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A Study of the Destruction and Disposal of Classified Documents in the Washington, D.C. Area

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Paper Evaluation Section
Institute for Materials Research
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July 23, 1973

Final Report

Prepared for
General Services Administration
Washington, D. C. 20407

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U. S. DEPARTMENT OF COMMERCE, Frederick B. Dent, Secretary

NATIONAL BUREAU OF STANDARDS, Richard W. Roberts, Director

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SUMMARY

Several agencies in the Washington, D.C. area are required to destroy comparatively large quantities of classified documents on a daily basis. Most agencies use a wet destruct process, and the product is a paper pulp that at times contains some impurities such as tape, staples, plastic film, etc. The pulp contains a high percentage of water, and the solids content is on the order of 30 percent. Although the fiber is potentially useful for paper and paperboard (especially the latter) manufacture, it contains too much water to be baled or economically shipped to a mill where it could be utilized.

The Paper Evaluation Section of NBS was asked to (1) determine whether the pulp from existing facilities could be baled, (2) look into the availability of more efficient dewatering equipment, (3) determine what equipment is available for document destruction and baling, and (4) obtain market information on the destructed material.

Information on (1)-(3) was developed by surveying the paper machinery industry. As equipment of this type (pulpers, dry defibrators, dewaterers, balers) usually is available from different manufacturers and not as a system from one manufacturer, an attempt was made to generate interest in planning a complete system for the destruction of classified documents and sale of the product for reuse or recycling. Whenever possible, trial runs were conducted by manufacturers at their plants.

Trial runs on two high powered screw presses extracted enough water to increase the solids content of the pulp to almost 70 percent. However, changes occurred during water extraction that made the pulp less desirable for recycling. Two other types of water extractors are manufactured for extracting water from wood pulp and would be quite satisfactory for water extraction in the present wet destruct systems. One of the extractors has the capability of forming wet sheets that can be stacked on skids for shipment. No trials have been conducted on any of this equipment.

One baler designed specifically for baling wet pulp is available, but the pulp consistency must be approximately 50 percent for successful operation.

At present, there is a good market for pulp from wet destruction of classified documents. This stems from a severe pulp shortage that is likely to continue for the foreseeable future. However, the pulp must first be baled before it can be sold, as paper and paperboard mills are not equipped to handle it in any other form. The pulp would be classified as mixed waste paper. The price of the pulp would be tied to the mixed waste paper market, which fluctuates considerably.

In addition to the two wet pulping systems currently used by many Government agencies, two dry destruct systems are available commercially. None of the systems have baling capabilities, and, in fact, the constitution of the effluent from one of the systems does not allow the effluent to be baled. The effluent from dry systems has a low bulk density so it is more expensive to truck to landfill.

All of the equipment necessary to assemble a satisfactory wet or dry destruct system is available commercially. Two firms have expressed an interest in manufacturing a destruct system. One of the firms, which manufactures a dry system, already has made arrangements to get on GSA schedule. This firm has conducted trials for a number of Government agencies and has proved its capability for destructing documents, and proved that the discharge from its system can be baled. The second firm supplies a wet pulping system that is used in the waste paper recycling industry. This system should be excellent for document destruction.

This investigation has shown that the wet system is best for destructing paper documents from the standpoint of completeness of document destruction and recycling potential. However, a dry system might be more suitable for agencies having only small quantities of material to destruct.

Considering the number of document destruction sites located in the Washington, D.C. area, it perhaps would be more efficient if a central facility for processing waste paper was established. Such a processing center would destruct classified documents and process mixed waste paper. A central processing center for paper should make waste paper collection and sale more efficient and hopefully more profitable. The center also could serve as a model waste paper reclamation system for municipalities. A successful paper reclamation system would eventually lead to a decline in the volume of waste sent to landfill.

