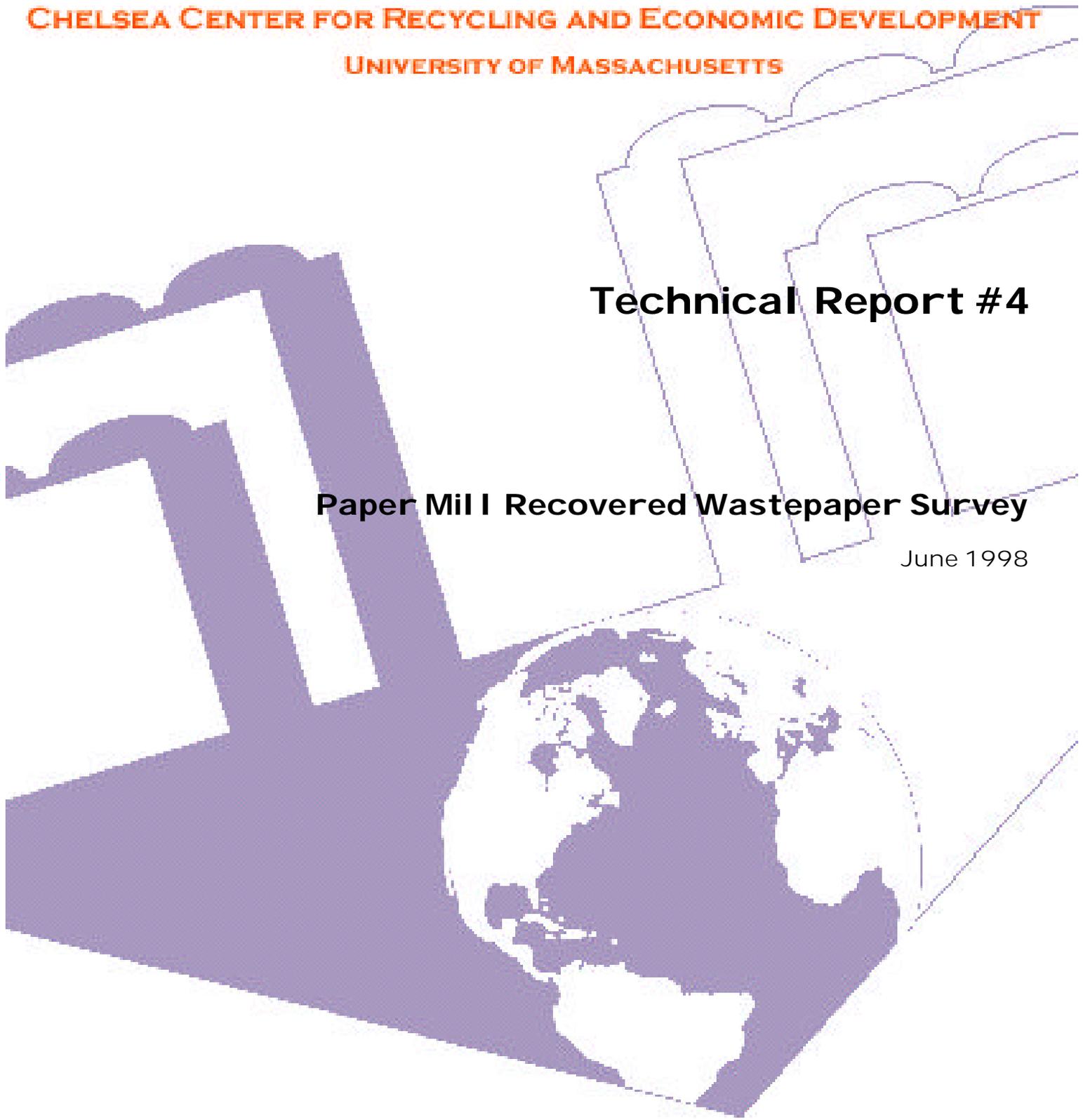


Technical Report #4

Paper Mill I Recovered Wastepaper Survey

June 1998



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The Chelsea Center for Recycling and Economic Development, a part of the University of Massachusetts' Center for Environmentally Appropriate Materials, was created by the Commonwealth of Massachusetts in 1995 to create jobs, support recycling efforts, and help the economy and the environment by increasing the use of recyclables by manufacturers. The mission of the Chelsea Center is to develop an infrastructure for a sustainable materials economy in Massachusetts, where businesses will thrive that rely on locally discarded goods as their feedstock and that minimize pressure on the environment by reducing waste, pollution, dependence on virgin materials, and dependence on disposal facilities. Further information can be obtained by writing the Chelsea Center for Recycling and Economic Development, 180 Second Street, Chelsea, MA 02150.

