Recycled Paperboard Technical Association

Using
Recycled Paperboard

A primer on recycled paperboard. Sources of fiber, contaminants and their removal and the impact on the properties of recycled paperboard

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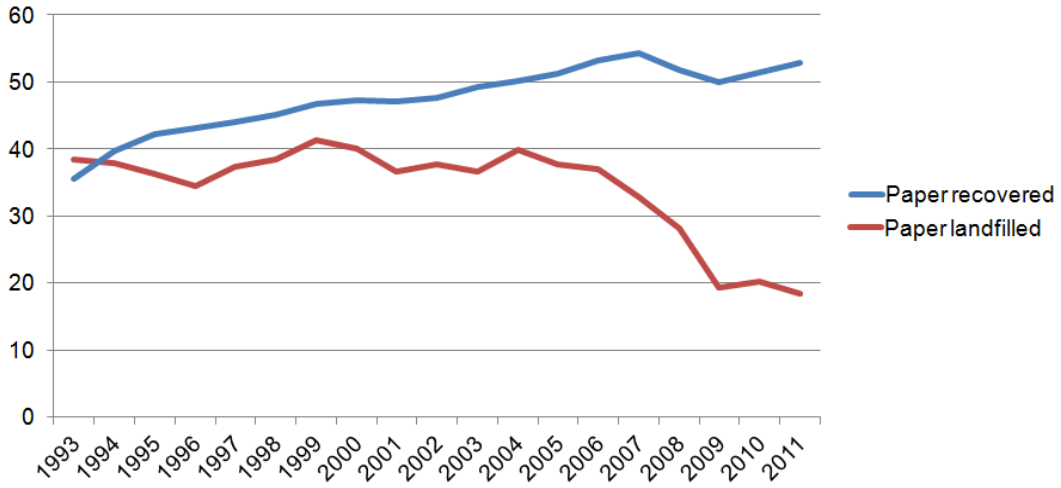
USE RECYCLED PAPERBOARD AND SAVE THE WORLD!

Saving the world by using recycled paperboard is a definite exaggeration. What is not an exaggeration is that far more paper is now recovered for reuse in the U.S. than is sent to landfills (Figure 1). Paper and paperboard constitute more than 73.2 percent of all packaging material diverted or recovered from the waste stream (Figure 2). Recovered paper is now a major source of fiber for the U.S. paper industry, constituting over 36.7 percent of its raw material. Recycled paperboard is the largest end market for recovered paper, consuming over 15.9 million tons per year in the manufacture of recycled paperboard products.

