22. TOOLING:
23. FEATURES:
                    Automatic inspection, adaptive control, and probing
```

14, 29, 44, 50, 69

1. COUNTRY: USA 2. COMPANY: Ingersol Rand LOCATION: 3. Roanoke, VA 4. DIVISION: 5. SUPPLIER: White Sunstrand 6. CLASS: **FMS** 7. YEAR: 72 8. FINANCIAL DATA: Labor savings of 50 %, cost savings of 70 % IBM 360/30 COMPUTER: 10. CONTROLS: Omnicontrol DNC 11. PRODUCTS: Housings for industrial hoists 12. MATERIALS: Cast iron, steel, aluminum 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 3 ft 17. PART SHAPE: Prismatic 18. OPERATION Fixed sequence within system, multiple alternate routings, 4 man crew, foreman dispatches jobs SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 5MC, 2ND 21. MATL. HANDLING: Roller conveyor with buffer at each MT 22. TOOLING: 360 tools in system 23. FEATURES: 24. REFERENCES: 38, 61, 84 1. COUNTRY: USA 2. COMPANY: Ingersoll Milling Machine 3. LOCATION: Rockford, IL 4. DIVISION: 5. SUPPLIER: Ingersoll Milling CLASS: **FMS** 6. 7. YEAR: 83 8. FINANCIAL DATA: Eliminated 17 MT's 9. COMPUTER: DEC VAX 750 10. CONTROLS: Allan Bradley 8200 11. PRODUCTS: Machine tool parts 12. MATERIALS: Steel, cast iron 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 25,000 parts/year 16. PART CUBE: 1 m 17. PART SHAPE: Prismatic 18. OPERATION SCHEDULING: 19. LOT SIZE: 1 (75 % of the time)20. MACHINE SET: 5 MC, 1 WS, 2 CMM 21. MATL. HANDLING: AGV 22. TOOLING: 23. FEATURES: Automated inspection, part washing

14, 32, 42

USA COUNTRY: 2. COMPANY: Ingersoll Milling Machine 3. LOCATION: Rockford, IL 4. DIVISION: 5. SUPPLIER: Ingersoll Milling 6. CLASS: FMS 7. YEAR: 87 8. FINANCIAL DATA: COMPUTER: VAX 750 10. CONTROLS: Allen Bradley 8200 11. PRODUCTS: Machine tool parts Steel, cast iron 12. MATERIALS: 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 3 MC 21. MATL. HANDLING: 22. TOOLING: 23. FEATURES: 24. REFERENCES: 14 USA 1. COUNTRY: 2. COMPANY: Ingersoll Milling Machine 3. LOCATION: Rockford, IL 4. DIVISION: 5. SUPPLIER: Ingersoll Milling 6. CLASS: **FMS** 7. YEAR: 87 8. FINANCIAL DATA: VAX 750 COMPUTER: Alen Bradley 8200 10. CONTROLS: 11. PRODUCTS: Machine tool parts 12. MATERIALS: Steel, cast iron 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Rotational 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 4 NV 21. MATL. HANDLING: 22. TOOLING: 23. FEATURES:

14

1. COUNTRY: USA 2. J. I. Case COMPANY: 3. LOCATION: Racine, WI 4. DIVISION: Components 5. SUPPLIER: Imgersoll Milling 6. CLASS: FTL 7. YEAR: 78 8. FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: Agricultural tractor transmission cases 11. PRODUCTS: 12. MATERIALS: Gray iron castings 13. NUMBER OF PARTS: 2 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION Fixed path sequencing SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 2 MC, 1 NM, 1 NB Roller conveyor, cart with towline for heads 21. MATL. HANDLING: 22. TOOLING: 2 head changers, 22 heads in system 23. FEATURES: Automated inspection 14, 43, 45 24. REFERENCES: COUNTRY: USA 1. 2. COMPANY: John Deere & Company 3. LOCATION: Moline, IL 4. DIVISION: 5. SUPPLIER: Masch. Diedesheim 6. CLASS: FMS 7. YEAR: 80 8. FINANCIAL DATA: 9. COMPUTER: DNC network 10. CONTROLS: Allan Bradley 11. PRODUCTS: Farm tractor parts Cast iron, steel 12. MATERIALS: 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Rotational 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 3 NT, 2 MC (WCI) 21. MATL. HANDLING: 2 Unimate robots 22. TOOLING: 23. FEATURES:

24. REFERENCES:

54

USA 1. COUNTRY: John Deere & Company 2. COMPANY: 3. LOCATION: Waterloo, IO 4. DIVISION: 5. SUPPLIER: KT 6. CLASS: **FMS** 7. YEAR: 79 8. FINANCIAL DATA: DEC COMPUTER: 10. CONTROLS: DEC, KT, CNC 11. PRODUCTS: Transmission & clutch housings 12. MATERIALS: Cast iron 13. NUMBER OF PARTS: 8 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 11 MC 21. MATL. HANDLING: Cart with towline 22. TOOLING: 5 Head indexers 23. FEATURES: Part washing 24. REFERENCES: 14 1. COUNTRY: USA 2. COMPANY: John Deere & Company 3. LOCATION: Waterloo, IO 4. DIVISION: 5. SUPPLIER: Burkhardt & Weber 6. CLASS: **FMS** 7. YEAR: 78 8. FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: 11. PRODUCTS: Agricultural machinery parts 12. MATERIALS: Cast iron, steel 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 2 MC 21. MATL. HANDLING: 22. TOOLING: Head changer 23. FEATURES:

14, 53

```
1. COUNTRY:
                     USA
2.
   COMPANY:
                     John Deere & Company
3.
   LOCATION:
   DIVISION:
5. SUPPLIER:
                     Burkhardt & Weber
   CLASS:
                     FMS
6.
7.
   YEAR:
                     84
8.
   FINANCIAL DATA:
9.
   COMPUTER:
10. CONTROLS:
11. PRODUCTS:
12. MATERIALS:
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
18. OPERATION
   SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
21. MATL. HANDLING:
22. TOOLING:
23. FEATURES:
24. REFERENCES:
                     14
1.
   COUNTRY:
                     USA
2.
   COMPANY:
                     LTV
LOCATION:
                     Dallas, TX
4. DIVISION:
                     Vought Aero Products
5.
                     Cincinnati Milicron
   SUPPLIER:
6. CLASS:
                     FMS
7.
                     84
   YEAR:
8.
   FINANCIAL DATA:
                     3 year return on investment
                     DEC PDP 11/70,44,24
   COMPUTER:
10. CONTROLS:
                     Acramatic 900, DEC, Allen Bradley
11. PRODUCTS:
                     Bl bomber airframe components
12. MATERIALS:
                     95 % aluminum, 5% steel
13. NUMBER OF PARTS: 540
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
                     30 x 32 x 36 in
17. PART SHAPE:
                     Prismatic
18. OPERATION
                     Simulation used to aid in computerized scheduling
    SCHEDULING:
                     Average crew size of 5.6
19. LOT SIZE:
20. MACHINE SET:
                     8 MC, 1 WS, 2 CMM
21. MATL. HANDLING:
                     4 AGV's, ASRS, 2 carousels with 10 stations each
                     ATC with capacity of 45
22. TOOLING:
23. FEATURES:
                     Automatic inspection, probing, and part washing
24. REFERENCES:
                     14, 21, 45, 75
```

```
USA
    COUNTRY:
                     Mack Truck
    COMPANY:
2.
3. LOCATION:
                     Haggerstown, MD
   DIVISION:
5.
    SUPPLIER:
                     KΤ
                     FMS
6. CLASS:
                     83
7.
   YEAR:
8. FINANCIAL DATA:
                     Labor reduction from 20 to 5
                     DEC PDP 11/44
9.
    COMPUTER:
10. CONTROLS:
                     Gemini
                     Truck transmission castings
11. PRODUCTS:
12. MATERIALS:
                     Aluminum
13. NUMBER OF PARTS: 7
14. PART FAMILIES:
                     1
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                     Prismatic
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                     4 MC, 1 NB
21. MATL. HANDLING:
                     Cart with towline
22. TOOLING:
                     2 head changers
23. FEATURES:
                     Adaptive control, probing, auto. insp., part washing
24. REFERENCES:
                     14
1.
    COUNTRY:
                     USA
2.
    COMPANY:
                     Massey Ferguson
LOCATION:
                     Detroit, MI
4. DIVISION:
                     Transmission & Axle Plant
5. SUPPLIER:
                     Massey Ferguson and Unimate
   CLASS:
                     MC
6.
                     79
7.
   YEAR:
8. FINANCIAL DATA:
                     1.5 year payback, 25 % increase in productivity
9.