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1. Introduction

Expanding recycling in Massachusetts has become an issue of vital importance to state planners and municipal officials across the Commonwealth. Continued growth in the use of paper products in the United States, from paper packaging and writing paper to newspapers and magazines, has contributed to increasing amounts of solid waste that local municipalities must dispose of. Recycling more paper will help reduce the volume (and associated costs) of wastes that need to be disposed of in municipal solid waste landfills.

In addition, recycling plays a key role in the health of the paper manufacturing industry in Massachusetts, an important part of the state's economy. Over 36 communities depend on the paper industry for much of their economic welfare; the primary paper industry in Massachusetts is a major source of taxable revenue for local communities and provides high-paying jobs for residents. Recent statistics indicate that the paper industry in Massachusetts alone provides over 4,500 high-paying jobs. Combining this with other industries dependent on Massachusetts' manufactured paper products accounts for an additional 21,225 jobs with a total payroll in excess of \$700 million annually.

Over the past decade, recycling programs in the cities and towns in Massachusetts have significantly increased the amount of wastepaper collected and recycled into new paper products. Despite this increase, however, there are concerns that demand for recovered wastepaper will not keep pace. Without strong demand, it may be difficult to sustain paper recycling as a permanent part of the state's economy.

One of the factors affecting wastepaper demand is the ability of Massachusetts' paper mills to increase the amount of wastepaper they use in their manufacturing process. To promote recycling and support the competitiveness of Massachusetts paper mills, state decision-makers need a more thorough understanding of the issues concerning the use of wastepaper in the paper-making process. Information is also needed to help paper manufacturers identify the impacts that increased use of recovered wastepaper can have on their manufacturing processes and develop procedures that will allow them to utilize more wastepaper.

To provide this information, the Chelsea Center for Recycling and Economic Development provided funding to the Merrimack Valley Manufacturing Partnership (MVMP) of Massachusetts to develop the Paper Mill Recovered Wastepaper Survey. The survey was designed to explore the attitude and perceptions of paper mills in Massachusetts regarding the increased use of recovered wastepaper and how this might impact their ability to manufacture high-quality paper products – products that make them unique and competitive in both national and international markets. The survey identifies local paper-making companies' technical concerns regarding their ability to use recovered wastepaper in the manufacturing of specialty paper products. The survey also assesses the mills' interest in developing site-specific pilot projects to increase the use of recovered feedstock in their manufactured paper products.

For this survey, MVMP sought information from paper mills across Massachusetts, such as the extent of their use of wastepaper and their attitudes toward further use of this material as feedstock in their manufacturing. This report is based on the survey findings. It summarizes the issues faced by Massachusetts' paper mills interested in using wastepaper as raw material, including production, solid waste disposal, wastewater discharge, regulatory, technical resource, and economic concerns. The report also identifies barriers to using more recycled wastepaper in the paper mills' market products. The final section of this report presents suggested and current pilot projects that can help mills explore and overcome these barriers.

The Chelsea Center for Recycling and Economic Development and MVMP hope that this survey will help to increase awareness of the key role played by Massachusetts' mills in the recycling loop. The authors also hope the report will contribute to initiatives that can help the mills to utilize growing amounts of wastepaper in the future.

2. Scope of the Survey

For this project, the Chelsea Center for Recycling and Economic Development and MVMP prepared and conducted a comprehensive survey of Massachusetts paper companies, analyzed the results, and prepared this report. Specifically, project staff:

