OVERVIEW OF EFFECTS OF RECYCLED FIBER USE

Introduction

Recovered fiber begins its life as virgin fiber, from harvested wood. Much of the virgin fiber that enters the paper fiber system, shown below, is used repeatedly before it is finally discarded. Sometimes recovered fiber is used to make the same product and sometimes it is moved to another point in the system where it is used to make a different product.

The types of fibers used by a mill are dictated by the product's performance requirements (brightness, absorbability, strength, etc.), cost considerations, the mill's processing equipment, and the customer's needs.

Recycled fiber is not separate from the industry's overall fiber system. The diagram below shows that the virgin fiber and recycled fiber systems are really part of a single wood fiber system. Recovered fiber would not exist if virgin fiber were not harvested, processed and placed into the wood fiber system. Likewise, with over 30% of the industry's fiber coming from recovered paper, the industry would be hard pressed to meet the demand for its products without recovered fiber. Both are required. Virgin fiber is generally used in those applications where it provides needed strength, brightness or surface properties at a competitive cost. Likewise, the use of recovered fiber is dictated by considerations of price and performance in specific applications.

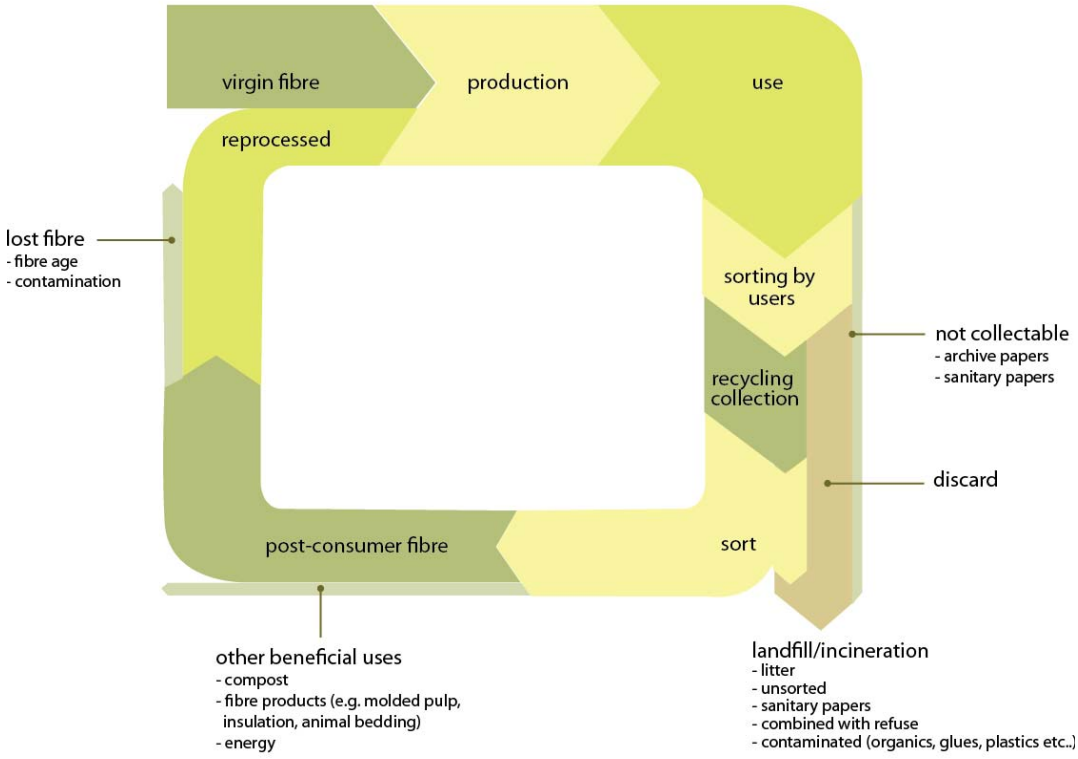

Figure R1 Generic Fiber System Illustrating Flow of Recovered Fiber (Source: Environment Canada 2011)

Defining Paper "Recycling" vs. "Recovery"

To understand the environmental effects of paper recycling, it is necessary to understand the difference between paper "recovery" and paper "recycling." Paper is *recovered* when someone separates paper from other parts of the waste stream in a form that it allows it to be reused instead of discarded. Because the fate of non-recovered paper is often known (e.g., in the U.S. about 80% is landfilled) it is often possible to estimate the effects of recovering used paper by looking at the emissions that would have occurred if the material had be discarded instead of recovered.