   COMPUTER:
10. CONTROLS:
11. PRODUCTS:
                     Planetary pinion gears
12. MATERIALS:
                     Stee1
13. NUMBER OF PARTS: 4 sizes
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
                      3.5 - 7 in round
17. PART SHAPE:
                     Rotational
18. OPERATION
                     Alternate part programs for MT's and robots, graceful
    SCHEDULING:
                     degradation in the event of MT failure
19. LOT SIZE:
20. MACHINE SET:
                      2 NV, 6 NG
21. MATL. HANDLING:
                     3 Unimate robots, custom design conveyor
22. TOOLING:
23. FEATURES:
```

45, 52, 54, 69

1. COUNTRY: USA 2. COMPANY: McDonnel Douglas 3. LOCATION: Saint Charles, MO 4. DIVISION: Astronautics 5. SUPPLIER: Giddings & Lewis 6. CLASS: FMS 7. YEAR: 85 60 % reduction in machining costs 8. FINANCIAL DATA: 9. COMPUTER: DEC VAX 11/780 10. CONTROLS: G & L CNC 8000 11. PRODUCTS: Missle body sections 12. MATERIALS: Aluminum 13. NUMBER OF PARTS: 72 14. PART FAMILIES: 15. PRODUCTION RATE: 34,800 parts/year 16. PART CUBE: 33 in round x 60 in long 17. PART SHAPE: Rotational 18. OPERATION Real time scheduling & control, average crew size of 2.5 SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 3 MC, 2 NV, 2 NH, 1 CMM, 1 WS 21. MATL. HANDLING: AGV, robots, 3 deburring stations, ASRS 22. TOOLING: ATC with 80 tool magazines 23. FEATURES: Auto. insp., probing, adaptive control, part washing 14, 27 24. REFERENCES: COUNTRY: 1. USA 2. COMPANY: Mercury Marine 3. LOCATION: Fond Du Lac, WI 4. DIVISION: 5. SUPPLIER: KT 6. CLASS: **FMS** 7. YEAR: 84 8. FINANCIAL DATA: 9. COMPUTER: DEC 10. CONTROLS: Gemini 11. PRODUCTS: Outboard marine engine block, and crank case parts 12. MATERIALS: Aluminum 13. NUMBER OF PARTS: 6 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 9 MC, 1 NB 21. MATL. HANDLING: Rail guided cart 22. TOOLING: Head indexer 23. FEATURES: Adaptive control, probing

1. COUNTRY: 2. COMPANY: 3. LOCATION: 4. DIVISION: 5. SUPPLIER: 6. CLASS: 7. YEAR: 8. FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: 11. PRODUCTS: 12. MATERIALS: 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE:	USA New York Air Brake  Cincinnati Milicron FMS 86
	Prismatic 14
1. COUNTRY: 2. COMPANY: 3. LOCATION: 4. DIVISION: 5. SUPPLIER: 6. CLASS: 7. YEAR: 8. FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: 11. PRODUCTS: 12. MATERIALS: 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: 18. OPERATION	24,000 parts/year 1.5 ft Prismatic Computer dynamically assigns work stations 10 - 50 8 MC, 1 NV, 1 WS, 1 CMM

	COUNTRY:	USA
2.	COMPANY:	Onan
3.	LOCATION: DIVISION:	Minneapolis, MN
4.	SUPPLIER:	v.m
٥.	CLASS:	KT
7	CLASS:	FMS 84
γ.	YEAR: FINANCIAL DATA:	04
٥.	COMPUTER:	
10.	CONTROLS:	KT, CNC
		Generator frames
	MATERIALS:	Steel
13.	NUMBER OF PARTS:	
	PART FAMILIES:	
	PRODUCTION RATE:	
	PART CUBE:	<b>D</b>
		Prismatic
	OPERATION SCHEDULING:	
	LOT SIZE:	
		1 NV, 1 MC
21.	MATI. HANDLING:	AGV planned for 88
22.	TOOLING:	not paumou 201 00
	FEATURES:	Adaptive control, probing
24.	REFERENCES:	14
1.	COUNTRY:	USA
2.	COUNTRY: COMPANY:	USA Rigid tool
2. 3.	COMPANY: LOCATION:	
2. 3. 4.	COMPANY: LOCATION: DIVISION:	Rigid tool Elyria, OH
2. 3. 4. 5.	COMPANY: LOCATION: DIVISION: SUPPLIER:	Rigid tool Elyria, OH KT
2. 3. 4. 5. 6.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS:	Rigid tool Elyria, OH KT FMS
2. 3. 4. 5. 6. 7.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR:	Rigid tool Elyria, OH KT
2. 3. 4. 5. 6. 7. 8.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA:	Rigid tool Elyria, OH KT FMS
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER:	Rigid tool Elyria, OH KT FMS
2. 3. 4. 5. 6. 7. 8. 9. 10.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS:	Rigid tool Elyria, OH KT FMS 84
2. 3. 4. 5. 6. 7. 8. 9. 10.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS:	Rigid tool Elyria, OH  KT FMS 84  Pipe fitting hand tools
2. 3. 4. 5. 6. 7. 8. 9. 10. 11.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS:	Rigid tool Elyria, OH KT FMS 84
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS:	Rigid tool Elyria, OH  KT FMS 84  Pipe fitting hand tools
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS:	Rigid tool Elyria, OH  KT FMS 84  Pipe fitting hand tools
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE:	Rigid tool Elyria, OH  KT FMS 84  Pipe fitting hand tools
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE:	Rigid tool Elyria, OH  KT FMS 84  Pipe fitting hand tools
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION	Rigid tool Elyria, OH  KT FMS 84  Pipe fitting hand tools Steel
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING:	Rigid tool Elyria, OH  KT FMS 84  Pipe fitting hand tools Steel
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE:	Rigid tool Elyria, OH  KT FMS 84  Pipe fitting hand tools Steel
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET:	Rigid tool Elyria, OH  KT FMS 84  Pipe fitting hand tools Steel
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING:	Rigid tool Elyria, OH  KT FMS 84  Pipe fitting hand tools Steel
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING:	Rigid tool Elyria, OH  KT FMS 84  Pipe fitting hand tools Steel
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING:	Rigid tool Elyria, OH  KT FMS 84  Pipe fitting hand tools Steel

1.	COUNTRY:	USA
	COMPANY:	Rock Island Arsenal
-	LOCATION:	
4	DIVISION:	
5	CUDDITED.	(Proposal)
6.	SUPPLIER:	FMS
0.	CLASS:	
7.	YEAR:	(Proposal)
8.	FINANCIAL DATA:	
	COMPUTER:	
	CONTROLS:	
	PRODUCTS:	
12.	MATERIALS:	
13.	NUMBER OF PARTS:	
14.	PART FAMILIES:	
15.	PRODUCTION RATE:	
	PART CUBE:	
		Prismatic
	OPERATION	TITOMOCIC
	SCHEDULING:	
10	LOT CITE	
	LOT SIZE:	
	MACHINE SET:	
	MATL. HANDLING:	
	TOOLING:	
	FEATURES:	
24.	REFERENCES:	22
	COUNTRY:	USA
	COUNTRY: COMPANY:	USA Rockwell Motch
	COMPANY:	
2. 3.	COMPANY: LOCATION:	Rockwell Motch
2. 3. 4.	COMPANY: LOCATION: DIVISION:	Rockwell Motch New Castle, PA
2. 3. 4. 5.	COMPANY: LOCATION: DIVISION: SUPPLIER:	Rockwell Motch New Castle, PA Oerlikon/Motch
2. 3. 4. 5. 6.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS:	Rockwell Motch New Castle, PA Oerlikon/Motch FMS
2. 3. 4. 5. 6. 7.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR:	Rockwell Motch New Castle, PA Oerlikon/Motch
2. 3. 4. 5. 6. 7. 8.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA:	Rockwell Motch New Castle, PA Oerlikon/Motch FMS
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER:	Rockwell Motch New Castle, PA Oerlikon/Motch FMS
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS:	Rockwell Motch New Castle, PA Oerlikon/Motch FMS 85
2. 3. 4. 5. 6. 7. 8. 9. 10.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS:	Rockwell Motch New Castle, PA  Oerlikon/Motch FMS 85  Steering knuckles
2. 3. 4. 5. 6. 7. 8. 9. 10. 11.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS:	Rockwell Motch New Castle, PA  Oerlikon/Motch FMS 85  Steering knuckles Steel
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS:	Rockwell Motch New Castle, PA  Oerlikon/Motch FMS 85  Steering knuckles Steel
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES:	Rockwell Motch New Castle, PA  Oerlikon/Motch FMS 85  Steering knuckles Steel
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE:	Rockwell Motch New Castle, PA  Oerlikon/Motch FMS 85  Steering knuckles Steel
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE:	Rockwell Motch New Castle, PA  Oerlikon/Motch FMS 85  Steering knuckles Steel
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE:	Rockwell Motch New Castle, PA  Oerlikon/Motch FMS 85  Steering knuckles Steel
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE:	Rockwell Motch New Castle, PA  Oerlikon/Motch FMS 85  Steering knuckles Steel 22
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE:	Rockwell Motch New Castle, PA  Oerlikon/Motch FMS 85  Steering knuckles Steel 22
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION	Rockwell Motch New Castle, PA  Oerlikon/Motch FMS 85  Steering knuckles Steel 22
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE:	Rockwell Motch New Castle, PA  Oerlikon/Motch FMS 85  Steering knuckles Steel 22  Rotational
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET:	Rockwell Motch New Castle, PA  Oerlikon/Motch FMS 85  Steering knuckles Steel 22
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING:	Rockwell Motch New Castle, PA  Oerlikon/Motch FMS 85  Steering knuckles Steel 22  Rotational
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING:	Rockwell Motch New Castle, PA  Oerlikon/Motch FMS 85  Steering knuckles Steel 22  Rotational
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING: FEATURES:	Rockwell Motch New Castle, PA  Oerlikon/Motch FMS 85  Steering knuckles Steel 22  Rotational  2 NV, 1 ND  Automated inspection
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING:	Rockwell Motch New Castle, PA  Oerlikon/Motch FMS 85  Steering knuckles Steel 22  Rotational

```
1. COUNTRY:
                     USA
2. COMPANY:
                     Smith Tool
3. LOCATION:
                     Irvine, CA
4. DIVISION:
5. SUPPLIER:
                     Okuma
6. CLASS:
                     FMS
7. YEAR:
                     84
8. FINANCIAL DATA:
9. COMPUTER:
                     Okuma
10. CONTROLS:
                     Okuma
11. PRODUCTS:
                     Oil fiels parts
12. MATERIALS:
                     Stee1
13. NUMBER OF PARTS: 54
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                     Rotational
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