- Designed a survey to assess the paper companies' concerns and any major constraints associated with the initial use or increased use of recovered paper as paper manufacturing feedstock. The survey requested specific information on labor cost; process modifications needed to handle recovered paper stock; and impacts on product quality, varying grade changes, solid waste disposal, and wastewater discharges with regard to existing operational permits. (Appendix A presents the form used for the survey.)
- Identified 28 paper mills in Massachusetts and contacted each of these companies by telephone to assess their interest in participating in the survey. Survey forms were then mailed to each of the 18 mills that indicated a willingness complete the survey. Nine of these mills filled out and returned the survey. Some of these surveys were not completely filled out; the balance of information was completed during a follow-up phone call. Some of the mills preferred that survey project staff conduct a site visit, during which the staff person assisted in the completion of the survey. (Appendix B lists the companies contacted for this survey.)
- Identified case studies recommended by the participating paper mills that can serve as models or pilot projects. These pilots each involve specific modification of present mill systems to allow usage of some types of recovered wastepaper products.
- Identified companies interested in developing further pilot projects with support from Chelsea Center for Recycling and Economic Development and MVMP technical assistance programs. These projects will be structured around critical issues identified by the results of the survey.

- Prepared this summary report presenting the results of the paper mill survey and identifying current and potential pilot or case study wastepaper use projects.

The survey was sent to mills representing each of the three primary categories of paper manufacturers located in Massachusetts: (1) high-grade white specialty paper mills; (2) paperboard mills producing base stock used for domestic and commercial packaging; and (3) tissue mills having de-inking facilities. High-grade mills comprised the bulk of the survey respondents. Of the nine mills that completed the survey, one was a paperboard mill and one was a tissue mill, while seven were high-grade mills. As a result, many of the attitudes and concerns presented in the following section are drawn from the high-grade category of paper manufacturer.

This report does not include references to specific paper mills. Each of the companies that participated in the survey, concerned that the information could be used by competitors, requested that their responses be kept proprietary. In particular, some mills were reluctant to complete certain portions of the survey questionnaire. However, survey staff were able to verbally obtain critical missing survey information after agreeing not to identify specific paper mills in the survey report. All participants were assured that any published results would be generalized to be representative of the consensus of the paper mills contacted.

3. Survey Results and Analysis

Following distribution of the survey and receipt of the completed forms, the information was analyzed to determine the specific concerns and recommendations of the paper mills that responded. This section presents the results of this analysis, organized by the specific types of concerns voiced by the respondents.

3.1 Physical Characteristics

In general, many mills expressed doubts relating to the replacement of a portion of their virgin feedstock with wastepaper. The mills were concerned about their ability to handle a lower-grade feedstock. Currently, recovered papers can become part of the mills' raw materials makeup and substitute for some amount of virgin wood product pulps. For example, used newsprint can partially (but not totally) replace virgin groundwood pulps. Paperboard manufacturers also are able to incorporate used newsprint as sheet filler or liner medium for some specialized products.

Recovered wastepaper, however, does not provide the required physical characteristics found in quality virgin pulps. Virgin pulps provide high-brightness optical properties and consistent fiber length, which are not possible with pulps made of recovered paper. (The most common pulps purchased by Massachusetts paper companies are high-brightness kraft hardwood and long-fibered, bleached softwood pulps. Some specialty mills require semi-bleached chemical thermal mechanical pulps, and stone groundwood pulps.) In addition, there are further mill-specific operating constraints imposed by

dirty pulp and unwanted build-up of short fibers that take up production capacity and create technical issues. As a result, paper mills manufacturing high-grade white stock have historically purchased high-quality virgin pulp or selectively sorted wastepaper in order to manufacture their products with a high degree of reliability.

3.2 Wastepaper Contamination

Of all the concerns over the use of wastepaper voiced by the paper mills contacted for the survey, elimination of contaminants from recovered paper is considered the most critical. Paper mills require a wide variety of raw stock in their product menus, and many mills change product menus several times daily. Going from high-grade whites to high-quality colored grades, for example, is difficult enough without having to contend with uncontrolled contaminants. Ensuring a manufacturing process free of contamination is critical to the mills' operations.

Many of Massachusetts' mills use a limited supply of de-inked, post-consumer pulp as a substitute for virgin kraft pulps. For example, paper mills and mills manufacturing base stock for laminated paper utilize a certain percentage of wastepaper in their operations. These mills have no plans to use additional recovered paper, however, unless proven technology demonstrates that the use of a low-grade recovered paper is possible. The mills producing laminated-type base stock cannot allow contamination of any sort and have difficulty meeting market quality standards even with the most expensive virgin fibers. In fact, the fiber quality standards required for some grades of specialty paper manufactured in Massachusetts are so stringent that, in some cases, the suppliers of these high-quality manufactured pulps also have difficulty meeting these raw material standards. This is an indication of how sensitive these high-quality grades are to contaminants.