Effects of Recovering and Recycling Paper

When recovered paper is used by paper or paperboard mills, we call it *recycling* (or in the industry's terminology, recovered paper utilization). The environmental effects of increased paper recycling by a company are much more difficult to know than the effects of overall used paper recovery. This is because there are many different competing uses for recovered paper. You need to ask yourself, "If I had not used this recovered paper, what would have happened to it?" This is often a difficult question to answer because, once recovered, used paper has many uses and is unlikely to be disposed of.

Many studies assume that the environmental effects of increased recycling include the effects of diverting material from disposal (i.e., recovery), but there are many circumstances where alternative assumptions may be equally valid, especially where recovery rates are approaching practical maximums and where exports are limiting the availability of recovered fiber for domestic use.

A report by Metafore (*The Fiber Cycle Technical Document*, available at http://postcom.org/eco/sls.docs/Metafore-Paper%20Fiber%20Life%20Cycle.pdf) explored the degree to which use of recovered fiber has been optimized in North America. The report found that

- the U.S. and Canada continue to increase recovery rates;
- recovered fiber is fully utilized;
- recovered fibers are fairly short-lived;
- different grades of paper utilize recovered fiber more efficiently than others but yield is reduced with every pass;
- increasing recovery is the key to improving the efficiency of the fiber cycle; and
- even at the highest possible recovery rate, the fiber cycle will continue to require significant inputs of virgin fiber to continue to produce paper.

In summary, the effects of increasing paper *recovery* are relatively clear because the alternatives to recovery are usually landfilling or burning. The effects of increased *recycling* for a particular use, however, are much less certain because there are many competing uses for recovered fiber and once recovered, the fiber is relatively unlikely to be discarded.

Questions related to the environmental aspects of recovering and recycling paper have led to a number of studies executed using the principles of life cycle assessment (LCA). NCASI has undertaken two reports that provide an overview of the methodological choices made in these studies, along with the implications of their selection when applied to the treatment of paper recycling within LCA (NCASI 2011, 2012). NCASI (2011) identifies seven overarching issues that drive the results of recycled fiber-related LCAs, or for which there is still too much uncertainty to fully understand their potential effect on LCA results:

1. impact of land use and alternative usage of the forest area;
2. the type of energy (i.e., fuel type and whether it is as power or heat) used during virgin and recovered fiber processing;
3. the type and amount of energy displaced when burning waste paper;
4. current capabilities of toxicity-related modeling for LCA impact indicators;

5. assumptions regarding the degree of paper degradation in landfills and the approach used for modeling of biogenic carbon dioxide;
6. the selected allocation procedure for recycling, in cases where virgin and recycled paper are compared; and
7. recycled-to-virgin fiber substation ratio.

Overall, the existing knowledge on LCA and paper recycling does not allow for general conclusions to be made regarding the environmental superiority of using recycled or virgin fiber for paper production.

Industry Performance

The industry has continued to encourage increased paper recovery, and to optimize the use of that fiber in its overall fiber system. In both the U.S. and Canada, paper recovery rates have steadily grown over time, as shown in the charts below.

The industry has placed increased focus on recovering waste material from recycling processes to generate other products. Traditional management has been to landfill these materials, but research and practice with alternatives are increasing. Old corrugated container rejects are most commonly used as fuel, particularly in mill power boilers that have been designed for traditional solid fuels. These rejects are also burned in municipal or commercial energy facilities and have been employed as a fuel pellet ingredient. For plastic rejects, the predominant beneficial uses are in wood-plastic composite lumber and in fuel pellets. NCASI has published a report on these beneficial uses (NCASI 2000).

