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Recycling Paper in Monroe County on a Large Scale*

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Recycling

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Summary

This study was conducted to determine the feasibility of recycling waste paper. It was found that, although recycling is preferable to landfill or other means of disposal, large-scale recycling of municipal waste paper in the Rochester area was not economically feasible. The present state of recycling technology, pulp production practice, and the present market for recycled paper were seen as reasons for the present situation. The greatest potential for establishment of large-scale waste-paper recycling in the Rochester area would come from the establishment of a large newsprint recycling plant, such as that being considered by Garden State Paper Co., for Columbus, Ohio. This plant would process waste newsprint from a number of surrounding cities, including Rochester.

Factors which would promote the recycling of waste paper and make large-scale recycling more economically feasible are considered.

Introduction

This bulletin is about the availability and disposal of paper in the context of solid waste management and resource scarcity in America. Special attention is given to manufacturing paper, use of paper, and the feasibility of large scale waste-paper recycling in the Rochester area.

The history of man has shown that it is possible to live in balance with nature, but the continued growth in the consumption rate of paper has led to two consequences. First, as paper use increases, more trees are cut and less climax forest land, or natural forests, remains. Although it is often assumed that the projected consumption of paper will be satisfied by our forest reserves in the near future (6, 13, 29), the implementation of waste paper recycling now will alleviate future abuse of our forests. The second, and more pressing, problem caused by increased paper usage is its disposal. The additional volume of garbage coupled with the rising cost of solid waste disposal, necessitates consideration of alternatives to present means of elimination. Paper comprises at least 50% of the volume of refuse, so recycling of wastepaper is a potential solution to both problems.

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Following is an attempt to show what is involved in large scale paper recycling from technological and economic points of view.

Technology

Wastepaper disposal. At present there are four basic methods for disposing of waste paper. The first, and most common, is to place the paper, along with other solid wastes, in either an open dump or a sanitary landfill. A second method, frequently employed, is incineration, usually done in the past without provision for recovery of the heat of combustion. A third method is to compost paper along with other organic wastes; the residue, humus, can be used for soil improvement. The fourth method is to recycle the paper into new products, by reprocessing waste paper (7).

Open dumping is, at best, a questionable means of disposal. On the other hand, a sanitary landfill which involves daily covering with six inches of dirt at a site carefully selected to avoid leaching, can provide an adequate short-term waste disposal system (7, 11). However, it is estimated that two-thirds of the 12,000 "sanitary landfills" in the country are actually open dumps (28). Locally there has appeared to be a shortage of land suitable for landfill sites (3, 7, 30).

Incineration can effectively reduce the volume of refuse which will then go to a landfill by as much as 85%. However, incinerators properly designed to meet air pollution standards are costly (7, 9, 30). Heat recovery, as steam, is desirable; but, although common in Europe, only two incinerators in North America (Chicago and Montreal) have been constructed with this potential. The generated steam can be used either to drive in-place turbines or can be sold directly to industry (9, 16, 13, 30). As in landfilling, incineration may be seen as a dead end for many reusable materials, including paper fibers.

Composting of municipal waste on a large scale is a relatively new technology, but an old process. The waste is sorted, ground and combined with thickened sewage sludge in some operations. Bacteria in the sludge degrade the waste in a carefully controlled digestion process to produce compost, which is sold as mulch when dry or topsoil when wet. Composting processes can consume large quantities of waste paper, but paper is not a necessary ingredient for obtaining the desired compost qualities (7, 10, 14, 30). Thus, composting of organic garbage and sewage sludge may be a desirable solution to part of the solid waste disposal problem. But, if possible, separation of waste paper for recycling should precede the composting operation.

Recycling of wastepaper into new paper products, both with and without de-inking, have been done for many years. Caustic de-inking and recycling without deinking have both existed as long as the techniques of modern paper manufacture (2). The Newton Falls Paper Co. in Newton Falls, New York, has employed caustic deinking in recycling paper since 1921. A new technique for recycling paper without removing ink has been developed by the Garden State Paper Co. (2) in New Jersey and California.

Techniques for recycling waste paper vary according to the grades of waste paper used and the products produced. Fiber quality of waste paper ranges from mixed waste paper (typical of municipal waste) to envelope cuttings, with about sixty-five grades in between. The grade or grades of waste paper which can be used in a process are determined by the nature of the finished product (3, 6).