If the mills are to integrate the use of recycled paper into their existing processes, a number of operational and environmental considerations must be addressed. Recovered wastepaper contains up to 50 percent nonusable contaminants (compared to 5 percent for virgin pulp). Nonusables consist primarily of dirt and short fibers. If total removal of these contaminants is not accomplished, serious problems could result during the stock preparation process, in paper machine operations, and in whitewater and wastewater characteristics. Dirt and concentrations of fiber fines could build up in the whitewater system, causing plugging, surging, paper machine retention and sheet formation problems, and an overloading of the process equipment.

3.3 Contaminant Removal Equipment

Often, the capacity of existing contaminant removal equipment limits a mill's ability to process additional wastepaper. The stock preparation equipment currently used by paper mills is designed to screen out specific types of dirt and contaminants and maintain the uniform suspension of dispersed fiber and other ingredients that the finished product demands. Removal of contaminants found in lower grades of recovered paper usually requires specialized equipment such as screening and cleaning machinery equipment that many mills currently lack.

Installation of state-of-the-art cleaning, screening, and contaminant removal and scalping equipment could make it possible for the mills to use selected types of recovered wastepaper. Presently, however, there are no incentives to spend the needed capital on such equipment. As a result, with the mills' current process configurations, using recovered wastepaper could have a negative impact on the quality of finished goods. In fact, the inability to meet product quality requirements already has been partly responsible for some mill closures.

3.4 Disposal of Contaminants

Another issue concerns disposal of the increased amount of non-usable contaminants brought in with the recycled material. By accepting wastepaper as a raw material, mills also take on the physical and financial responsibility of collecting and disposing of the non-usable material as solid waste, or of treating it with their wastewater discharge.

Mills typically discharge to their own wastewater treatment systems or to publicly owned treatment works (POTWs). Some may use a primary treatment system at the mill prior to discharging to a POTW. In any case, using wastepaper produces additional waste materials, which can impact treatment system operations and costs. Contaminants also compromise the mills' ability to reuse clarified whitewater; using recovered wastepaper requires specialized flotation and fiber scalping systems installed in the mill process to remove solids and recover usable whitewater. Color removal from wastewater discharge also is a problem because of the high concentrations of colored fiber it contains during grade changes. This would typically require additional, expensive treatment equipment. (Since virgin pulps contain no inks or dyes, color removal when virgin feedstock is used is rarely an issue.)

In addition, POTW facilities may not be able to handle the additional suspended solids or biological oxygen demand (BOD) loadings that may result from using recovered wastepaper without significant system upgrades at the mills. Typically, POTWs impose a surcharge on BOD and suspended solids loadings over a nominal threshold value. Using more wastepaper could mean an increase in the amount of nonusable material discharged with the mills' wastewater, which could cause a mill to incur significant surcharges. In addition, wastewater flows can increase due to the additional fresh water required for cleaning and screening. These additional clean water requirements would impact the operations and costs of mill water-treatment facilities.

In some cases, mills will need to dispose of a certain level of nonusable material generated from using recovered paper as solid waste. This additional solid waste will most likely be of a type not currently found in high-grade white paper mill systems. Recovered wastepaper can have higher concentrations of plastic coatings, solvent coatings, waxed and poly coatings, clay solids, and many other unwanted, insoluble chemicals which attach to fiber fines and end up in the mills' solid waste. The respondents indicated that the mills are concerned with the requirements imposed by, and the liability associated with, hazardous and toxic waste regulations which might apply to any solid waste they would collect if they began to use recovered wastepaper.

3.5 International Competition

Paper manufacturers in other countries that have made provisions to use recovered paper in their products are very competitive with manufacturers in Massachusetts. For example, some manufacturers in Asian countries are using technologies that allow them to rely almost totally on recovered paper for their raw materials. One reason they are able to do this is a willingness to invest in specialized types of screening and cleaning equipment, a strategy made possible by government subsidies. The Asian mills buy low-cost, used primary equipment from closed mills in the United States; then, using the subsidies, they invest in state-of-the-art cleaning and screening equipment. Another advantage for Asian mills is low-cost labor. These mills have a higher-quality sorted waste available in their countries because of the comparatively low cost of labor in the region.