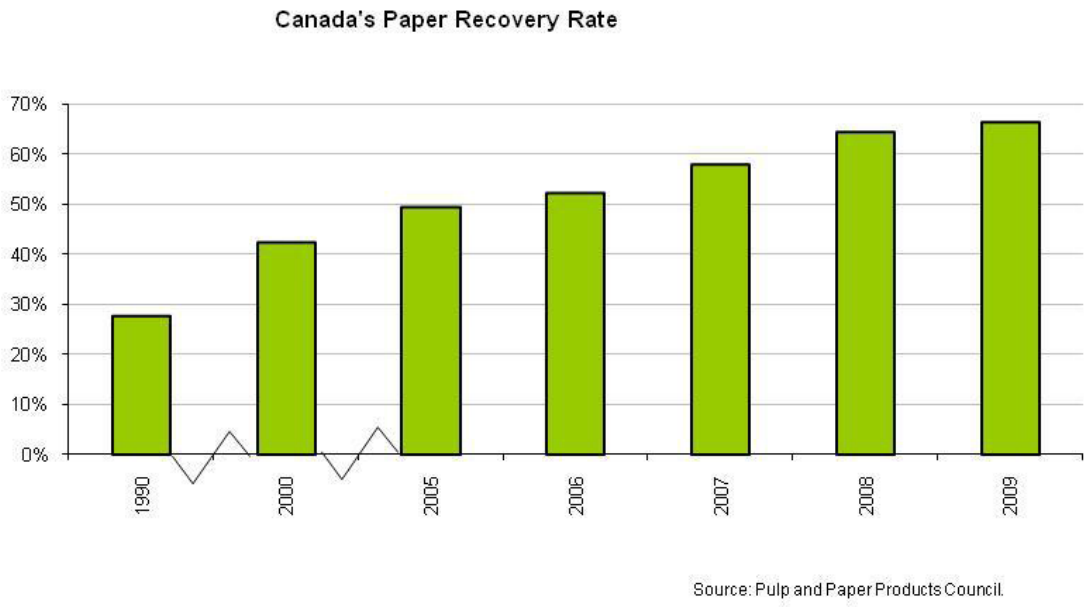

Figure R2 Canada's Paper Recovery Rate
(Source: Pulp and Paper Products Council as cited in FPAC 2012;
http://www.fpac.ca/publications/FPAC-Recycling_and_Fibre_Cycle-White_paper_FINAL.pdf)