1. INTRODUCTION

Three methods are available for the destruction of classified documents:

(1) Incineration
(2) Pulping (wet process)
(3) Shredding or milling (dry process)

Incineration is total destruction and precludes reuse or recycling, although the fuel value of the organic matter could be recovered. Pulping involves disintegration and dispersion in a water medium to individual fibers. Shredding or milling (hammermill) involves cutting or dry beating, and the effluent is discharged through a heavy screen. The product is less homogeneous than that from wet pulping, and the size distribution is governed by the size of the holes in the screen. In any case, considerable dust is generated and precautions must be taken to prevent explosions. The machines are very noisy and must be installed in acoustically insulated rooms.

During the mid 1960s, two wet pulping systems for document destruction became available commercially, and a number of these systems were installed at various Government agencies in the Washington, D.C. area. The effluent from the pulper, containing approximately 5 percent solids dispersed in water, is pumped into a low powered screw press which concentrates the slush to about 30 percent solids. The extracted water is recycled to the pulper. The discharge from the screw press is conveyed to a dump truck or a trash container for disposal to landfill.

Originally, it was planned that the pulp would be baled and sold to paper and paperboard mills for recycling. The high water content and the fact that the screw press caused the pulp to aggregate into sphere-like shapes made it impossible to form a rigid bale. The bales broke apart during loading, shipping, or unloading. Therefore, marketability vanished and the pulp had to be trucked to landfill. Disposal of the pulp became a liability, and considerable effort was made to find a use for it.

Each new use that was found disappeared as soon as its lack of easy handling was recognized. Disposal problems mounted as similar destruct systems were installed in new locations.

As dissatisfaction with the wet pulping system became known, dry systems for document destruction were investigated. Some commercial systems were available and at least two different systems were installed in the Washington, D.C. area. Ironically, one of the dry systems quickly found itself in a position similar to that of the wet pulping system because the product could not be baled due to the constitution of the effluent and had to be trucked to landfill. By virtue of its low apparent density, the cost of disposing of the dry material on a per ton basis was greater than for the wet material. As noted above, the dry system is very noisy and dusty and requires appreciably more maintenance.

Responsibility for the disposal of destructed classified documents lies largely with the General Services Administration (GSA), as most destruct systems are located in buildings under their supervision. In response to a proposal submitted to GSA by the National Bureau of Standards (NBS), a project was initiated at NBS to:

(1) Determine whether the pulp from existing facilities could be baled.

(2) Look into the availability of more efficient dewatering equipment.

(3) Determine what equipment is available for document destruction and baling.

(4) Obtain market information on the destructed material.

2. DOCUMENT DESTRUCTION BY PULPING

Destruction of paper documents by wet pulping is most certainly one of the most desirable methods from the standpoint of destruction efficiency and recycling potential. It would be impossible to restore any part of a completely defibered document, and the pulps could be recycled to make paper or paperboard. Because of the mixture of papers, the product, at best, would be classified as pulp from No. 1 mixed paper.

The operators of a pulping system must have some training in the use and maintenance of the equipment and at least a moderate degree of technical competence. Operators must understand the limitations of their equipment and how to deal with problems that are certain to occur.

For a pulping destruct system to function properly, it must contain a pulper capable of ultimate paper defibering. It should be constructed of stainless steel to avoid corrosion and must be ruggedly constructed. It should be equipped with a "junker" and a "ragger" to cope with contaminants such as metal clips, staples, cans, and bottles.

A desirable feature is the capability to pulp wet strength paper. Most pulpers cannot defiber wet strength paper, and documents such as maps otherwise could not be processed in a pulping system. Map paper is made from expensive long fibered pulp, and every effort should be made to recycle the paper. If destructed dry, maps can be utilized only by a small number of paper mills set up to process wet strength paper. This creates a fluid market situation. If the maps were completely defibered in a pulping system, there would be no restraints on its marketability.

The pulping system should be fitted with a high powered press capable of receiving a consistency varying from 1 to 10 percent solids and capable of producing a discharge of no less than 45 percent solids. This permits the production of stable bales. One piece of dewatering equipment can produce a lap which can be sheeted, stacked, and loaded into skids. The resulting skid can be transported easily without problems. Lap is sheets of wet pulp as they come from a wet machine for shipment or for storage. The lap, whether baled or in sheet form, can be mixed with solid fuels and burned in power plants for energy. There may be a need to burn pulped documents at times when a surplus of waste paper exists. The possibility of multiple use for destructed documents should result in a more stable price for the pulped document.