By contrast, recovered wastepaper in Massachusetts, particularly curbside material, is often poorly packaged and baled. This leads to handling problems and increased labor costs at the mill, both in the receiving and pulping areas. Because of the intense international competition, establishing long-term supplies of higher-quality sorted wastepaper is essential before mills will invest in equipment required to convert recovered wastepaper into a high-quality finished product. A statewide commitment to reducing the burden and responsibility of the paper companies is an important facet of a successful recycling program. Many of the mills felt that Massachusetts waste recovery programs should support the development of automated recovery classification technology, which would result in a more uniform recovered paper product in each of the wastepaper categories.

3.6 Conclusions

The most consistent and important feedback from the survey was that product quality and consistency are critical issues. This is true for both raw materials and finished goods. Mills would consider using recycled paper as a feedstock only if a supply were identified that was compatible with the mills' process, if using the wastepaper were technically and economically feasible, and if the mills' finished goods would remain cost-competitive.

The mills' greatest issue of concern regarding the use of recovered paper was contamination. Respondents consistently pointed out many mills' inability to deal with contaminants of any sort. The second most important issue was equipment limitations. The existing mill process equipment typically operates at maximum capacity and is limited in its ability to handle dirt, short fibers, and other contaminants. These systems were not designed to purge the many types of contaminants found in lower grades of recovered wastepaper.

Another factor brought out during the survey was the fact that paper mills in Massachusetts are uniquely designed to manufacture a number of short-run products. These require special menus and unique processing parameters that vary from product to product. A series of modifications would be required for plants like these to make use of recovered wastepaper.

4. Survey Summary and Recommendations

The numerous issues and barriers identified in the survey create little incentive for the mills to dedicate the necessary resources to investigate the use of recovered paper. The general consensus among the paper mills contacted for this survey is that technical and economic hurdles outweigh the potential benefits associated with using recovered wastepaper. If the state encourages Massachusetts paper makers to increase wastepaper usage by demanding that state-purchased paper products be made using a certain percentage of recycled material, the mills indicated, it must also be willing to help Massachusetts' mills to achieve these goals. The mills also voiced their determination not to become risk takers. They feel they cannot afford to try resolving the state's solid waste problems at the risk of contaminating their own systems, reducing the quality of their finished products, or incurring solid waste discharge penalties.

In addition, the mills feel that advocates for recycling often do not realize the operational impact and scope of commitment required by papermaking companies, many of which are only marginally profitable. Any changes from mills' present mode of operations are costly to implement and could have serious impacts on product quality and cost. In order to remain competitive, mills have downsized their technical staffs. Those technicians remaining have multiple responsibilities with barely time enough to support daily mill operations. Requiring that they prepare feasibility studies to investigate changing to wastepaper as feedstock would pose a significant burden.

In light of the responses in the survey, it seems clear that statewide support for the paper industry is required if Massachusetts wishes to promote greater use of recovered wastepaper. This support should include the development of improved methods of sorting curbside and commercial wastepaper, packaging, newspapers, magazine paper, and many other wastepaper products. In addition, if mills in Massachusetts are to begin using recycled wastepaper, the need for installation of specifically designed equipment and implementation of new technologies cannot be overemphasized. This also is true for solid waste handling and wastewater treatment technology, so that treated mill effluent will not compromise existing discharge permits or the quality of Massachusetts' waterways. Since the mills typically lack the capital needed for the necessary process modifications and additional operator training, incentives are needed to encourage them to consider using recycled paper.

One important step the state could take to address these issues is to develop or support carefully designed equipment demonstrations and other pilot projects that can serve as models for industry-wide improvements. Such projects should be designed to be useful to the majority of paper mills interested in using wastepaper as a raw material. One suggested approach is to initiate a state-administered program that brings together a selected university, equipment suppliers, paper mills, and engineers to perform the necessary pilot projects required to establish standards. To ensure these pilot demonstration projects develop into full-scale design changes, updated operating manuals and procedures may be needed. In addition, the paper companies may need assistance from equipment vendors to demonstrate some of the technologies. Once the pilot projects have been completed and new standards established, it is critical that they be supported by all involved parties, including the public.