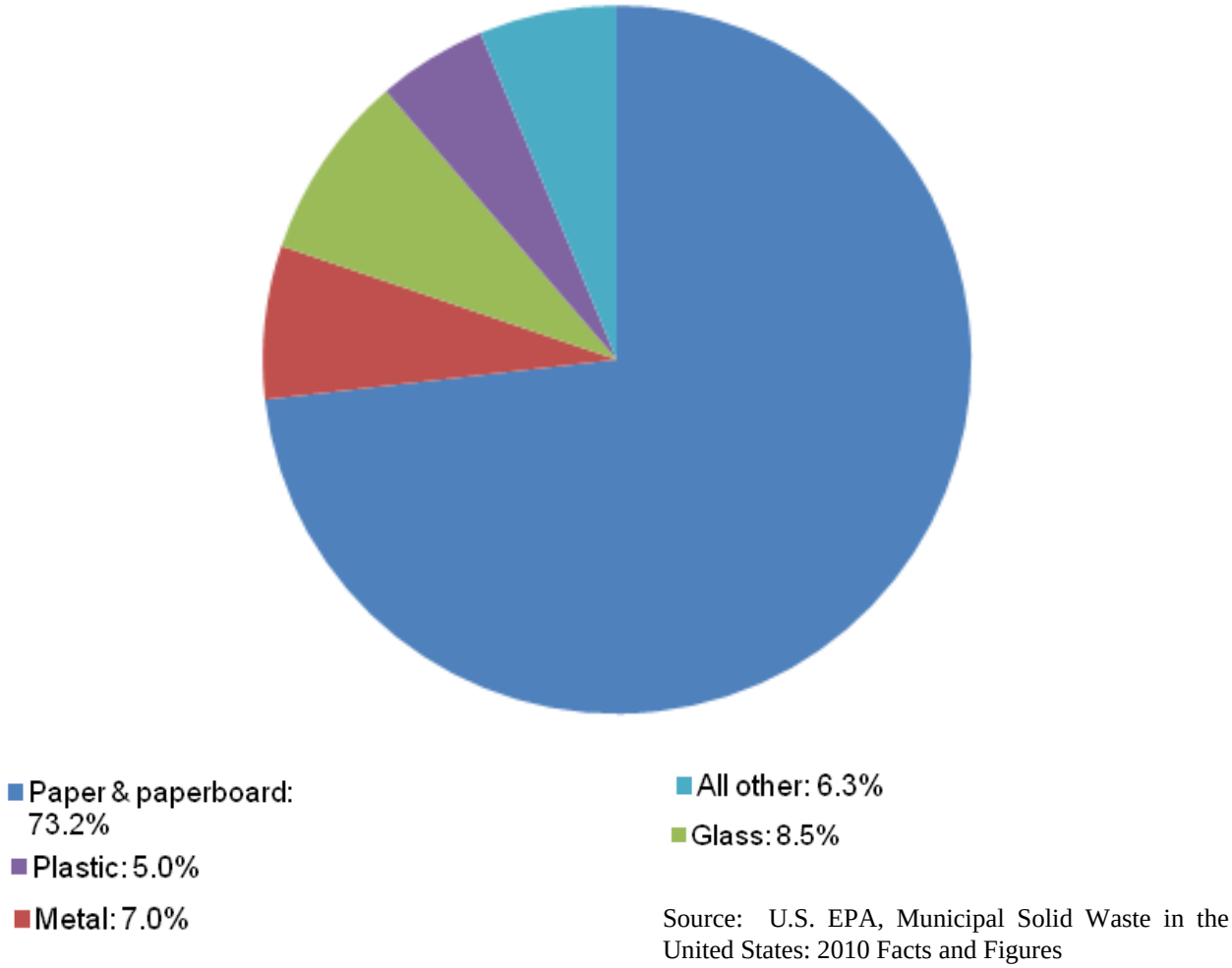
Recycling does not eliminate the need for landfills or the need to cut down trees. Recycling is, however, a wise use of all our resources, utilizing materials which would otherwise be discarded and extending our other resources into the future. As we increase our recovery of materials that in the past have been landfilled or incinerated, and as we strive to use recovered materials in more products, we face a variety of challenges.

Figure 1 – Paper Recovery vs. Landfill



source: paperrecycles.org

Figure 2 -- Packaging Recovery: Share of Total Amount Recovered by Type



Source: U.S. EPA, Municipal Solid Waste in the United States: 2010 Facts and Figures

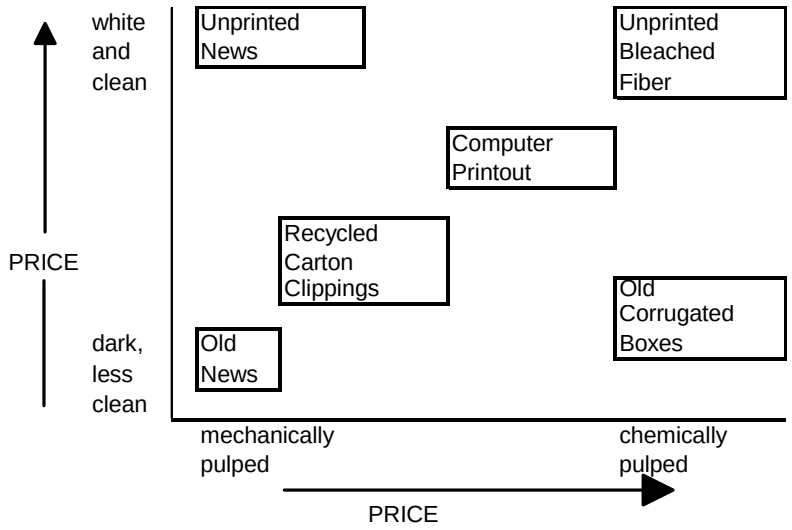
The Recycled Paperboard Technical Association (RPTA) is a cooperative venture of the nation's leading recycled paperboard manufacturers which, for over fifty years, has been dedicated to improving the recycled paperboard manufacturing process. RPTA works with its member companies and their customers to ensure that recycled paperboard meets the quality demands of the marketplace.

Common recycled paperboard applications include food packaging such as cereal boxes, cores and tubes, and as components in many other household and industrial products such as gypsum wallboard.

