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RECOVERY OF PARAFFIN AND PAPER STOCK
FROM WASTE PARAFFIN PAPER

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The growing usefulness of paraffin paper, in the form of wrappers, cartons, drinking cups, etc., has given the material an added importance in recent years, and has also led to an increase in the amount manufactured. It is excellent for excluding moisture, is sanitary, and is cheap enough to be discarded after use. It makes possible several substitutes for ordinary conveniences when these are not available. The increased cost of the materials used in the manufacture of paraffin paper, caused by an abnormal condition of the market, has resulted in several requests for some means of their recovery. In response to these requests, this Bureau has devised a practical method which employs a vertical steam cooker, tanks for receiving the paraffin and hot water from the steam cooker, and a beating engine. The steam cooker is provided with a pipe at the top to carry off the hot water and paraffin, and is covered with a screen to retain the fiber. Some means for agitating the stock, either by hand or mechanically, is necessary, as this assists the disintegration of the paper.

The amount of waste involved in the production of paraffin paper is considerable. It results chiefly from improperly coated papers and trimmings. In addition, the waste-paper trade gathers much of it, for which there is no market. Beside the paraffin, the paper stock is sufficiently valuable to make its recovery worth while.

Paraffin paper is produced by saturating an unsized paper with sufficient paraffin to make the sheet impervious to moisture. The amount of paraffin used varies from about 15 to 35 per cent of the finished paper. Before the paraffin is applied the paper is frequently printed with a colored advertisement or trade-mark of the concern using it. Therefore, it may be necessary not only to separate the paraffin and paper from each other, but also from the ink which is present.

It is obvious that any procedure for effecting the separation and recovery of paraffin and paper stock must be cheap, practical, and involve the least possible amount of time and labor. A separation is easily obtained by means of a solvent such as gasoline, but is, of course, out of the question because of the expense. Aside from the inflammable nature of the solvent and its necessary recovery in order to make the process sufficiently economical, the material to be extracted is very bulky and the recovered paraffin is contaminated and discolored by the ink removed with it.

The simplest method of separation is by melting out the wax from the paper by means of hot water. Mere treatment with hot water is not sufficient to remove all the paraffin because the fibers are too thoroughly impregnated with the wax. By reducing the paper to a pulp more paraffin is recovered, and a thorough washing with hot water shortens the time required for the pulp to remain in the beater. After several trials with hot water alone it was found that the separation was always incomplete, and it was found necessary to employ steam under pressure, e. g., exhaust steam at 15 to 25 pounds. The following procedure, based upon experiments with about 25 pounds of waste material, was found to be the most satisfactory.

The waste stock is placed in a tank cooker, sufficient water added to cover the stock, and steam is injected into the water at the bottom of the tank. A rotary boiler could be used for disintegrating the waste stock, but it is better to have a special steam cooker constructed for that purpose. The waste paper may be packed closely, but allowance should be made for the water formed by condensation of the steam. These conditions are best determined by experience. As the temperature rises the flow of steam is reduced until a gentle and uniform agitation is produced. When the maximum temperature is attained the steam may be cut off, the cover of the tank removed, and the paper broken up by pounding it with a wooden pole, in order to hasten the pulping,

or mechanical agitation may be used. The paper is reduced to a pulp in one hour or less, the time required depending upon the rate of flow of the steam and the amount of stock and water. Hot water is now run in at the bottom of the cooker, and the paraffin and water are run off from the top through a screen into a settling tank and allowed to cool. The screen may be placed over the pipe within the cooker or the pulp may be forced out with the hot water and screened and washed at the settling tank. The washing may also be carried out in an octagonal screen drum revolving horizontally in a tank in hot water, which, flowing through the tank, carries the residual paraffin with it into the settling tank; but this procedure does not possess any advantages over the former methods.

The pulp is transferred to a beater and treated with water at a temperature above 85° C. A soap solution containing 2 pounds of soap to 100 pounds of waste stock is added, followed by sufficient turkey-red oil to prevent the formation of foam. The oil is also of value in causing the residual paraffin to coalesce and rise to the surface. After the contents of the beater are mixed the washer is lowered and hot water is run through for about one-half hour. The paraffin may be quickly collected on a metal cylinder revolving below the surface of the hot water in the beater. The cylinder is chilled internally by a stream of cold water. By this time the stock is much cleaner, and cold water may be introduced. As the temperature falls particles of paraffin rise to the surface. These collect as a scum in front of the roll and are easily removed. If the washer becomes coated the wax may be forced through it by means of steam. In general, the pulp is clean about three hours after it has been placed in the beater. If the pulp has been well washed in the previous operation, the time required is lessened. Any paraffin remaining in the pulp after the treatment in the beater is caught by the screen boxes of the paper machine. In the experiments conducted it proved to be a very small quantity.

If the stock contains much ink it must be treated with caustic soda and bleached in the usual way. If ink is absent this operation is unnecessary. It is well to use the beater employed for the work for this purpose alone, and the roll should be cleaned occasionally by means of hot water or steam.

By installing the necessary tanks it should be possible to carry out the process on a larger scale without difficulty. The size and

design of these would vary with the individual requirements, but the equipment requires little space.

Several trials of the method have been made and the results submitted to the manufacturers interested. The recovered paraffin was somewhat darker in color than the original wax, the color depending upon the nature of the ink present. It is obvious that the wax may be improved by filtration, or if necessary by bleaching. The paper stock, which consisted entirely of sulphite pulp, was run over the paper machine under the supervision of Mr. F. C. Clark, in charge of the paper laboratory of this Bureau. No paraffin reached the Fourdrinier wire and none was detected in the finished sheet, which was satisfactory in every respect.

From the waste stock used in the experiments 15 per cent of paraffin and 85 per cent of paper pulp were obtained, on the basis of the recovered material. About 10 per cent of the paraffin in the original stock was lost, but practically all of the paper stock was recovered. The method is being used by at least one concern at the present time.

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