Paper production. Paper fibers are obtained from timber by two basically separate methods: pulpwood is either ground mechanically to produce groundwood fibers or separated into fibers chemically to yield "Kraft" pulp. Kraft pulp fibers are typically stronger and of higher quality than groundwood fibers. Paper fibers are also either softwood or hardwood depending on the type of tree used.

Use of waste paper. (1, 6, 31, 32) There are two basic types of industries which use waste paper as a raw material. One is the paper mill which produces high grade book, magazine and label paper. These mills generally buy single source, high grade waste paper from industry. The second type of industry, which can be termed "low-discriminators," includes the roofing and wall-board companies and utilizes primarily low grade waste papers.

A paper mill producing high grade paper will use clean, high grade waste paper along with Kraft pulp. Depending on the qualities desired in the paper produced, as much as 100% waste paper can be used in the process. These paper mills will usually not use ground wood pulp or groundwood waste papers such as newsprint.

The low-discriminators also require relatively clean, baled waste paper. One plant visited used 33% mixed waste paper; the remaining 67% of the waste is sorted, uniformly graded paper. Low discriminators use a large amount of newsprint, phone books and other groundwood products. Deinking is seldom necessary in these operations.

One paper-recycling industry which does not fit into either category is the Garden State Paper Co. which uses a process converting old newsprint to new newsprint.

Difficulties in using waste paper. In utilizing waste paper for recycling, several technical difficulties are encountered. One problem is the need for separating the various papers into uniform grades (1, 31, 32, 33, 34). The reprocessor avoids this problem by purchasing only uniform-grade waste. The paper dealer, in turn, avoids the problem by obtaining the major portion of his stock from single sources in printing or other industry operations, but he also does some hand-sorting. Hand separating on a larger scale at the municipal level is considered prohibitive, due to labor costs; at this time only the conscientious householder can make this method effective.

One technological possibility is to provide for the separation of fibers after the waste paper is repulped; such a separation device is currently being developed on an experimental basis (30, 35).

Contaminants in waste paper are a serious problem for reprocessors, especially in plants which produce a high grade product. Certain adhesives, rubber and synthetic films encountered in paper can produce holes in the finished product, alter its color or disrupt its printability. "Hard color" papers, those with a high concentration of color pigments, are not adequately deinked unless fed to the deinking pulper as only a small percentage of the charge. For a plant not employing deinking, "hard color" papers increase the difficulty of achieving proper color control (1, 3, 6, 13).

In recovering waste paper fibers, 25%, by weight, of the initial waste paper charge may end up as suspended solids in process effluents; for this reason, the reprocessing plants encounter pollution control difficulties. Plants utilizing only virgin pulp, where fiber yields are quite high, incur minimum effluent control difficulties (1, 31). However, the processes which produce virgin pulp originally from timber are faced with water pollution problems of even greater magnitude than those encountered in recovery of waste paper.

If recovered pulp is sterilized completely, it can be used in the production of certain food containers. However, pulp sterilization increases both the capital and processing costs of using recycled paper (34).

Economics

Implementing an economically sound paper recycling operation at the municipal level requires both a market for paper produced by the recycling process and a source of waste paper to supply the process (7, 13, 30, 33). When contemplating the estimate of such a feedback system within the framework of the current economy, it is important to satisfy the former requirement first. In this report, economic feasibility will be analyzed in the contexts of marketing, processing and source of waste paper. It is clear that recycling efforts, due to transportation costs, will manifest significant differences on the local and regional levels. In a regional operation, shipping large quantities of waste paper in bulk over large distances lowers the transportation cost per ton to below those incurred in a local operation. Therefore, this report will incorporate both local and regional considerations.

Markets for recycled paper in the Rochester area. By far the largest consumer of newsprint and most extensive publisher in the Rochester area is Gannett Co., Inc. Distributing over 40,000 tons of newsprint per year to local subscribers, it owns one paper mill in Canada and obtains the rest of its paper from three other mills, one in the United States and two in Canada, at a cost of \$160/ton (36). Currently, recycled newsprint is being produced at \$153 per ton (2). Thus if a newsprint recycling plant were operating locally, Gannett would save \$7 per ton along with the shipping costs currently entailed in hauling newsprint from Canadian mills. At present, the nearest newsprint recycling plant is the Garden State Paper Co. in New Jersey. Although Gannett currently purchases some paper there, transportation costs, as well as the fact that the Garden State plant is producing at full capacity, prohibit the Gannett Co. from increasing its use of the recycled newsprint (37).