The first step in the recycling process is the collection of paper from homes, businesses and institutions. The paper is then sorted by type or grade. One of the primary grading criteria is the method by which the wood was transformed into paper fiber. In the Kraft process, the wood fiber is chemically separated. Kraft fibers, which are naturally brown, are commonly used in corrugated boxes and grocery bags, or are bleached for use in writing papers such as copy papers.

Another way to separate the wood fibers is to mechanically grind the wood into fibers small enough to use in the paper making process. Newspapers are primarily composed of mechanically processed wood fiber. The type and color of the recovered fiber helps determine the type of product which can be made from it. An old corrugated box is not easily turned into newsprint and old newspapers are not a good source of fiber for high quality printing and writing papers. These factors greatly influence the price of recovered paper (Figure 3)

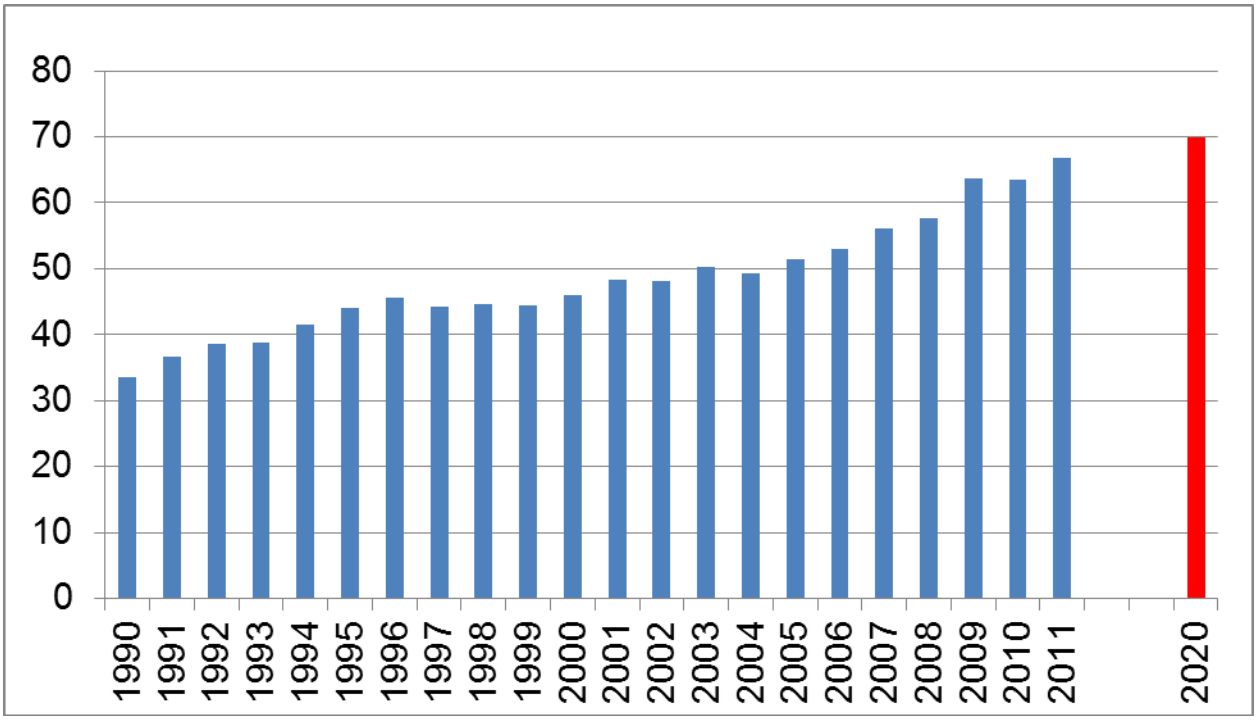
Figure 3 – Price/Quality Factors for Recovered Paper



In addition to the type of fiber, another critical factor affecting the recovered paper markets are the many ways in which paper can be contaminated. Currently, over 66.8 percent of all the paper and paperboard produced in the United States is recovered for recycling. A new recovery goal

of 70 percent by the year 2020 has recently been set (Figure 4). The increase in the recovery rate has led to a corresponding increase in the level of contaminants found in the recovered fibers, and creates new challenges in meeting quality expectations. While the public has a strong preference for recycled paperboard, they are not willing to accept imperfections in the products they buy.