3. DOCUMENT DESTRUCTION BY DRY PROCESSING

Dry methods reduce documents to such a small size that restoration would be virtually impossible. In hammermilling the documents are thrown against a breaker plate where considerable size reduction occurs. The hammers then drive the material against a screen where further size reduction is performed. Final particle size is governed by the diameter of the perforations in the screen through which the disintegrated material is discharged from the hammermill.

The discharge is conveyed away from the hammermill by a pneumatic system. Air is drawn through the mill to help clear the screens, to increase the grinding efficiency, and to cool the screen and hammers, thus reducing the possibility of fire. An insufficient amount of air drawn through the mill very frequently results in a fire somewhere in the system. Very high velocities of air also help extinguish a fire.

The effluent is conveyed to a cyclone where the solids are separated from the air stream. The solids drop to the bottom of the cyclone and pass through an air lock. The discharge can be baled providing its constitution is amenable to baling. Otherwise, the effluent is placed in trash containers and hauled to landfill.

A hammermill operation is noisy, dusty, and there is the potential for fire and explosions. Therefore, the proper precautions for the health and safety of the operators must be taken. It is necessary to insulate the system to reduce noise and to locate it in an air-tight room to prevent dust from circulating throughout the building. The introduction of a fine mist of water usually is sufficient to prevent dust explosions.

The fan which draws air and material discharge from the hammermill usually is connected directly to the mill shaft. There is an initial decrease in motor speed as the mill is charged, which results in a decrease in the amount of air drawn through the mill at a time when it is most needed. The problem would not arise if the fan were driven by a separate motor, but then the cost of the system would increase significantly.

A supposed advantage of the dry system is its ability to destruct tapes, plastics, metal components, and glass. These non-paper articles usually are mixed with paper documents, so the result is a defibered paper product contaminated with film, tape, metal, and glass. In addition, there is a significant shortening of paper fibers and production of fairly large quantities of debris. These make recycling of the paper virtually impossible. From the standpoint of recycling, the dry system is less satisfactory than wet pulping for destructing paper documents.

Although the disadvantages of the dry method for destruction generally outnumber the advantages, a dry system would have an apparent advantage over the wet system for small quantities. The dry system can be operated intermittently and for short periods of time. The wet system should be operated continuously for at least one shift per day for best performance.

4. SURVEY OF PAPER MACHINERY

4.1 Potential Additions to the Present Pulping Systems

The first task was to determine if equipment is commercially available that would extract more water from the pulp than at present. Manufacturers of water extraction equipment were contacted, and at least two demonstrations of screw type presses were observed. It was demonstrated that much more water could be extracted than by the present systems, and in one instance, the solids content was as high as 67 percent. However, as the discharge from the water extractor consisted of clumps of varying sizes, the clumps would not cohere, and there was no real improvement in baling. In addition to the difficulty in baling, "fish eyes" (which later cause transparent spots in the finished paper) formed during the extraction process. These make the pulp undesirable for recycling.

One baler manufacturer found that wet pulp could be baled successfully at a consistency of approximately 50 percent if the pulp was fluffed before baling. Fluffing is an operation similar to hammermilling, whereby the structured pulp is broken down mechanically to a near fibrous condition after water extraction. The fluffed pulp is readily baled in a baler specifically designed to bale wet pulp. All attempts to arrange for a demonstration were unsuccessful. The reason given by the manufacturer was that many mills utilize his equipment to bale all types of wet pulp, and he was not willing to underwrite the cost of a trial run. He did suggest, however, that a pulp mill with this equipment might agree to process a quantity of pulp for a fee. This arrangement was made but more than a year elapsed before funds were made available for the work. By that time, the work load in the pulp mill precluded the use of his equipment for this purpose.

Further inquiries revealed that at least one press is commercially available that can concentrate pulp from 3 percent or less to 50 percent consistency in a single step. Unfortunately, the press is designed to process much greater amounts of paper than are produced in the largest of the pulping destruct systems.