                     4 MC, 2 NT
20. MACHINE SET:
21. MATL. HANDLING: 2 robots, conveyor
22. TOOLING:
23. FEATURES:
24. REFERENCES:
                     75
1. COUNTRY:
                     USA
2. COMPANY:
                     Sunstrand Aviation
3. LOCATION:
                     Rockford, IL
4. DIVISION:
5. SUPPLIER:
                     White Sunstrand
6. CLASS:
                     FMS
7. YEAR:
                     67
8. FINANCIAL DATA: Alternative was 100 MT's
9. COMPUTER:
10. CONTROLS:
                     Omnicontrol DNC
11. PRODUCTS:
                     Pump & aircraft parts
12. MATERIALS:
                     Aluminum, Magnesium
13. NUMBER OF PARTS: 70
14. PART FAMILIES:
                     2
15. PRODUCTION RATE: 24,000 parts/year
16. PART CUBE:
                     16 in
17. PART SHAPE:
                     Prismatic
18. OPERATION
                     Fixed sequence, unidirectional flow, crew of 8
    SCHEDULING:
19. LOT SIZE:
                     Range of 25 to 300
                     8 MC, 2 ND, 1 WS, 1 CMM
20. MACHINE SET:
21. MATL. HANDLING: Roller conveyor, ASRS
22. TOOLING:
                     Local to MC, 39 max
23. FEATURES:
```

38, 61, 84

1.	COUNTRY:	USA Sweet mond Assistion	
3.	COMPANY: LOCATION: DIVISION:	Sunstrand Aviation Rockford, IL	
	SUPPLIER:	KT	
	CLASS:	FMS	
	YEAR:	85	
	FINANCIAL DATA: COMPUTER:	DEC	
	CONTROLS:	Gemini	
	PRODUCTS:	Aircraft parts	
	MATERIALS:	Aluminum	
	NUMBER OF PARTS:		
	PART FAMILIES: PRODUCTION RATE:		
	PART CUBE:		
	PART SHAPE:	Prismatic	
	OPERATION		
	SCHEDULING:		
	LOT SIZE:	0.140	
	MACHINE SET: MATL. HANDLING:	2 MC AGV, ASRS	
-	TOOLING:	AGV, ASKS	
	FEATURES:	Automated Inspection, probing,	and adaptive control
24.	REFERENCES:	14	·
1.	COUNTRY.	IISA	
1. 2.	COUNTRY: COMPANY:	USA Union Special	
2.		USA Union Special Huntley, IL	
2. 3. 4.	COMPANY: LOCATION: DIVISION:	Union Special Huntley, IL	
2. 3. 4. 5.	COMPANY: LOCATION: DIVISION: SUPPLIER:	Union Special Huntley, IL KT	
2. 3. 4. 5.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS:	Union Special Huntley, IL KT FMS	
2. 3. 4. 5. 6. 7.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR:	Union Special Huntley, IL KT	
2. 3. 4. 5. 6. 7.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS:	Union Special Huntley, IL KT FMS	
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS:	Union Special Huntley, IL KT FMS 84	
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS:	Union Special Huntley, IL KT FMS	
2. 3. 4. 5. 6. 7. 8. 9. 10. 11.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS:	Union Special Huntley, IL KT FMS 84	
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS:	Union Special Huntley, IL KT FMS 84	
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS:	Union Special Huntley, IL KT FMS 84	
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE:	Union Special Huntley, IL  KT FMS 84  Sewing machine parts	
2. 3. 4. 5. 6. 7. 8. 9. 110. 111. 121. 13. 14.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE:	Union Special Huntley, IL KT FMS 84	
2. 3. 4. 5. 6. 7. 8. 9. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING:	Union Special Huntley, IL  KT FMS 84  Sewing machine parts	
2. 3. 4. 5. 6. 7. 8. 9. 110. 111. 122. 131. 143. 153.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE:	Union Special Huntley, IL  KT FMS 84  Sewing machine parts	
2. 3. 4. 5. 6. 7. 8. 9. 110. 111. 121. 131. 141. 151. 161. 171.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET:	Union Special Huntley, IL  KT FMS 84  Sewing machine parts	
2. 3. 4. 5. 6. 7. 8. 9. 110. 111. 121. 133. 144. 156. 177. 188.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING:	Union Special Huntley, IL  KT FMS 84  Sewing machine parts	
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET:	Union Special Huntley, IL  KT FMS 84  Sewing machine parts	
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING:	Union Special Huntley, IL  KT FMS 84  Sewing machine parts	

1.	COUNTRY:	USA
2.	COMPANY:	Vickers
3.	LOCATION:	Omaha, NE
4.	DIVISION:	
5.	SUPPLIER:	Acme Cleveland
6.	CLASS:	FMS
7.	YEAR:	84
	FINANCIAL DATA:	Replaced a transfer line
	COMPUTER:	
	CONTROLS:	Westinghouse
	PRODUCTS:	Pump blocks
	MATERIALS:	Cast iron, steel
	NUMBER OF PARTS:	25–30
	PART FAMILIES:	23-30
		25 125/
		35-135 parts/hour
	PART CUBE:	
	PART SHAPE:	Prismatic
18.	OPERATION	
	SCHEDULING:	
	LOT SIZE:	
	MACHINE SET:	5 MC, 3 NT, 2 vertical broaching machines
	MATL. HANDLING:	Roller conveyor, 11 ASEA robots
	TOOLING:	
23.	FEATURES:	Automated inspection
24.	REFERENCES:	14, 82
1.	COUNTRY:	USA
	COUNTRY: COMPANY:	USA Warner Ishi
2.	COMPANY:	Warner Ishi
2. 3.	COMPANY: LOCATION:	
2. 3. 4.	COMPANY: LOCATION: DIVISION:	Warner Ishi Shelbyville, IL
2. 3. 4. 5.	COMPANY: LOCATION: DIVISION: SUPPLIER:	Warner Ishi Shelbyville, IL KT
2. 3. 4. 5. 6.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS:	Warner Ishi Shelbyville, IL KT FMS
2. 3. 4. 5. 6. 7.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR:	Warner Ishi Shelbyville, IL KT
2. 3. 4. 5. 6. 7. 8.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA:	Warner Ishi Shelbyville, IL KT FMS 84
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER:	Warner Ishi Shelbyville, IL KT FMS 84
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS:	Warner Ishi Shelbyville, IL  KT FMS 84  DEC Gemini
2. 3. 4. 5. 6. 7. 8. 9. 10.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS:	Warner Ishi Shelbyville, IL KT FMS 84
2. 3. 4. 5. 6. 7. 8. 9. 10. 11.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS:	Warner Ishi Shelbyville, IL  KT FMS 84  DEC Gemini
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS:	Warner Ishi Shelbyville, IL  KT FMS 84  DEC Gemini
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES:	Warner Ishi Shelbyville, IL  KT FMS 84  DEC Gemini
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE:	Warner Ishi Shelbyville, IL  KT FMS 84  DEC Gemini
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE:	Warner Ishi Shelbyville, IL  KT FMS 84  DEC Gemini Turbo charger housings
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE:	Warner Ishi Shelbyville, IL  KT FMS 84  DEC Gemini
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION	Warner Ishi Shelbyville, IL  KT FMS 84  DEC Gemini Turbo charger housings
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING:	Warner Ishi Shelbyville, IL  KT FMS 84  DEC Gemini Turbo charger housings
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE:	Warner Ishi Shelbyville, IL  KT FMS 84  DEC Gemini Turbo charger housings
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET:	Warner Ishi Shelbyville, IL  KT FMS 84  DEC Gemini Turbo charger housings  Prismatic  2 MC, 2 NT
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE:	Warner Ishi Shelbyville, IL  KT FMS 84  DEC Gemini Turbo charger housings
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET:	Warner Ishi Shelbyville, IL  KT FMS 84  DEC Gemini Turbo charger housings  Prismatic  2 MC, 2 NT
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING:	Warner Ishi Shelbyville, IL  KT FMS 84  DEC Gemini Turbo charger housings  Prismatic  2 MC, 2 NT
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING:	Warner Ishi Shelbyville, IL  KT FMS 84  DEC Gemini Turbo charger housings  Prismatic  2 MC, 2 NT Robots

USA 1. COUNTRY: 2. COMPANY: Watervliet Arsenal Watervliet, NY LOCATION: 4. DIVISION: 5. SUPPLIER: White Sunstrand 6. CLASS: FMS 85 7. YEAR: 8. FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: Omnicontrol DNC Gun tubes 11. PRODUCTS: 12. MATERIALS: Stee1 13. NUMBER OF PARTS: 6 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Rotational 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 8 MC, 2 NV, 2 CMM, 1 WS 21. MATL. HANDLING: AGV 22. TOOLING: 23. FEATURES: Automated inspection 24. REFERENCES: 14, 84 1. COUNTRY: USA 2. COMPANY: Westinghouse 3. LOCATION: Cheswick, PA 4. DIVISION: Electro-Mechanical 5. SUPPLIER: White Consolidated 6. CLASS: **FMS** 7. YEAR: 84 8. FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: 11. PRODUCTS: Nuclear pump parts Stainless steel, inconnel 12. MATERIALS: 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 1.5 ft round x 1.5 ft long 17. PART SHAPE: Rotational 18. OPERATION JIT, real time scheduling & inventory control SCHEDULING: 19. LOT SIZE: 1 MC, 2 NT, 1 CMM 20. MACHINE SET: 21. MATL. HANDLING: 1 gantry robot, ASRS 22. TOOLING: 23. FEATURES: 5 24. REFERENCES:

```
COUNTRY:
                      USA
1.
2.
    COMPANY:
                      Xerox
3.
    LOCATION:
                      Rochester, NY
   DIVISION:
5.
    SUPPLIER:
                      Unimate
6.
    CLASS:
                      FMS
7.
   YEAR:
                      79
   FINANCIAL DATA:
8.
    COMPUTER:
10. CONTROLS:
                      Unimate, central control to robots
                      Fuser rolls for copy machines
11. PRODUCTS:
12. MATERIALS:
                      Copper
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                      Rotational
18. OPERATION
                      Frequent model changes
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                      3 NT, 1 brazing station, 1 NGR, 1 broaching MT
21. MATL. HANDLING:
                      3 robots, conveyor
22. TOOLING:
23. FEATURES:
                      52
24. REFERENCES:
1.
    COUNTRY:
                      USA
2.
    COMPANY:
                      Yamazaki Machinery Works (Mazak)
                      Florence, KY
3. LOCATION:
                      Mazak
4.
   DIVISION:
5.
   SUPPLIER:
                      Yamazaki
6.
   CLASS:
                      FMS
7.
   YEAR:
                      81
8.