Figure 4 - U.S. Paper Recovery Rate



Source: paperrecycles.org

What are these contaminants? Anything that is mixed with the recovered paper that is not wood fiber can be considered a contaminant. Printing inks and glue are the most prevalent contaminants, as one or both are inherent in most paper applications. A box that does not hold together or a newspaper without printing is of little value. The majority of recycled paperboard mills have learned to make quality products without removing the inks or glues which are commonly found in recovered paper. RPTA and other industry groups are working with the manufacturers of inks and adhesives to reduce the effect of these contaminants on the entire recycling process.

Bales of recovered paper ready for recycling. These bales are made of old corrugated boxes. Bales from other sources are segregated to be used in a recipe creating the desired characteristics in the final product.

Banks of centrifugal cleaners remove high specific gravity contaminants.

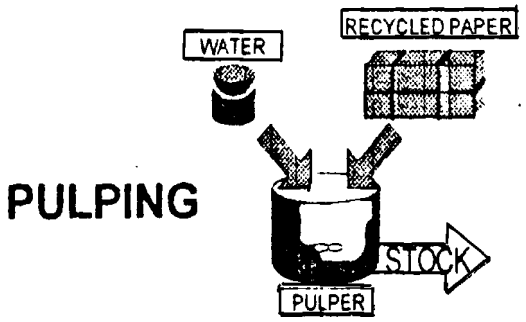
Other contaminants are added to paper products to improve their usefulness or to enhance consumer eye appeal including, for example, plastic laminates, plastic resealable or easy open features, wax or other impervious coatings. These contaminants may limit or eliminate the potential use of recovered fiber in the recycling process.

The recovery process itself introduces additional contaminants to the recovered fiber supply, including glass, metal, plastics, stones, and sand. As more communities move toward single-stream collection – that is all recyclable materials are put in the same bin -- paperboard mills have seen an increase in these types of contaminants. At the extreme, paper that is mixed with garbage cannot be recycled, and becomes garbage itself.

Elimination of contaminants at the source is the most reliable means to improve the quality of recovered paper. Consequently there are sources of wastepaper that are less contaminated than others. The recovered fiber from the printer or the box manufacturer is generally cleaner than that picked up at curbside from a municipal recycling effort.

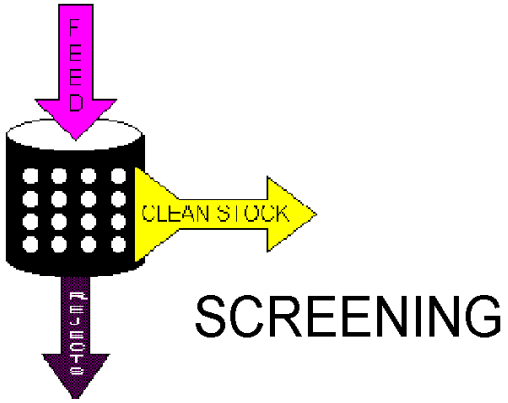
In the second step of the recycling process, the recovered paper is turned into pulp. Recovered fiber is mixed with water in a large pulping tub. A large impeller in the pulping tub separates the fibers and forms a thin slurry (Figure 5). About 20 pounds of water are used for each pound of paper in the slurry. Most of this water is reused within the mill.

Figure 5



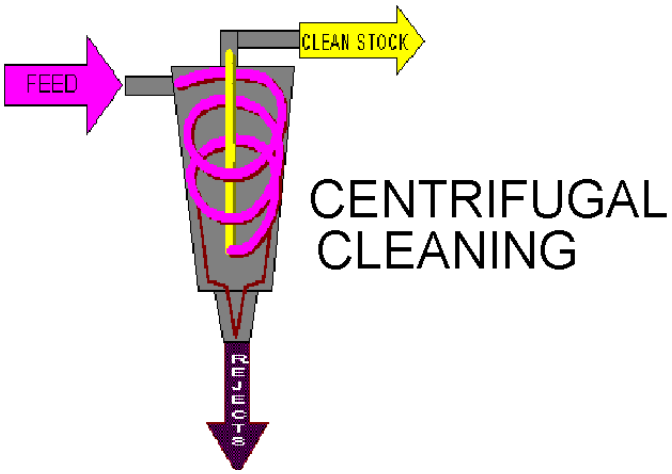
When the paper is mixed with water, contaminants can be separated and removed based on two characteristics: size and density (weight per unit volume). The slurry is first pumped through a variety of screens which remove large contaminants such as stones and large pieces of glass, plastic or metal (Figure 6). The oversized particles can be either returned to the pulper for fiber separation or they can be removed from the process completely.