4.2 Potential for Manufacture of Complete Destruct Systems

An extensive search of the pulp and paper machinery industry indicated that no complete pulping and baling system for document destruction is available. The two commercial pulping destruct systems now in use are not manufactured by paper machinery companies. Many of the problems associated with the two pulping destruct systems now in use may be due to lack of knowledge of paper technology by the two manufacturers.

Although no complete wet destruct system is produced by any one manufacturer in the paper machinery industry, all of the components needed for a destruct system are available commercially. It is necessary only to combine the components into a complete destruct system. Furthermore, one system designed for processing waste paper would be excellent for destructing paper documents. Reference to this system is made in section 7 of this report.

A similar situation exists with respect to dry destruction. Commercially available dry destruct systems are not manufactured by the paper machinery industry. However, paper machinery firms have shown a greater willingness to demonstrate dry destruct equipment. Part of the reason for the difference in attitude is the lower dependence on other companies for system components. Consequently, companies are more enthused about designing a dry destruct system since it involves greater in-house utilization of products and manpower.

5. FACTORS TO BE CONSIDERED IN CHOOSING A DESTRUCT SYSTEM

Perhaps the most important factor in deciding on a destruct system is the disposition of the discharge from the system. The existing wet systems have created a distorted opinion of wet destruction because of the many problems associated with the product. The present trend appears to favor dry destruction of documents if only because the effluent is dry. However, a decision should not be biased for or against a type of process because of past performance of systems that were improperly designed.

A very important difference between dry and wet pulping is the relative degradation of the fiber by the two systems. Wet pulping causes changes in the fibers, but these changes are small in comparison with the cutting and massive destruction that occurs during dry disintegration. Therefore, pulp from a wet process normally is useful for recycling, but the product from dry disintegration is severely limited in recycling potential.

There is an increasing trend to dispose of paper by using it as a fuel in power plants. There are many advantages, but the wisdom of burning paper instead of reusing it to make paper or paperboard is questionable at a time when a serious fiber shortage exists. A very real local pulp supply shortage last winter was caused by a low wood inventory at some pulp mills due to unfavorable weather in the South for harvesting and delivering logs.

Other problems may cause future localized shortages of pulp for paper. One problem is a potential woods labor shortage, especially in the South. Logging is strenuous, the summer heat is almost unbearable, and, for some, there is a constant danger of poisonous snakes. With generally high employment levels, work opportunities in other employment, high wage levels, and better employment conditions, higher woods wages would probably simply result in higher pulp and paper prices.

Fuel shortages would also affect pulp supply. Sixty three percent of the industry's pulp capacity and 48 percent of its paper and paperboard capacity is in the South. Gas provided 50 percent of the external energy required by the industry in the South in 1971. In the South Central Region, 52 mills with 25 percent of the industry's pulp capacity

depend on gas for 85 percent or more of their external energy requirements. On January 8, 1973, the Federal Power Commission announced proposals to establish a system of rationing natural gas and to put industrial consumers on the lowest order of priority. Industrial consumers would also be put on an interruptable basis for gas beginning mid 1974, even if they presently hold firm contracts for gas. Hence, a severe winter in 1973-74 could create a paper shortage even greater than the one experienced during the winter of 1972-73.

In consideration of the impending problems of the pulp and paper industry and the encouragement by the Federal Government to recycle materials, it would seem only logical to choose document destruct systems that would enable the discharge to have maximum recycling potential. Therefore, in general, wet pulping systems should be favored over dry systems. Choosing a system yielding a product with maximum recyclability would tend to encourage recycling in the private sector. As stated previously, however, certain installations that process only small quantities of paper documents probably should choose a dry system.

In the event the pulp supply situation becomes brighter and the need for recycling declines, the wet pulp at 50 percent solids could be burned as fuel in power plants. Wet systems have the diversity of providing a discharge which can be recycled for paper or paperboard or used as fuel to generate power.