   FINANCIAL DATA:
   COMPUTER:
10. CONTROLS:
11. PRODUCTS:
                      Machine tool frames & beds
12. MATERIALS:
                      Cast iron
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                      Prismatic
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                      4 MC
21. MATL. HANDLING:
                      AGV
22. TOOLING:
                      ATC
23. FEATURES:
                      Probing
```

12, 14, 49, 69

1. COUNTRY: USA 2. COMPANY: Yamazaki Machinery Works (Mazak) 3. LOCATION: Florence, KY 4. DIVISION: Mazak Yamazaki 5. SUPPLIER: 6. CLASS: **FMS** 7. YEAR: 81 FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: 11. PRODUCTS: Gear boxes and small MT parts 12. MATERIALS: Cast iron, steel 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Prismatic and rotational 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 4 MC, 1 NM, 1 NV, 1 NT 21. MATL. HANDLING: AGV 22. TOOLING: 23. FEATURES: Probing 14, 49 24. REFERENCES: 1. COUNTRY: USSR 2. COMPANY: Ceboksary 3. LOCATION: 4. DIVISION: 5. SUPPLIER: Comau 6. CLASS: **FMS** 7. YEAR: 78 8. FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: 11. PRODUCTS: Farm tractor cases and frames 12. MATERIALS: Cast iron, steel 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: Plant produces 5,000 tractors per year 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 2 SP, 1 CMM 21. MATL. HANDLING: Cart with towline, robot 22. TOOLING: 1 head changer 23. FEATURES:

14, 53

```
1. COUNTRY:
                      USSR
2.
    COMPANY:
                      Ceboksary
3.
   LOCATION:
4. DIVISION:
5.
   SUPPLIER:
                      COMAU
                      FMS
6.
   CLASS:
7.
   YEAR:
                      82
8.
  FINANCIAL DATA:
   COMPUTER:
10. CONTROLS:
11. PRODUCTS:
12. MATERIALS:
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                      Prismatic
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
21. MATL. HANDLING:
22. TOOLING:
23. FEATURES:
24. REFERENCES:
                      14
1.
   COUNTRY:
                     USSR
2.
                      ENIMS (United R & D Center for Machine Tools)
    COMPANY:
3.
   LOCATION:
                      Regional Centers
4.
  DIVISION:
5. SUPPLIER:
                     ENIMS
   CLASS:
6.
                     MC
7.
   YEAR:
8.
   FINANCIAL DATA:
                     Productivity increase of 3-4 times
                     CNC, PC's
    COMPUTER:
10. CONTROLS:
                     ASK 1, ASK 2, and ASK 3, Systems
11. PRODUCTS:
12. MATERIALS:
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
                      250 - 1600 mm
17. PART SHAPE:
                     Prismatic
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
21. MATL. HANDLING: Manual part handling, ASRS
22. TOOLING:
23. FEATURES:
                      Adaptive control
24. REFERENCES:
                      86
```

```
USSR
    COUNTRY:
1.
2.
    COMPANY:
                     ENIMS (United R & D Institute for Machine Tools)
   LOCATION:
                     Moscow
   DIVISION:
                     ENIMS
5. SUPPLIER:
   CLASS:
                     MC
6.
7. YEAR:
                     71
    FINANCIAL DATA:
9.
   COMPUTER:
10. CONTROLS:
                     AU-1 System
11. PRODUCTS:
12. MATERIALS:
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
                     Rotational
17. PART SHAPE:
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
21. MATL. HANDLING:
22. TOOLING:
23. FEATURES:
24. REFERENCES:
                     86
                     USSR
    COUNTRY:
1.
2.
    COMPANY:
LOCATION:
4. DIVISION:
5. SUPPLIER:
6. CLASS:
                     FMS
7.
   YEAR:
                      82
8.
   FINANCIAL DATA:
9.
    COMPUTER:
                     USSR manufacture
10. CONTROLS:
                      ACB-20 System
11. PRODUCTS:
                     Machine tool parts
12. MATERIALS:
                      Steel, cast iron
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
                      250 mm round x 750 mm long
17. PART SHAPE:
                      Rotational
18. OPERATION
                     Parts may enter the system in random order, 24 hour
    SCHEDULING:
                      operation
19. LOT SIZE:
                      as small as 10, about 150 half of the time
20. MACHINE SET:
                      6 NT, 3 NVD, 1 NVM, 1 NHM, 1 CMM
21. MATL. HANDLING:
                     Gantry cranes, conveyors, robots, AGV's
22. TOOLING:
23. FEATURES:
24. REFERENCES:
                      81
```

USSR 1. COUNTRY: 2. COMPANY: Strankokonstruktsiya 3. LOCATION: DIVISION: 4. ENIMS (United R & D Institute for Machine Tools) 5. SUPPLIER: CLASS: 6. MC 76 YEAR: 7. FINANCIAL DATA: 8. 9. COMPUTER: M6000, Minsk 32 10. CONTROLS: ASV-20 System 11. PRODUCTS: Machine tool parts 12. MATERIALS: Steel, cast iron 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Rotational 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 6 NT, 3 ND, 1 NVM, 1 NHM, 1 CMM 21. MATL. HANDLING: 22. TOOLING: 23. FEATURES: 24. REFERENCES: 86 1. COUNTRY: USSR Strankostroenie 2. COMPANY: 3. LOCATION: Moscow 4. DIVISION: 5. SUPPLIER: ENIMS (United R & D Institute for Machine Tools) 6. CLASS: **FMS** 7. YEAR: 79 FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: AP1 System 11. PRODUCTS: Machine tool parts 12. MATERIALS: Steel, cast iron 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 500 mm 17. PART SHAPE: Prismatic 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 6 MC, 1 CMM 21. MATL. HANDLING: Automated materials handling, ASRS 22. TOOLING: 23. FEATURES: 24. REFERENCES: 23, 69, 86

1.	COUNTRY:	West Germany
2.	COMPANY:	Brown Boveri
3.	LOCATION:	DIOWN DOVELL
4.	DIVISION:	
-		m 1
-	SUPPLIER:	Trumph
6.	CLASS:	FMS
7.	YEAR:	84
8.	FINANCIAL DATA:	
9.	COMPUTER:	
	CONTROLS:	
	PRODUCTS:	
	MATERIALS:	
12.	NUMBER OF PARTS:	
14.	PART FAMILIES:	
15.	PRODUCTION RATE:	
16.	PART CUBE:	
17.	PART SHAPE:	
18.	OPERATION	
	SCHEDULING:	
19	LOT SIZE:	
	MACHINE SET:	
	MATL. HANDLING:	
22.	TOOLING:	
23.	FEATURES:	
24.	REFERENCES:	14
1.	COUNTRY:	West Germany
		West Germany Brown Boyeri
2.	COMPANY:	West Germany Brown Boveri
2. 3.	COMPANY: LOCATION:	· ·
2. 3. 4.	COMPANY: LOCATION: DIVISION:	Brown Boveri
2. 3. 4. 5.	COMPANY: LOCATION: DIVISION: SUPPLIER:	Brown Boveri Trumph
2. 3. 4. 5.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS:	Brown Boveri Trumph FMS
2. 3. 4. 5. 6. 7.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR:	Brown Boveri Trumph
2. 3. 4. 5. 6. 7.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA:	Brown Boveri Trumph FMS
2. 3. 4. 5. 6. 7.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR:	Brown Boveri Trumph FMS
2. 3. 4. 5. 6. 7. 8.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA:	Brown Boveri Trumph FMS
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER:	Brown Boveri Trumph FMS
2. 3. 4. 5. 6. 7. 8. 9. 10.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS:	Brown Boveri Trumph FMS
2. 3. 4. 5. 6. 7. 8. 9. 10. 11.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS:	Brown Boveri Trumph FMS
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS:	Brown Boveri Trumph FMS
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES:	Brown Boveri Trumph FMS
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE:	Brown Boveri Trumph FMS
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE:	Brown Boveri Trumph FMS
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 17.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE:	Brown Boveri Trumph FMS
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 17.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION	Brown Boveri Trumph FMS
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING:	Brown Boveri Trumph FMS
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION	Brown Boveri Trumph FMS
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING:	Brown Boveri Trumph FMS
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE:	Brown Boveri Trumph FMS
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING:	Brown Boveri Trumph FMS
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET:	Brown Boveri Trumph FMS

1. COUNTRY: West Germany 2. COMPANY: Eberhard Bauer 3. LOCATION: Esslingen 4. DIVISION: 5. SUPPLIER: Fritz Werner 6. CLASS: **FMS** 7. YEAR: 79 8. FINANCIAL DATA: COMPUTER: 10. CONTROLS: Fritz Werner 11. PRODUCTS: 195 electric geared motors 12. MATERIALS: 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 9 NVM 21. MATL. HANDLING: Roller conveyor 22. TOOLING: 23. FEATURES: Part washing 24. REFERENCES: 14, 36 1. COUNTRY: West Germany 2. COMPANY: Friedrich Deckel AG 3. LOCATION: Munich 4. DIVISION: 5. SUPPLIER: Friedrich Deckel 6. CLASS: **FMS** YEAR: 84 8. FINANCIAL DATA: COMPUTER: 10. CONTROLS: 11. PRODUCTS: Machine tool parts 12. MATERIALS: Steel, cast iron 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION 16 hours with operator, 5.5 unmanned hours, SCHEDULING: Crew of 15 19. LOT SIZE: 100 20. MACHINE SET: 8 MC 21. MATL. HANDLING: 2 AGV's 22. TOOLING: ATC with capacity of 80 23. FEATURES: 24. REFERENCES: 14. 73

```
West Germany
1. COUNTRY:
                     Gebr. Heller Maschinenfabrik
2. COMPANY:
3. LOCATION:
4. DIVISION:
5. SUPPLIER:
                     Heller
6. CLASS:
                     FMS
7. YEAR:
                     77
8. FINANCIAL DATA:
9. COMPUTER:
10. CONTROLS:
11. PRODUCTS:
                     Machine tool parts
12. MATERIALS:
                     Cast iron
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
                     1.5 \times 2 \times 3 \text{ ft}
17. PART SHAPE:
                     Prismatic
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                    4 MC
21. MATL. HANDLING: Stacker crane, roller conveyor
22. TOOLING:
23. FEATURES:
                     14, 36, 38
24. REFERENCES:
1.