The next section describes pilot projects proposed by paper mills to demonstrate the types of process reviews and current demonstration projects designed to encourage the increased usage of recovered wastepaper products.

5. Recovered Wastepaper Use Pilot Projects

The development of pilot projects is one strategy for researching the issues associated with use of wastepaper in paper mills and exploring potential solutions. This section summarizes the specific pilot projects recommended by the mills surveyed for this report. It also contains brief descriptions of pilot projects that have been launched in response to these and other suggestions from the recycling community.

5.1 Projects Suggested by Surveyed Mills

During the course of the survey, the nine participating paper mills were asked what type of pilot projects would be most beneficial to them in enhancing their ability to utilize more wastepaper, assuming that the state provided sufficient support and revenue for cost sharing. They were asked to consider value-added versus implementation costs, as well as required commitments needed in dealing with low-grade recovered wastepaper.

Respondents indicated they would be interested in any project that demonstrates value-added incentives either by increasing production capacity or by reducing the cost of their products with minimal implementation cost. Respondents also requested a reevaluation of the paper machine stock approach system. If improvements to this system could be coupled with lowering the cost of recovered paper stock, these types of pilot projects would prove worthwhile.

Pilot projects suggested by the mills include:

- Run vendor-supplied equipment trials at mill (or independent) sites to demonstrate increased fiber dispersion for easier removal of contaminants and fines and improved first-pass retention. Two value-added benefits of this type of project are increased system processing capacity (due to improved fiber dispersion) and more efficient cleaning and screening of dirt and fiber fines, which would allow the paper mill to use a lower-grade, lower-cost recovered wastepaper.
- Survey the stock preparation and paper machine whitewater system, identifying areas around discreet screening and cleaning equipment that would enhance process whitewater and mill effluent color removal during grade changes and wash-ups. (Several mills noted that high concentrations of color and fiber losses are most likely to occur during grade changes and wash-ups.) This would allow increased production, since less downtime would be incurred in changing grades and peak effluent loading on internal wastewater treatment systems or municipal POTWs would be reduced.

- Develop guidelines for local communities interested in implementing selective sorting techniques that would make their curbside wastes more attractive to mills that currently use recovered wastepaper as their raw materials. This could reduce loadings on municipal landfills or incinerators, and may result in a more usable, lower-cost material for the paper mills. Incentives should be considered as a means to gain interest from the local communities.

5.2 Current Pilot Projects

To help resolve some of the concerns associated with the use of recovered wastepaper, Massachusetts state agencies have implemented the following pilot programs:

- **Project One: Erving Paper Mills, Erving, Massachusetts.** The purpose of this pilot project is to evaluate the installation of a Beloit/Maule GR-Kneader to be used for improved fiber dispersion. As noted above, improved fiber dispersion increases the mill's ability to use a lower grade recovered waste paper and increase first pass fiber retention, resulting in increased production. High consistency pulp dispersion also has the potential to lower wastepaper furnish cost and increase optical and physical properties of recycled tissue. Better retention of fiber fines in the sheet means less solids loading in the mill process system and reduces the solids being discharged to a publicly operated waste treatment plant. Since a large and somewhat risky capital investment is required to test this proposal at mill scale, work will be done at pilot scale to determine the economic feasibility of the project.
- **Project Two: Creative Paper, Inc., Worcester, Massachusetts.** The purpose of this pilot project is to automate the present pulper reject dumping procedure and research specific equipment systems capable of filtering and screening out contaminants more efficiently. This pilot project will examine increased efficiency in screening out plastics and other non-fibrous materials found in recovered paper and paperboard. A re-circulation system will be installed, which should more efficiently separate usable fiber from the poly-coated papers, old corrugated waste paper, mixed waste, or curbside sorted recovered wastepaper. The work may include a simple water balance around the pulper and screening system. A preliminary flow diagram will be developed to determine equipment fiber and whitewater flow rates for uniform consistency loading. Cost estimates (including the cost of final engineering) and preliminary engineering needed to integrate the new equipment with the present pulper and fiber screening system will be part of the work scope. The improved removal of non-usable material at the pulper could increase the usage of recovered feed stock by 30 tons per day. In addition, contaminant removal at the pulper will prevent mill wide system contamination, allowing the mill to use greater volumes of recovered paper and a lower grade of mixed recovered waste paper products.