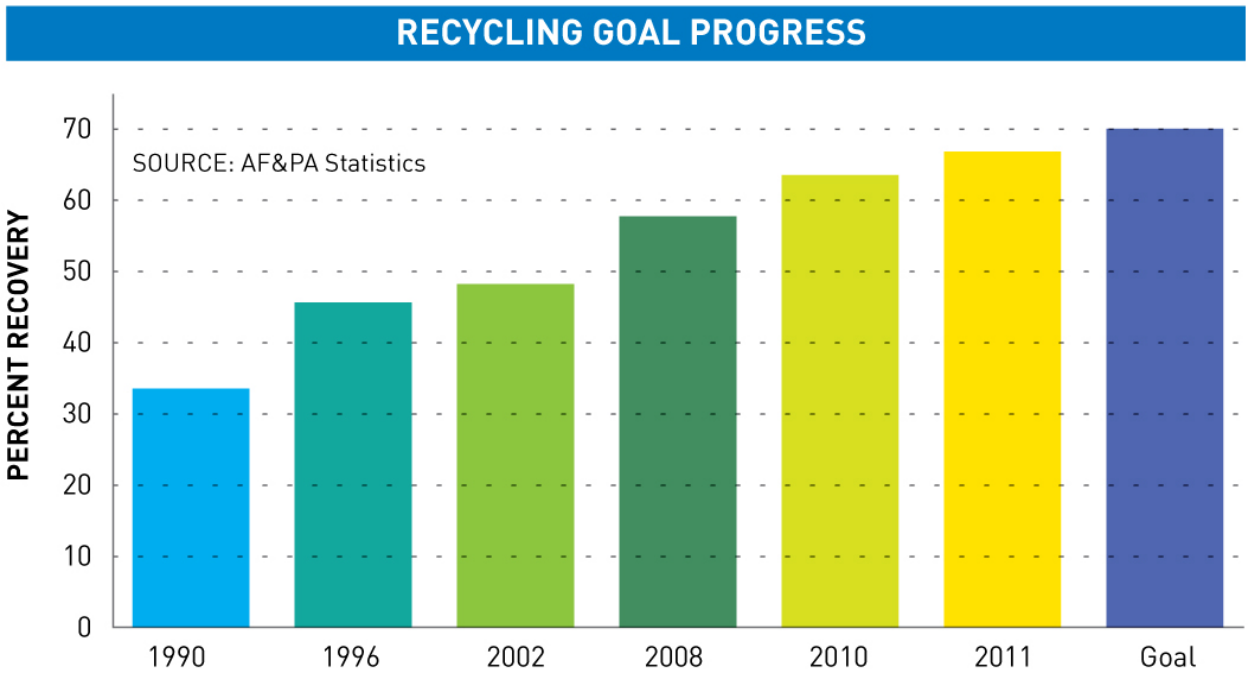

Figure R3 U.S. Paper Recovery Rate and AF&PA Recycling Goal
(Source: AF&PA 2012; http://www.afandpa.org/docs/default-source/default-document-library/2012-af-amp-pa-sustainability-report.pdf?sfvrsn=0)

Opportunities for Improvement

It is sometimes assumed that increased recycling creates a new demand for recovered fiber that, in turn, results in increased recovery. Whether this is true depends on a number of things. For instance, for several types of recovered fiber (e.g., old corrugated containers and old newsprint) the recovery rates are approaching practical limits (between 70% and 80% is recovered). This means that there is essentially a relatively stable pool of these types of recovered fiber, and if more is used in one type of product there will probably be less used in another type of product. This is especially true nowadays, where recovered paper exports from North America have grown to such an extent that an increase in paper recovery actually does not make more recycled paper available for domestic consumption. That said, the industry continues to seek opportunities to increase recovery of all types of paper, and continues to integrate recovered fiber into the supply chain.

Challenges to Increasing Recovery and Recycling

Foreign demand for recovered fiber from the U.S. has increased significantly in recent years, increasing competition for the resource. The fraction of paper and paperboard recovered for reuse in the U.S. nearly doubled between 1990 and 2012, to roughly 65%, but exports of recovered paper to China and other nations absorbed 41% of the paper collected for recycling in the U.S. in 2012, according to the American Forest and Paper Association (AF&PA); http://paperrecycles.org/statistics/where-recovered-paper-goes. This export rate continues to be a significant challenge in terms of ensuring a strong domestic source of recovered fiber for recycled paper mills in North America.

Effects of Recycled Fiber Use

General Overview

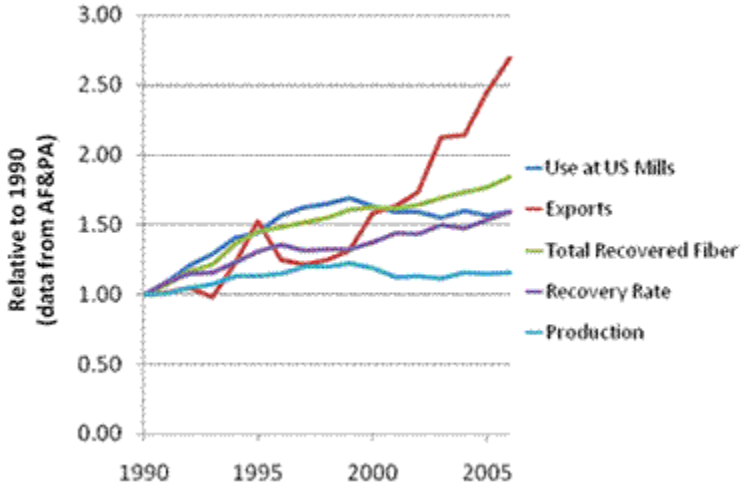

Figure R4 Recovered Fiber Trends
(Source: AF&PA)

Municipal paper recovery programs continue to expand in North America. The increased introduction of "single stream" recovery programs has, however, led to technical challenges for the industry in terms of reducing the relative recovery of usable fiber. Financial challenges for smaller communities in establishing effective paper recovery programs continue to limit paper recovery to larger population centers and locations where transportation of recovered fiber to paper mills is not prohibitively expensive.

Information on fiber recovery and use is available from the American Forest and Paper Association (AF&PA) at http://paperrecycles.org/statistics and from the Forest Products Association of Canada (FPAC) at http://www.fpac.ca/publications/FPAC-Recycling_and_Fibre_Cycle-White_paper_FINAL.pdf.

References

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