  COUNTRY:
                     West Germany
2. COMPANY:
                     Hieldelberger Druckmaschinenfabrik
3. LOCATION:
                     Hiedelberg
4. DIVISION:
5. SUPPLIER:
                     Hieldelberger Druckmaschinenfabrik, U. of Stuttgart
6. CLASS:
                     FMS
7. YEAR:
                     69
8. FINANCIAL DATA:
9. COMPUTER:
10. CONTROLS:
11. PRODUCTS:
                     Printing press precision parts
12. MATERIALS:
                      Steel
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                     Prismatic
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                     13 MC, 1 WS
21. MATL. HANDLING: Stacker crane, roller conveyor
                     Automated tool flow
22. TOOLING:
23. FEATURES:
                      Automated inspection
```

14, 36, 38, 52

```
1. COUNTRY:
                     West Germany
   COMPANY:
                     Holder
3. LOCATION:
4. DIVISION:
                     Friedrich Deckel
5. SUPPLIER:
6. CLASS:
                     FMS
7.
   YEAR:
                     84
8. FINANCIAL DATA:
   COMPUTER:
10. CONTROLS:
11. PRODUCTS:
12. MATERIALS:
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                     Prismatic
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
21. MATL. HANDLING:
22. TOOLING:
23. FEATURES:
24. REFERENCES:
                     14
   COUNTRY:
                     West Germany
   COMPANY:
                     Kloeckner Humboldt Deutz AG
3. LOCATION:
4. DIVISION:
5. SUPPLIER:
                     Burkhardt & Weber
6. CLASS:
                     FMS
7. YEAR:
                     84
8. FINANCIAL DATA:
                     Siemens 300
9. COMPUTER:
10. CONTROLS:
                     Sinumeric 8
11. PRODUCTS:
                     Crank case, differential, clutch, and trans. housings
12. MATERIALS:
                     Cast iron
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                     Prismatic
18. OPERATION
                     Crew of 5
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                    4 MC, 1 WS
21. MATL. HANDLING: Rail guided cart
22. TOOLING:
23. FEATURES:
24. REFERENCES:
                     14, 72
```

2.	COUNTRY: COMPANY:	West Germany Linde Aschaffenburg
	LOCATION:	
4.	DIVISION: SUPPLIER:	Scharmann
	CLASS:	FMS
7.	YEAR:	84
	FINANCIAL DATA:	
	COMPUTER: CONTROLS:	
	PRODUCTS:	
	MATERIALS:	
	NUMBER OF PARTS:	
	PART FAMILIES: PRODUCTION RATE:	
	PART CUBE:	
	PART SHAPE:	
18.	OPERATION	
10	SCHEDULING:	
	LOT SIZE: MACHINE SET:	
	MATL. HANDLING:	
22.	TOOLING:	
	FEATURES:	14
24.	REFERENCES:	14
	COUNTRY:	West Germany
2.	COMPANY:	Messerschmitt Boelkow Blohm
2. 3.	COMPANY: LOCATION:	Messerschmitt Boelkow Blohm Augsburg
2. 3. 4.	COMPANY:	Messerschmitt Boelkow Blohm
2. 3. 4. 5. 6.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS:	Messerschmitt Boelkow Blohm Augsburg Military Aircraft FMS
2. 3. 4. 5. 6. 7.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR:	Messerschmitt Boelkow Blohm Augsburg Military Aircraft
2. 3. 4. 5. 6. 7.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA:	Messerschmitt Boelkow Blohm Augsburg Military Aircraft FMS 85
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA:	Messerschmitt Boelkow Blohm Augsburg Military Aircraft FMS
2. 3. 4. 5. 6. 7. 8. 9. 10.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS:	Messerschmitt Boelkow Blohm Augsburg Military Aircraft  FMS 85  DFU Nabern  Aircraft parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS:	Messerschmitt Boelkow Blohm Augsburg Military Aircraft  FMS 85  DFU Nabern  Aircraft parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS:	Messerschmitt Boelkow Blohm Augsburg Military Aircraft  FMS 85  DFU Nabern  Aircraft parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS:	Messerschmitt Boelkow Blohm Augsburg Military Aircraft  FMS 85  DFU Nabern  Aircraft parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE:	Messerschmitt Boelkow Blohm Augsburg Military Aircraft  FMS 85  DFU Nabern  Aircraft parts Aluminum
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE:	Messerschmitt Boelkow Blohm Augsburg Military Aircraft  FMS 85  DFU Nabern  Aircraft parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING:	Messerschmitt Boelkow Blohm Augsburg Military Aircraft  FMS 85  DFU Nabern  Aircraft parts Aluminum
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE:	Messerschmitt Boelkow Blohm Augsburg Military Aircraft  FMS 85  DFU Nabern  Aircraft parts Aluminum  Prismatic and rotational
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET:	Messerschmitt Boelkow Blohm Augsburg Military Aircraft  FMS 85  DFU Nabern  Aircraft parts Aluminum  Prismatic and rotational
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING:	Messerschmitt Boelkow Blohm Augsburg Military Aircraft  FMS 85  DFU Nabern  Aircraft parts Aluminum  Prismatic and rotational
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET:	Messerschmitt Boelkow Blohm Augsburg Military Aircraft  FMS 85  DFU Nabern  Aircraft parts Aluminum  Prismatic and rotational
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING:	Messerschmitt Boelkow Blohm Augsburg Military Aircraft  FMS 85  DFU Nabern  Aircraft parts Aluminum  Prismatic and rotational

1. COUNTRY: 2. COMPANY: 3. LOCATION: 4. DIVISION: 5. SUPPLIER: 6. CLASS: 7. YEAR: 8. FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: 11. PRODUCTS: 12. MATERIALS: 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE:	West Germany Messerschmitt Boelkow Blohm Augsburg Military Aircraft Burkhardt & Weber MC 80 52.6 % reduction in MT's and labor Siemens 330, 3 DEC PDP 11/34's Aircraft parts Titanium
17. PART SHAPE: 18. OPERATION SCHEDULING:	Prismatic
19. LOT SIZE: 20. MACHINE SET: 21. MATL. HANDLING: 22. TOOLING: 23. FEATURES: 24. REFERENCES:	1 MC, 1 NM AGV, ASRS Overhead conveyor & ASRS for tools on pallets 26, 30, 36, 38, 69
1. COUNTRY: 2. COMPANY: 3. LOCATION: 4. DIVISION:	West Germany Moteren Turbinen Union (MTU)
<ul><li>5. SUPPLIER:</li><li>6. CLASS:</li><li>7. YEAR:</li><li>8. FINANCIAL DATA:</li></ul>	FMS 81
9 COMPUTER:	
13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE:	Cylinder heads Cast iron 4
10. CONTROLS: 11. PRODUCTS: 12. MATERIALS: 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: 18. OPERATION SCHEDULING:	Cast iron
10. CONTROLS: 11. PRODUCTS: 12. MATERIALS: 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET:	Cast iron 4

```
COUNTRY:
                     West Germany
1.
   COMPANY:
                     Oberkochen
2.
3. LOCATION:
4. DIVISION:
                     Carl Zeiss
5. SUPPLIER:
  CLASS:
                     FMS
6.
7. YEAR:
                     84
  FINANCIAL DATA:
                     DEC PDP 11/24
   COMPUTER:
10. CONTROLS:
11. PRODUCTS:
12. MATERIALS:
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                     Prismatic
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                     4 MC
21. MATL. HANDLING: Rail guided cart
22. TOOLING:
23. FEATURES:
                     Automated inspection
24. REFERENCES:
                     14
   COUNTRY:
                     West Germany
                     Robert Bosch
2.
   COMPANY:
LOCATION:
4. DIVISION:
5. SUPPLIER:
                     Steinel
                     MC
6. CLASS:
7. YEAR:
                     82
   FINANCIAL DATA: Labor reduced from 18 to 5, cost 20 %, LT from 6wks to 1
8.
COMPUTER:
10. CONTROLS:
                     4 Bosch CNC Micro # 8
                     Power tool gearboxes, housings for hand tools
11. PRODUCTS:
12. MATERIALS:
                     Aluminum
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE: 300,000 parts/year
                     12 x 8 x 8 in
16. PART CUBE:
17. PART SHAPE:
                     Prismatic
18. OPERATION
                     4 independent CNC machines in parallel,
                     crew of 2
    SCHEDULING:
                     Small & medium
19. LOT SIZE:
20. MACHINE SET:
                     4 CNC
21. MATL. HANDLING:
                     4 robots, 2 conveyor belts (50 ft each)
22. TOOLING:
                     ATC with capacity of 60
23. FEATURES:
                     48
```

1. West Germany COUNTRY: 2. Robert Bosch COMPANY: 3. LOCATION: DIVISION: 4. 5. SUPPLIER: Steine1 CLASS: **FMS** 6. 7. YEAR: 82 8. FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: Bosch CNC Micro # 8 11. PRODUCTS: ABS anti-skid system 12. MATERIALS: Aluminum 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 400 x 250 mm pallet 17. PART SHAPE: Prismatic 18. OPERATION SCHEDULING: 19. LOT SIZE: Medium & large 20. MACHINE SET: 8 MC, 1 CMM 21. MATL. HANDLING: Belt conveyor, 8 Bosch robots ATC with capacity of 30 22. TOOLING: 23. FEATURES: Pallet coding with pin system 24. REFERENCES: COUNTRY: West Germany 1. 2. COMPANY: SEW 3. LOCATION: DIVISION: 4. 5. SUPPLIER: Friedrich Deckel CLASS: **FMS** 6. 7. YEAR: 84 8. FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: 11. PRODUCTS: 12. MATERIALS: 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 21. MATL. HANDLING: 22. TOOLING: 23. FEATURES:

14

West Germany 1. COUNTRY: Scharmann GmbH & Co. 2. COMPANY: 3. LOCATION: 4. DIVISION: 5. SUPPLIER: Scharmann FMS 6. CLASS: 84 7. YEAR: 8. FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: 11. PRODUCTS: Machine tool parts 12. MATERIALS: Steel, cast iron 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 21. MATL. HANDLING: 22. TOOLING: 23. FEATURES: 24. REFERENCES: 14 1. COUNTRY: West Germany 2. COMPANY: Trumph 3. LOCATION: 4. DIVISION: 5. SUPPLIER: Friedrich Deckel 6. CLASS: **FMS** 7. YEAR: 84 8. FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: 11. PRODUCTS: Machined sheet metal products 12. MATERIALS: 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 2 MC 21. MATL. HANDLING: 22. TOOLING: 23. FEATURES: Automated inspection, part washing

24. REFERENCES:

34

```
1.