The disadvantages of the wet systems compared to other systems are their cost, the need for good technical staffing, and the necessity for avoiding or removing contamination with plastics, glass, or metals. The inability of some pulpers to defiber wet strength paper can be eliminated by merely specifying that the pulper be capable of defibering wet strength paper. Pulpers that can process both types of papers equally well are available.

6. POTENTIAL MARKETS FOR FIBER FROM DESTRUCTED DOCUMENTS

The discharge from document destruction systems is considered to be a product from mixed paper. As such, the price for the destructed documents would be tied to the mixed paper market. However, the sale of this material is dependent on its transportability, i.e., stability of bales, freedom from contamination, and water content, as it affects total weight and shipping costs.

Pulped documents inherently produce a cleaner product than is produced by dry systems from the standpoint of paper machine performance. Great care must be taken at destruct sites to avoid such articles as glass, plastic cups, tapes, films, etc., being charged to the pulper. This product would be acceptable to paper and paperboard mills if the products contained less water and could be baled or formed into wet lap. The almost certain cleanliness of the pulp might result in a higher price than mixed paper since it could be used for combination paperboard outer liner and would not have to be used for paperboard filler as is the case with other Government mixed paper.

The only undesirable contaminant that might be found are polychlorinated biphenyls (PCBs) originating in "no carbon required" paper. The incidence of PCBs should decline with time as PCBs have not been used in this type of paper for at least two years. However, as old files containing PCBs will be in the discard category for several years, the problem will remain for some time.

The market for dry destructed documents is much more uncertain. Considerable debris is formed when documents are destructed by hammermilling or shredding. The debris makes the product undesirable for many paper uses, and perhaps, its only real market would be for board filler or for insulation. When used for insulation, the destructed documents would be referred to as fluffed waste paper.

As pointed out earlier, dry destructed documents are more likely to contain contaminants because the dry systems can tolerate a certain quantity of these materials. Therefore, the market potential for dry destructed documents would, at best, be equal to that of wet pulped documents on a per ton basis, but is more likely to be significantly lower.

A stable price could not be placed on either wet or dry destructed documents, even if they met all the paper stock and mill requirements, because of market fluidity. Of greatest importance is the potential marketability. However, because of the superior quality of fiber, wet destruct systems of proper design should produce the most marketable product.

7. CENTRAL PAPER PROCESSING CENTER

As the study on destruction processes progressed, it became clear that a great amount of duplication exists in document destruction facilities. This redundancy is costly and quite possibly unnecessary. A central location for document destruction in the Washington, D.C. area might eliminate this duplication of facilities, improve the quality of destruction, and reduce the cost.

Paper documents to be destructed would be baled at each Government facility. The baling equipment could be designed to bale automatically and to bag and seal each bale. The bales would be picked up by armored truck at each agency at an appointed time and delivered to the central destruct center.

When the bales arrived at the center, they would be transferred to the destruct system and, in the presence of a security officer of the agency, removed from the plastic wrapper and dumped into a large pulper. The system would be designed to remove cans, bottles, tape, film, and other contaminants from the charged documents. Such a system is available commercially. Contaminants such as tape and film could then be destroyed by pyrolysis. The documents would be completely defibered. The discharge from the system would be in the form of a wet lap or it could be flash dried, depending on the disposition of the effluent. The final product would either be sheeted wet lap or baled secondary pulp.

A separate study would be needed to evaluate the security requirements for a central processing facility. Traffic accidents, the possibility of removing documents during transit, and other factors known only to security personnel would need to be considered. Although the cost of security might be greater, the elimination of duplication of facilities, plus other advantages mentioned below, should far outweigh this.

With a central paper processing center as suggested, all Government mixed papers could be processed at the site during the remaining hours of the day. The resulting pulp should be satisfactory for making paperboard without additional processing. Because of the cleanliness of the product, the pulp could be used for top or bottom board liner with an expected price increase of 50-60 percent above the market price of mixed papers. The processing of paper other than classified documents would increase security because the classified documents would be diluted with unclassified paper.