Other markets for local waste paper are U.S. Gypsum, Inc. in Oakfield, New York and Upsum Wallboard Corp. in Lockport, New York. The Oakfield plant is currently at full capacity (110 tons per day), producing as much gypsum board as the building trades demand. Waste paper is bought from the salvagers, Krieger and Spector Companies, and the Rochester Salvation Army; this is shipped to the plant for a total cost to the U.S. Gypsum Co. of \$14-\$16 per ton. These sources handle primarily single source industrial waste paper. Upsum, like Gypsum, is producing at full capacity, handling 850-900 tons per week. Upsum purchases its waste paper from Krieger in Rochester and a number of salvagers in the Buffalo area at an average cost, including shipping, of \$20 per ton (32, 38).

The output of these operations depends upon the demand for wallboard by the building trades. Because this demand is presently being met, if more newsprint from Rochester were used in these plants, the amount of industrial waste paper used would have to be reduced. Merely switching sources of waste paper would not alleviate the waste paper disposal problem.

Although there are no binding contracts between the waste paper salvagers and U.S. Gypsum, each is tacitly committed to facilitating the other's economic stability. Hence, in the immediate future waste paper used by U.S. Gypsum would probably be obtained through the salvagers.

New uses for waste paper. Basic research is being conducted in the development of new uses for waste paper. For example, mulches and fertilizers have been made from paper by several composting methods (3). However, the nutritional content is typically low, requiring extensive use of phosphate and nitrate additives (7, 10, 14, 30). Other possible uses are in the beginning stages of research and development.

Local processing operations. As a result of its own market research, Garden State Paper Co. has concluded that the establishment of a newsprint recycling plant in the Rochester area is not economically feasible. There is not a market for 80,000 tons of newsprint per year, the minimum economic plant capacity, in this area. The necessary supply of 90,000 tons of waste newsprint per year needed for processing is also not available (37). Furthermore, a plant such as those constructed by the Garden State Paper Co. would need thirty acres of land near the urban center; such an area may not be available at an affordable cost.

Local sources of waste paper. One of the more critical problems in recycling waste paper from municipalities is that of separating it from other forms of refuse. The original separation might occur either at the home or at centrally located collection centers. Sorting into various grades can also be a problem, but can in principle be handled by the salvager.

The various collection centers for voluntary recycling depend upon the homeowner for sorting, as do the one-day drives conducted by various groups such as the Boy Scouts. The Salvation Army collects newspapers on call and the Volunteers of America have done so at times. However, because of the limited scope of these efforts and the use of volunteer organizations, such arrangements fail to satisfy the need for stable, long term, and efficient recycling of municipal waste paper. To transform a voluntary local collection system into a viable, economically sound system would require 1) establishing a local ordinance mandating separation of waste in every home and 2) a municipally operated collection network. Considerable savings could be realized if the Department of Public Works trucks were fitted with racks, making paper transport a city function and part of the regular refuse collection.

Conclusions

It is concluded on the basis of the analysis above, that large-scale recycling of waste paper is not at present economically feasible for the Rochester area. However, if a large recycling plant were built in a suitable location, it could process waste paper from several cities, and serve a larger market than the Rochester area provides. This would probably make recycling feasible. Such a plant is being considered by Garden State Paper Co. for the Columbus, Ohio, area.

Factors which would promote the recycling of waste paper and make the establishment of a large-scale recycling plant more economically feasible are as follows:

- 1) Activities by consumer and environmental groups to increase support for paper recycling by government, industry and the public.
- 2) Voluntary recycling projects in many communities to make more wastepaper available for recycling.
- 3) Encouraging the increased use of recycled paper.
- 4) The institution of comprehensive solid waste management programs by the City of Rochester and the County of Monroe which would permit large-scale recycling of paper.
- 5) Legislation, policies and tax incentives by the State of New York to encourage the use of secondary materials.
- 6) Changes in regulations concerning transportation rates so that secondary materials may be shipped at rates more comparable to those for primary materials.

7) Support by the Federal Government of a vigorous program of research into techniques of paper recycling, particularly in automated separation and grading of paper fibers.

8) Changing the design of certain paper products to facilitate recycling them.

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