    COUNTRY:
                     West Germany
                     University of Berlin
    COMPANY:
3. LOCATION:
                     Berlin
4. DIVISION:
5. SUPPLIER:
                     University of Berlin
6. CLASS:
7.
   YEAR:
                     76
8. FINANCIAL DATA:
9. COMPUTER:
10. CONTROLS:
11. PRODUCTS:
12. MATERIALS:
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                     Prismatic and rotational
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
20. MACHINE SET:
                     1 NT, 1 NM
21. MATL. HANDLING: Roller conveyor, overhead conveyor, 2 robots
22. TOOLING:
23. FEATURES:
                     36, 38, 52
24. REFERENCES:
1.
   COUNTRY:
                     West Germany
2.
   COMPANY:
                     University of Stuttgart
3. LOCATION:
                     Stuttgart
4. DIVISION:
5. SUPPLIER:
                     University of Stuttgart
6. CLASS:
                     FMS
                     76
7.
   YEAR:
8. FINANCIAL DATA:
9. COMPUTER:
10. CONTROLS:
                     University of Stuttgart
11. PRODUCTS:
12. MATERIALS:
13. NUMBER OF PARTS:
14. PART FAMILIES:
15. PRODUCTION RATE:
16. PART CUBE:
17. PART SHAPE:
                     Prismatic
18. OPERATION
    SCHEDULING:
19. LOT SIZE:
                     4 MC, 1 CMM
20. MACHINE SET:
21. MATL. HANDLING: 2 stacker cranes, rack at each MC
22. TOOLING:
                     Tooling under computer control
23. FEATURES:
                     Automated inspection
```

14, 36, 38, 52, 72

	COUNTRY:	West Germany
3.	COMPANY: LOCATION:	Bauer Plant
	DIVISION: SUPPLIER:	Burkhardt & Weber
	CLASS: YEAR:	FMS 81
8.	FINANCIAL DATA: COMPUTER:	
10.	CONTROLS:	
	PRODUCTS: MATERIALS:	
	NUMBER OF PARTS: PART FAMILIES:	
15.	PRODUCTION RATE:	
17.	PART CUBE: PART SHAPE:	Prismatic
18.	OPERATION SCHEDULING:	
	LOT SIZE:	9 MC
21.	MATL. HANDLING:	
	TOOLING: FEATURES:	
24.	REFERENCES:	18
1.	COUNTRY:	West Germany
2.	COUNTRY: COMPANY:	West Germany VFW - Fokker
2. 3. 4.	COMPANY: LOCATION: DIVISION:	
2. 3. 4. 5.	COMPANY: LOCATION: DIVISION: SUPPLIER:	VFW - Fokker
2. 3. 4. 5. 6.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR:	
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER:	VFW - Fokker FMS
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS:	VFW - Fokker  FMS 81
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS:	VFW - Fokker FMS
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES:	VFW - Fokker  FMS 81  Toranado aircraft parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE:	VFW - Fokker  FMS 81  Toranado aircraft parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE:	VFW - Fokker  FMS 81  Toranado aircraft parts
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING:	VFW - Fokker  FMS 81  Toranado aircraft parts Aluminum
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET:	VFW - Fokker  FMS 81  Toranado aircraft parts Aluminum  Prismatic  8 MC
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING:	VFW - Fokker  FMS 81  Toranado aircraft parts Aluminum  Prismatic  8 MC
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET:	VFW - Fokker  FMS 81  Toranado aircraft parts Aluminum  Prismatic  8 MC

2. 3.	COUNTRY: COMPANY: LOCATION: DIVISION:	West Germany Vereinigte Flugtechnische Werke
5.	SUPPLIER: CLASS:	Heller and Heyligenst.
	YEAR:	77
8.	FINANCIAL DATA:	
	COMPUTER: CONTROLS:	
	PRODUCTS:	Airframe parts
12.	MATERIALS:	Aluminum
	NUMBER OF PARTS:	9
	PART FAMILIES: PRODUCTION RATE:	
	PART CUBE:	
17.	PART SHAPE:	Prismatic
18.	OPERATION	
10	SCHEDULING: LOT SIZE:	
	MACHINE SET:	8 MC. 1 WS
21.	MATL. HANDLING:	
	TOOLING:	
	FEATURES: REFERENCES:	Automated inspection 14
	KII IKINOLO:	**
1.	COUNTRY:	West Germany
2.	COMPANY:	West Germany Volkswagen
2. 3.	COMPANY: LOCATION:	The state of the s
2. 3. 4.	COMPANY: LOCATION: DIVISION:	Volkswagen
2. 3. 4. 5.	COMPANY: LOCATION:	The state of the s
2. 3. 4. 5. 6.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR:	Volkswagen  Burkhardt & Weber
2. 3. 4. 5. 6. 7. 8.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA:	Volkswagen  Burkhardt & Weber FMS
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER:	Volkswagen  Burkhardt & Weber FMS
2. 3. 4. 5. 6. 7. 8. 9.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS:	Volkswagen  Burkhardt & Weber FMS 80
2. 3. 4. 5. 6. 7. 8. 9. 10. 11.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS:	Volkswagen  Burkhardt & Weber FMS 80  Transmission and rear axle housings Cast iron
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS:	Volkswagen  Burkhardt & Weber FMS 80  Transmission and rear axle housings Cast iron
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES:	Volkswagen  Burkhardt & Weber FMS 80  Transmission and rear axle housings Cast iron
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS:	Volkswagen  Burkhardt & Weber FMS 80  Transmission and rear axle housings Cast iron
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE:	Volkswagen  Burkhardt & Weber FMS 80  Transmission and rear axle housings Cast iron
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION	Wolkswagen  Burkhardt & Weber FMS 80  Transmission and rear axle housings Cast iron 7
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE:	Wolkswagen  Burkhardt & Weber FMS 80  Transmission and rear axle housings Cast iron 7
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET:	Wolkswagen  Burkhardt & Weber FMS 80  Transmission and rear axle housings Cast iron 7
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING:	Wolkswagen  Burkhardt & Weber FMS 80  Transmission and rear axle housings Cast iron 7  Prismatic
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING: TOOLING:	Wolkswagen  Burkhardt & Weber FMS 80  Transmission and rear axle housings Cast iron 7  Prismatic
2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18.	COMPANY: LOCATION: DIVISION: SUPPLIER: CLASS: YEAR: FINANCIAL DATA: COMPUTER: CONTROLS: PRODUCTS: MATERIALS: NUMBER OF PARTS: PART FAMILIES: PRODUCTION RATE: PART CUBE: PART SHAPE: OPERATION SCHEDULING: LOT SIZE: MACHINE SET: MATL. HANDLING:	Wolkswagen  Burkhardt & Weber FMS 80  Transmission and rear axle housings Cast iron 7  Prismatic

1. COUNTRY: West Germany Werkzeugmaschinenlabor 2. COMPANY: Aachen 3. LOCATION: 4. DIVISION: 5. SUPPLIER: **FMS** 6. CLASS: 7. YEAR: 83 8. FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: 11. PRODUCTS: 12. MATERIALS: 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 50 - 250 mm round 17. PART SHAPE: Rotational 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: 1 MC, 2 NT 21. MATL. HANDLING: 1 robot in an orbital layout 22. TOOLING: ATC with 20 tool magazine on MC 23. FEATURES: 24. REFERENCES: 14 1. COUNTRY: West Germany 2. COMPANY: Westfalia Separator 3. LOCATION: 0elde 4. DIVISION: 5. SUPPLIER: Dixi (Swiss) 6. CLASS: **FMS** 7. YEAR: 84 8. FINANCIAL DATA: 9. COMPUTER: 10. CONTROLS: 11. PRODUCTS: Machine tool parts 12. MATERIALS: Steel, cast iron 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Prismatic 18. OPERATION SCHEDULING: 19. LOT SIZE: 20. MACHINE SET: MC's 21. MATL. HANDLING: AGV's, ASRS 22. TOOLING: 23. FEATURES:

24. REFERENCES:

45

Zahnradfabrik Friedrichshafen

West Germany

1.

2.

COUNTRY:

COMPANY:

3. LOCATION: 4. DIVISION: 5. SUPPLIER: Zahnradfabrik Friedrichshafen 6. CLASS: **FMS** 7. YEAR: 82 FINANCIAL DATA: 8. DEC PDP 11/44 9. COMPUTER: 7 of 13 NC MT's DNC 10. CONTROLS: 11. PRODUCTS: Gears 12. MATERIALS: Stee1 13. NUMBER OF PARTS: 100 + 14. PART FAMILIES: 4 15. PRODUCTION RATE: 16,000 parts/month 16. PART CUBE: 280 mm round x 80 mm thick 17. PART SHAPE: Rotational 18. OPERATION SCHEDULING: 19. LOT SIZE: Range of 50 to 500 20. MACHINE SET: 1 NC, 4 NT, 3 SP, 5 NG 21. MATL. HANDLING: Robots, gantry crane 22. TOOLING: 23. FEATURES: Automated inspection, part washing 24. REFERENCES: 14, 34, 86 COUNTRY: Yugoslavia 1. Ljublana University 2. COMPANY: 3. LOCATION: Ljublana 4. DIVISION: 5. SUPPLIER: Ljublana University 6. CLASS: **FMS** YEAR: 7. 81 FINANCIAL DATA: 8. COMPUTER: DEC PDP 11/70 10. CONTROLS: 11. PRODUCTS: Miscellaneous parts for local industry Steel, cast iron 12. MATERIALS: 13. NUMBER OF PARTS: 14. PART FAMILIES: 15. PRODUCTION RATE: 16. PART CUBE: 17. PART SHAPE: Prismatic and rotational 18. OPERATION SCHEDULING: 19. LOT SIZE: 1 NT, 1 MC (3 additional MT's planned by 82) 20. MACHINE SET: 21. MATL. HANDLING: 22. TOOLING: 23. FEATURES: 24. REFERENCES: 86

1. "The All-American System's System," Tooling & Production, (February 1984), pp. 26-30.