Results from these pilot projects should help paper mills and other players in the recycling industry in Massachusetts determine ways to improve their operations while at the same time helping expand paper recycling in the Commonwealth.

Appendix A
Paper Mill Recovered Wastepaper Survey

1. Facility Data

Date of Visit _____
Company Name _____
Address _____
Telephone/Fax _____
Facility Representative(s) _____
Title/Position _____

What is the company's current position on using recycled paper, such as:

Deinked post consumer waste _____
Unprinted paper stock _____
Printed stock _____
Curbside waste paper products _____
Other _____
Comments _____

If you are currently using recycled paper, what is your total furnish make up (by percent) and what restricts you from increasing these volumes?

If you are not currently using recycled paper as part of your product furnish, what restricts you from doing so? _____

Do you have an updated flow diagram of your mill process? Yes _____ No _____

Could you supply it to us? Yes _____ No _____

Comments _____

Do you have an updated stock and water balance for your mill process system?

Yes _____ No _____

If yes, is it by grade being produced? Yes _____ No _____

If not by grade, what operational standard does the flow diagram represent?

2. Operational & Production Data

Description of the product? _____
 What % is this of your total production? _____
 Bone dry tons per day max. _____ min. _____ avg. _____
 Basis weight max. _____ min. _____ avg. _____
 Max. bone dry tons produced in a 24 hour period _____
 Scheduled production hours per week _____
 Non-production hours allocated to changing grades (wash-up, color changes, etc.) _____
 Comments: _____
 Operating hours per week _____ Days per Year _____ Weeks per year _____

3. Paper Machine Stock Preparation Furnish Data

Bone Dry raw furnish to pulper (tons per day) _____
 Virgin Softwood Kraft. (tons per day) _____
 Virgin Hardwood Kraft (tons per day) _____
 Virgin Pulp Substitute (tons per day) _____
 Other furnish (note colored, printed or unprinted)
 recovered paper _____
 in-house wet broke _____
 dry broke _____

4. Stock Preparation Pulp Quality Requirements and Fiber Survey

What are your specified pulp handsheet beater curve requirements for the following tests?

	Hardwood	Softwood	Post-consumer waste paper	Other recovered paper	Comments
Freeness test (CSF,ml)					
Bulk test (cm ³ /g)					
Brightness (3.0g,%)					
Brightness (1.2 g,%)					
Handsheets basis wt. (g)					
Tear (mN*m ² /g):					
Breaking Length (km)					
Stretch (%)					
Dirt particle size (mm ²)					
Ash (%)					
Fiber Classification, Bauer Mcnett (%)					
+14					
+28					
+48					
+100					
+200					

5. General Comments

Of the following, what are the major constraints in blending post consumer waste or nondeinked recovered waste paper into your product line?

Need to modify the process Yes ____ No ____

Competitive marked quality restrictions Yes ____ No ____

Need technical assistance to evaluate Yes ____ No ____

Other _____

In order to implement the increased use of recovered waste paper what process modifications do you anticipate?

If you have considered blending recovered paper into your process, what modification costs will be required to do so?

What would be the magnitude of these costs? \$_____

Could you estimate what your savings would be (per bone dry ton) if you were able to use recovered waste paper versus virgin fiber pulp? \$_____

Comments by site visit survey team:

Appendix B
List of Massachusetts Paper Mills Participating in the
Paper Mill Recovered Wastepaper Survey

American Tissue Mills of Massachusetts
Aquagenics, Inc.
Bay State Paper Company
Byron Weston Company
Cascades Diamond, Inc.
Crocker Technical Papers, Inc.
Crown Vantage, Inc. (Adams Mill)
Erving Paper Mills, Inc.
Esleeck Manufacturing Company, Inc.
Fiber Mark
Fox River Paper Company
Haverhill Paperboard Corporation
Hollingsworth & Vose Company
Interstate Container Corporation
Kanzaki Specialty Papers
Mead Corporation (Specialty Paper Division)
Merrimack Paper Company
Natick Paperboard Corporation
Newark Atlantic Paperboard
Parsons Paper Company
Pepperell Paper
Rexam
Schweitzer Maudit International, Inc.
Seaman Paper Company
Sirius Pulp Inc.
Strathmore Papers
Vescom Corporation
Vogue Wallcoverings