Figure 6

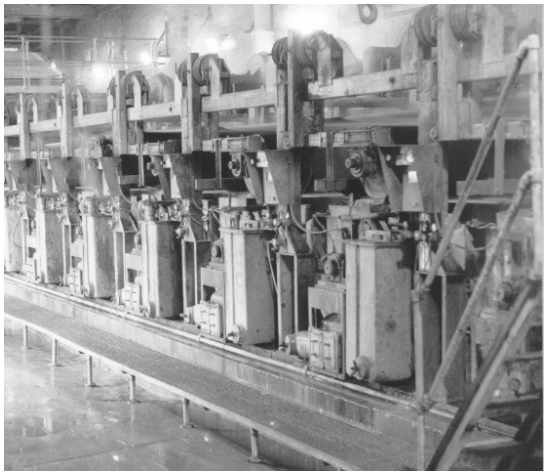


After the large contaminants are removed in the screening process, other methods are used to remove the smaller contaminants. Contaminants that have a different density than the fibers can be removed by centrifugal action (Figure 7). Centrifugal cleaners can be designed to remove heavier materials such as sand, glass, staples, and paper clips when the slurry is spun around at high speeds. Some cleaners are designed to remove materials lighter than the fiber, such as plastics like polystyrene.

Figure 7



No cleaner is 100 percent efficient at separating and removing contaminants from the blend of fibers. Consequently, a series of cleaners is necessary to produce recycled paperboard that meets today's stringent quality demands. In addition to removing contaminants, the cleaning process removes fibers which are damaged or too short for the intended end product. Because some fiber is always lost in the recycling process, the nation's paper recyclers are dependent on the continuing utilization of fiber harvested from trees.



The paper machine receives the thin slurry, forms a mat by draining water, and transfers the mat to a felt.

After drying the multi-layer fiber mat, it is coated and then rolled and slit to its final size.

The final stages of the papermaking process begin after the fiber is cleaned and the pulp is delivered to the papermaking machine. On the paper machine, the paperboard is built up in multiple plies or layers. The different layers of the paperboard can be made from different types of fiber, or fiber blends. If, for example, high quality graphic images are to be printed on the paperboard, the outer layer will be made of clean white fiber. Old newspapers, on the other hand, may be found in the interior layers of the paperboard, while recovered fiber grades with longer, higher quality fibers may be found on the top or the back of the sheet.

The thickness and weight of the sheet, along with its appearance and strength can be adjusted to match the end-use requirements of the final product. The ability to tailor the paperboard properties to the specific application or end use is one of the reasons for the broad use of recycled paperboard.

As the nation's recycled paperboard producers increasingly rely on recovered paper grades which just a few years ago would have been landfilled or incinerated, RPTA is working to ensure that the use of lower quality, contaminated raw materials does not undermine the quality of the final product. In fact, the industry's recent experience is just the opposite. As a result of manufacturers' efforts to improve the efficiency of the fiber cleaning and screening equipment, the modern mill has the ability to produce paperboard of higher quality than was possible even a few years ago. To counter the increasing contaminant trend, programs are also being instituted to educate consumers on what materials are considered contaminants by the recovered fiber users. Consequently, more and more traditionally virgin fiber consumers are finding recycled paperboard a preferred packaging material for both graphical as well as environmental marketing strategies.

RPTA and its members continually strive to develop means and methods to use more recovered fiber in the production of recycled paperboard which can be converted into usable and needed, high quality products. Using recycled paperboard will not save the world, but it will make it a nicer place to live.

[This is one of a series of Technical Bulletins published by the Recycled Paperboard Technical Association to inform its members and others about the recycled paperboard industry. For a full list of other bulletins available call or write the address listed below.]

The Recycled Paperboard Technical Association (RPTA) is dedicated to the improvement and use of recycled paperboard and related products. Founded in the early 1950's as the Boxboard Research and Development Association, RPTA represents paper companies worldwide which manufacture products that contain at least 90 percent recycled fiber. RPTA supports training, scientific research, product stewardship, materials investigations, benchmarking and survey work. These efforts enable our members to improve the conservation and utilization of raw materials and energy which, in turn, enables them to reduce costs and improve product and manufacturing quality. While the information contained within is believed to complete as of the publication date, RPTA disclaims any and all warranties, expressed or implied.

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