2. "Allison Gear FMS will be GM Prototype," American Machinist, (April 1985),

p. 33.

3. Annborn, Mats, "Two Flexible Manufacturing Systems with Automated Material Handling Installed in Sweden," <a href="Proceedings of the 2nd International Conference on Flexible Manufacturing Systems">Proceedings of the 2nd International Conference on Flexible Manufacturing Systems</a>, October 26-28, 1983, London, UK, North Holland Publishing Company, New York, pp. 41-56.

Annborn, Mats, "The Factory of the Future," Proceedings of the 3rd
International Conference on Flexible Manufacturing Systems, September 1113, 1984, Boeblingen, West Germany, North Holland Publishing Company,

New York, pp. 59-72.

5. Arrigo, Thomas J., "Planning for Flexible Manufacturing," Flexible Manufacturing Systems '85, March 11-14, 1985, Dallas, SME Technical Paper MS85-149.

6. Asano, K., H. Takeyama, K. Sawada, and S. Oboshi, "Development of Programmable Precision Manufacturing Systems (PPMS) for Small Lot Production, "
Proceedings of the 1st International Conference on Flexible Manufacturing Systems, October 20-22, 1982, Brighton, UK, North Holland Publishing Company, New York, pp. 515-519.

7. Ashburn, Anderson, "GE Puts FMS in an Aging Plant," American Machinist,

(May 1983), pp. 104-105.

8. Ashburn, Anderson, and Joseph Jablonowski, "Japan's Builders Embrace FMSs,"
American Machinist, (February 1985), pp. 83-88.

9. Brodbeck, B., "Computer-Controlled Flexible Production for Precision Parts at MBB, Dynamics Division," Proceedings of the 3rd International Conference on Flexible Manufacturing Systems, September 11-13, 1984, Boeblingen, West Germany, North Holland Publishing Company, New York, pp. 85-95.

10. Browne, Jim, Didier Dubois, Kieth Rathmill, Suresh P. Sethi, And Kathern E. Stecke, "Classification of Flexible Manufacturing Systems," The FMS

Magazine, (April 1984), pp. 114-117.

11. Bryce, A. L. Graham, and P. A. Roberts, "Flexible Machining Systems in the U.S.A.," Proceedings of the 1st International Conference on Flexible Manufacturing Systems, October. 20-22, 1982, Brighton, UK, North Holland Publishing Company, New York, pp. 49-69.

12. Bylinsky, Gene, "The Race to the Automatic Factory," Fortune, (February

21, 1983), pp. 51-64.

13. Cohen, Peter A., "Trends in Flexible Manufacturing Systems," CIMCOM '85, April 15-18, 1985, Anaheim, SME Technical Paper MS85-350.

- 14. "A Competitive Assessment of the U.S. Flexible Manufacturing Systems Industry," International Trade Administration, U.S. Department of Commerce, (October 1985).
- 15. Conte, G., "Alsthom Unelec FMS A Case Study," Proceedings of the 2nd International Conference on Flexible Manufacturing Systems, October 26-28, 1983, London, UK, North Holland Publishing Company, New York, pp. 317-335.
- 16. Dawson, James R., "Getting Started in F.M.S.," Proceedings of the 2nd European Conference on Automated Manufacturing, May 16-19, 1983, Birmingham UK, North Holland Publishing Company, New York, pp. 413-425.
- 17. Drozda, Thomas J., "Our FMS' Will Do the Work of 67 Conventional Machine Tools," <u>Production</u>, (April 1978), pp. 66-69.

18. Dupont-Gatelmand, Catherine, "A Survey of Flexible Manufacturing Systems," Journal of Manufacturing Systems, Vol. 1, No. 1, (June 1982), pp. 1-15.

19. Dupont-Gatelmand, Catherine, "Flexible Manufacturing Systems for Gearboxes," Proceedings of the 1st International Conference on Flexible Manufacturing Systems, October 20-22, 1982, Brighton, UK, North Holland

Publishing Company, New York, pp. 453-462.

20. Egalini, P., and A. Ferrari, "An FMS for Mandelli Production," Proceedings of the 3rd International Conference on Flexible Manufacturing Systems, September 11-13, 1984, Boeblingen, West Germany, North Holland Publishing

Company, New York, pp. 267-283.

21. Ennis, G. E., "Flexible Machining Cell (FMC)," Paper presented at Flexible Machining Systems '84, CASA/SME, April 3-5, 1984, Chicago.

22. Flexible Manufacturing Systems Handbook, Noyes Publications, Park Ridge,

N.J., (1984).

- 23. "Flexible Manufacturing Systems State of the Art and Trends in Their Diffusion," Working Party on Engineering Industries and Automation, Economic Commission for Europe, (July 2, 1984).
- 24. "FMSs are Widespread at GDR Show," American Machinist, (May 1985), pp. 37-39.
- 25. Furlani, Cita M., Ernest W. Kent, Howard M. Bloom, and Charles R. Mclean. "The Automated Manufacturing Research Facility of the National Bureau of Standards," Paper presented at the Summer Computer Simulation Conference, July 11-13, 1983, Vancouver. 26. Gans, G., "Flexible Manufacturing at Messerschmitt-Bolkow-Blohm," Paper

presented May 3, 1983.

- 27. Germann, Michael J., "Advanced Flexible Manufacturing Systems for Tactical Missiles," Flexible Manufacturing Systems '85, March 11-14, 1985, Dallas, SME Technical Paper MS85-148
- 28. Gindy, M. N. Z., and S. K. Ghosh, "Flexible Manufacturing for Mixed Metal Forming and Machining Operations," Proceedings of the 3rd International Conference on Flexible Manufacturing Systems, September 11-13, 1984, Boeblingen, West Germany, North Holland Publishing Company, New York, pp. 455-465.

29. Graf, Henry R., "Flexible Manufacturing System for the Fabrication of Precision Components with Real Time Simulation," Proceedings of CASA/SME

Cincom '84 Conference, March 14, 1984, Washington.

30. Handke, Gunter, "Design and Use of Flexible Automated Manufacturing Systems," Proceedings of the 2nd International Conference on Flexible Manufacturing Systems, October 26-28, 1983, London, UK, North Holland Publishing Company, New York, pp. 485-504.

31. Helliwell, John R., "Flexible Turning Cells by SMT Machine Co. AB Sweden," Proceedings of the 2nd European Conference on Automated Manufacturing, May 16-19, 1983, Birmingham UK, North Holland Publishing Company, New

York, pp. 427-442.

32. Hess, George J., "Computer Integrated Flexible Manufacturing - 1985

(CIFM-85)," CIMCOM '85, April 15-18, 1985, Anaheim.

33. Hocken, Robert J., and Philip Nanzetta, "Research in Automated Manufacturing at NBS," Manufacturing Engineering, (October 1983), pp. 68-69.

- 34. Hoerl, A., and S. C. Vaughan, "FMS at ZF Friedrichshafen a Case Study," Proceedings of the 2nd International Conference on Flexible Manufacturing Systems, October 26-28, 1983, London, UK, North Holland Publishing Company, New York, pp. 799-809.
- 35. Hutchinson, G. K., "Flexible Manufacturing Systems in Japan," NTIS PB 288000, (November 1977).
- 36. Hutchinson, G. K., "Flexible Manufacturing Systems in the Federal Republic of Germany (BRD)," NTIS PB 288193 (December 1977).

  37. Hutchinson, G. K., "Flexible Manufacturing Systems in the German
- Democratic Republic (DDR)," Management Research Center, University of Wisconsin, (April 1978).
- 38. Hutchinson, G. K., "Advanced Batch Manufacturing Systems, Proceedings of the 16th Numerical Control Society Annual Meeting and Technical Conference, March 25-28, Los Angeles, pp. 118-146.
- 39. Hutchinson, G. K., "An Update on ABMS's in the German Democratic Republic (DDR)," Management Research Center, University of Wisconsin, (May 1982).
- 40. Hutchinson, G. K., "Messerschmitt-Bolkow-Blohm GMBH," Management Research Center, University of Wisconsin, (May 1982).
- 41. Hutchinson, G. K., "ABMS's in Czechoslovakia," Management Research Center, University of Wisconsin, (May 1982).
- 42. "Ingersoll Spending \$20M for In-House FMS," Automation News, Vol. 2, No. 8, (August 6, 1984), p. 1,5.
  43. Jablonski, Joseph, "Aiming for Flexibility in Manufacturing Systems,"
- American Machinist, (March 1980), pp. 167-182.

  44. Jablonski, Joseph, "Deciding on an FMS," American Machinist, (May 1983), pp. 109-111.
- 45. Jablonski, Joseph, "Reexamining FMSs," American Machinist, (March 1985), pp. 125-140.
- 46. Jablonski, Joseph, "Keeping an FMS up to Date," American Machinist, (August, 1985), pp. 76-78.
- 47. Johansson, Stig, "An FMS at Volvo Components for Machining Crank Shafts." Proceedings of the 2nd European Conference on Automated Manufacturing, May 16-19, 1983, Birmingham UK, North Holland Publishing Company, New York, pp. 388-391.
- 48. Kief, Hans B., "FMS at Bosch: An Experience Report," Flexible Manufacturing Systems '85, March 11-14, 1985, Dallas, SME Technical Paper MS85-159.
- 49. Kinnucan, Paul, "Flexible Systems Invade the Factory," High Technology, (July 1983), pp. 32-42.
- 50. Knabb, William F., "Implementing an FMS at Hughes Aircraft Company," Proceedings of CAM-I International Spring Seminar, May 3-5, 1983, St. Louis, pp. 121-123.
- 51. Knight, J. A. G., "The Latest Developments of FMS in Japan," Proceedings of the 1st International Conference on Flexible Manufacturing Systems, October 20-22, 1982, Brighton, UK, North Holland Publishing Company, New York, pp. 31-36.
- 52. Larsen, Raymond J., "Flexible Manufacturing: The Technology Comes of Age," Iron Age, (September 7, 1981), pp. 82-97.