The central paper processing facility would make the waste paper collection and selling system more efficient and, hopefully, more profitable. The facility could also serve as a model waste paper reclamation system for municipalities of all sizes. Considerable information could be generated with respect to waste paper collection and processing with the intent of recycling. The system eventually could be modified to include a deinking plant so that a high quality secondary pulp could be produced. If the tonnage became large enough, the secondary pulp could be flash dried to decrease the cost of transportation. Production of secondary pulp would enable much greater use of waste paper since mills not having recycling equipment could include secondary fiber in their products. At present, only specially designed mills are able to use waste paper. Unfortunately, secondary fiber usually is consumed at the mill or at another corporate mill and does not enter the pulp market. A central paper processing center would provide an excellent example for the private sector.

Such a central facility would not necessarily have to be financed and operated by the Federal Government. There are strong indications that with assured volumes and grades of waste paper available under long-term, equitable arrangements, a secondary fibers firm(s) would be ready to seize the opportunity and finance the plant wholly or in part under agreed upon security surveillance procedures.

8. CONCLUSIONS

1. The discharge from wet pulping systems currently in use can be baled only if more water is extracted and a unique baler is employed. This equipment is available.

2. A commercial press is available that produces a wet lap which can be sheeted and placed on skids for shipment. No baler is required.

3. Equipment necessary to assemble satisfactory wet or dry destruct systems is available commercially.

4. Pulping is preferred to dry disintegration as it produces the best marketable fiber for recycling. In the event the market for pulp declines, the pulp can be burned for fuel.

5. At least two firms are interested in manufacturing destruct systems with proven capability for baling or wet lap production.

6. Dry systems can destruct documents satisfactorily, but considerable debris is generated. The discharge is barely suitable for recycling. Nevertheless, the dry method for destruction probably is best suited for small quantities of documents, that is, approximately five tons of documents per day or less.

9. RECOMMENDATIONS

1. Several agencies in the Washington, D.C. area maintain facilities for document destruction. Duplication of equipment should be eliminated by installing one central facility for waste paper processing.

2. Whenever possible, document destruction should be accomplished by pulping and not by dry disintegration. Facilities destructing less than five tons of paper daily should consider a dry system. A central facility for document destruction will eliminate the need for dry destruction.

3. Every effort should be made to recycle destructed paper documents, especially with the present and probable continuing fiber shortage.

4. No destruct system should be purchased unless it has demonstrated a capability for baling or sheeting the effluent in a transportable form.

5. A properly designed wet system would be capable of defibering wet strength paper as well as non-wet strength paper.

6. Dry destruct systems should have adequate safety and health provisions, e.g., explosion proof protection in addition to provisions for noise abatement.

7. Wet pulping systems should be fabricated from stainless steel in order to avoid corrosion problems.

8. Before it is approved, a wet destruct system that employs uncommon methods for defibering paper should be evaluated to ensure that excessive fiber degradation does not occur.

9. Every effort should be made to avoid contamination of paper with plastic, glass, film, metal, etc., regardless of the method of destruction.

10. The proper destruction of material other than paper should be investigated. For example, pyrolytic methods for destructing non-paper classified documents such as plastics and films should be considered, especially if the system converts the plastic and films into a gaseous or liquid fuel.

11. Specifications for document destruct systems should be reviewed by experts before they are released for bid.

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Several agencies in the Washington, D.C. area are required to destroy comparatively large quantities of classified documents on a daily basis. Most agencies use a wet destruct system, and the product is a paper pulp that contains a high percentage (70) of water and impurities such as tape, staples, plastic, and film. The pulp is potentially marketable but contains too much water to be baled or economically shipped to a paper mill.

The Paper Evaluation Section was asked to (1) determine whether pulp from existing facilities could be baled, (2) determine the availability of more efficient dewatering equipment, (3) determine what equipment is available for document destruction and baling, and (4) obtain market information on the destructed material.

The study indicated that (1) more efficient water extractors are available commercially, (2) the discharge from wet destruct systems can be baled, (3) other destruct equipment is available, and (4) a market exists for the baled pulp.

17. KEY WORDS (Alphabetical order, separated by semicolons)

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