- 53. Larsen, Raymond J., "Flexible Manufacturing: More Companies Make Competition Intense," <u>Iron Age</u>, (September 28, 1981), pp. 85-95. 54. Larsen, Raymond J., "Japan on First, Europe on Second in Battle for
- Rotational Systems Market," Iron Age, (February 19, 1982), pp. 61-73.

55. Larsen, Raymond J., "U. S. Plays Catch Up in the Development of Rotational Systems," <u>Iron Age</u>, (March 1, 1982), pp. 58-67.
56. Larsen, Raymond J., "The Technology of 'Change' Will Highlight the Growth of FMS in World Market," <u>Iron Age</u>, (April 23, 1982), pp. 76-81.
57. Long, Peter A., "SCAMP," <u>Proceedings of the 2nd European Conference on Automated Manufacturing</u>, May 16-19, 1983, Birmingham UK, North Holland Publishing Company New York pp. 371-374 Publishing Company, New York, pp. 371-374.

58. "Major UK FMS Installations Under Construction," Financial Times, (January

12, 1984).

59. Martell, R. P., "Bringing an FMS "On-Line" in an Aerospace Company," Flexible Manufacturing Systems '85, March 11-14, 1985, Dallas, SME Technical Paper MS85-150.

60. McBean, D. J., "Practical Applications of F.M.S.," Proceedings of the 2nd International Conference on Flexible Manufacturing Systems, October 26-28, 1983, London, UK, North Holland Publishing Company, New York, pp. 477-484.

61. Meade, William P., "Flexible Manufacturing Systems in the United States," a report prepared for the French government by the Management Collaborative Group, Chapel Hill, NC, (November 1978).

62. "Milacron Installing FMS to Aid Plastics Unit," Automation News, Vol. 2, No.

8, (August 6, 1984), pp. 1,17.

- 63. Morgan, T. K., "Planning for the Introduction of FMS," Proceedings of the 2nd International Conference on Flexible Manufacturing Systems, October 26-28, 1983, London, UK, North Holland Publishing Company, New York, pp. 349-357.
- 64. Percival, I. W., "A Flexible Computer Controlled Production System," Proceedings of the 2nd International Conference on Flexible Manufacturing Systems, October 26-28, 1983, London, UK, North Holland Publishing Company, New York, pp. 515-524.

65. Purdom, Peter A., and Tony Palazzo, "The Citroen (CCM) Flexible Manufacturing Cell," Proceedings of the 1st International Conference on Flexible Manufacturing Systems, October 20-22, 1982, Brighton, UK, North

Holland Publishing Company, New York, pp. 151-169.

66. Purdom, Peter A., "The Citroen Flexible Manufacturing Cell," Proceedings of the 2nd International Conference on Flexible Manufacturing Systems, October 26-28, 1983, London, UK, North Holland Publishing Company, New York, pp. 93-103.

67. Ranky, P. G., "The FMS in Cespel Machine Tool Company," Proceedings of the 1st International Conference on Flexible Manufacturing Systems, October 20-22, 1982, Brighton, UK, North Holland Publishing Company, New York,

pp. 141-150.

68. Rathmill, K., N. Greenwood, and M. Houshmand, "Computer Simulation of FMS," Proceedings of the 2nd International Conference on Flexible Manufacturing Systems, October 26-28, 1983, London, UK, North Holland Publishing Company, New York, pp. 251-280.

69. "Recent Trends in Flexible Manufacturing," Economic Commission for Europe, United Nations Economic and Social Council, (December 4, 1984).

70. Romanini, S., "FMS That Reach Their Goal," Proceedings of the 2nd International Conference on Flexible Manufacturing Systems, October 26-28, 1983, London, UK, North Holland Publishing Company, New York, pp. 81-92.

71. Romanini, S., "Automated Factory: Science Fiction or Reality?," Proceedings of the 3rd International Conference on Flexible Manufacturing Systems, September 11-13, 1984, Boeblingen, West Germany, North Holland Publishing Company, New York, pp. 73-84.

72. Schmidt, J., "Flexible Manufacturing Systems Applied in Volume Production," Proceedings of the 3rd International Conference on Flexible Manufacturing Systems, September 11-13, 1984, Boeblingen, West Germany, North Holland

Publishing Company, New York, pp. 133-142.

73. Schmoll, P., and F. Popplewell, "Flexible Automation Made to Measure," Proceedings of the 3rd International Conference on Flexible Manufacturing Systems, September 11-13, 1984, Boeblingen, West Germany, North Holland Publishing Company, New York, pp. 27-46.

74. Sizemore, Richard G., "LTV's \$10-Million FMS Comes On-Line," Automation

News, Vol. 2, No. 8, (August 6, 1984), p. 1.
75. "SME Seminar: Flexible Automation Now," SME York Chapter No. 22, (March 30, 1985).

76. Storr, A., and S. Chmielnicki, "Proving of Simulation Programs with the Aid of a Graphic CRT," Proceedings of CAM-I International Spring Seminar,

May 3-5, 1983, St. Louis, pp. 27-35.

77. Suzuki, T., et. al., "Present State of the Japanese National Project," Proceedings of the 2nd International Conference on Flexible Manufacturing Systems, October 26-28, 1983, London, UK, North Holland Publishing Company, New York, pp. 19-30.

78. Tomek, Pavel, and Jaromir Zeleny, "Machining Technology in Flexible Manufacturing Systems for Prismatic Parts with Automated Flow of Tools," Proceedings of the 2nd International Conference on Flexible Manufacturing Systems, October 26-28, 1983, London, UK. North Holland

Publishing Company, New York, pp. 57-68.

79. Umbricht, F., and C. R. Boer, "TUGEFA: Manufacturing of Turbocharger Casings in a Flexible Manufacturing System," Proceedings of the 3rd International Conference on Flexible Manufacturing Systems, September 11-13, 1984, Boeblingen, West Germany, North Holland Publishing Company, New York, pp. 143-152.

80. Vaccaro, Salvatore M., "FMC's Venture into FMS: A Case Study," Flexible Manufacturing Systems '85, March 11-14, 1985, Dallas, SME Technical Paper

MS85-152.

81. Vasiliev, V. N., V. A. Kudinov, and S. V. Vasiliev, "FMS in the U.S.S.R.: Case Studies, "Proceedings of the 3rd International Conference on Flexible Manufacturing Systems, September 11-13, 1984, Boeblingen, West Germany, North Holland Publishing Company, New York, pp. 15-20.

82. "Vickers Buys 18-Cell FMS," Automation News, Vol. 2, No. 8, (August 6,

1984), p. 1,5.

83. Vuzelov, Vitan, "Robotization and Its Role in Flexible Manufacturing Systems," Proceedings of the 1st International Conference on Flexible Manufacturing Systems, October 20-22, 1982, Brighton, UK, North Holland Publishing Company, New York, pp. 239-248.

84. "W.C.I. Manufacturing Systems Division FMS Credentials," a White Consoli-

dated Industries handout, (1983).

85. Wilcox, D. J., "FMS Linking Machining Center with Lathe for Small Batch Production of Large Seals," <a href="Proceedings of the 3rd International Conference on Flexible Manufacturing Systems">Proceedings of the 3rd International Conference on Flexible Manufacturing Systems</a>, September 11-13, 1984, Boeblingen, West Germany, North Holland Publishing Company, New York, pp. 47-57.

pp. 47-57. 86. Yoshikawa, Hiroyuki, Keith Rathmill, and Jozsef Hatvany," Computer-Aided Manufacturing: An International Comparison," NTIS PB82 172321, (1981).

NBS-114A (REV. 2-8C)				
U.S. DEPT. OF COMM.	1. PUBLICATION OR REPORT NO.	2. Performing Organ. Report No. 3. Public	ation Date	
BIBLIOGRAPHIC DATA	NBSIR 86-3413	ALCO II	~T 400¢	
SHEET (See instructions)	NDSTR 80-3413	AUGU	ST 1986	
4. TITLE AND SUBTITLE				
A Survey of Flexible Manufacturing Systems Implementations				
5. AUTHOR(S) Dr. William P. Darrow Guest Worker from Towson State University				
6. PERFORMING ORGANIZAT	TION (If joint or other than NBS,	see instructions) 7. Contrac	/Grant No.	
NATIONAL BUREAU OF STA	NDARDS			
DEPARTMENT OF COMMERCE		8. Type of	Report & Period Covered	
GAITHERSBURG, MD 2	20899			
9. SPONSORING ORGANIZAT	TON NAME AND COMPLETE AT	DDRESS (Street, City, State, ZIP)		
	reau of Standards			
	0, Room A-127			
Gaithersbur	g, Maryland 20899			
10. SUPPLEMENTARY NOTES	S			
		·		
Document describes a	computer program; SF-185, FIPS	Software Summary, is attached.		
11. ABSTRACT (A 200-word or	r less factual summary of most s	ignificant information. If document include	s a significant	
bibliography or literature s	urvey, mention it here)			
This report pre	esents descriptive	data on three hundred m	anufacturing	
		er integrated manufactur		
		parts for commercial, in		
military produc	cts. Of these 258	were categorized as Fle	xible	
		y descriptive statistics		
		ganized into records by		
		location. Each record		
		lity, the product, and the a reference to the sour		
		the information has prove		
sparse. Never	sparse. Nevertheless, taken in aggregate, a picture of the state of			
the art for FM	S has emerged from	the study. This picture	e is reflected	
in the graphical summaries of the data, which are presented by region				
for Eastern Europe, Western Europe, Japan, and the United States. An				
analysis of trends in FMS implementation, product and material characteristics, and materials handling technology is made for each				
of the above re		unaring coomorogy is ma	.0 101 00011	
11 11 11 11 11 11 11 11 11 11 11 11 11				
12. KEY WORDS (Six to twelve	entries; alphabetical order; cap	italize only proper names; and separate key	words by semicolons)	
	-	ernational, Flexible Manufacturing, S	iurvey,	
° Statistics, W	orld-wide			
13. AVAILABILITY			14. NO. OF	
y Unlimited			PRINTED PAGES	
	on. Do Not Release to NTIS		202	
31		nent Printing Office, Washington, D.C.	15. Price	
X Order From National To	echnical Information Service (NT	IS), Springfield, VA. 22161	\$22.95	





