ENVIRONMENTAL FOOTPRINT COMPARISON TOOL

A tool for understanding environmental decisions related to the pulp and paper industry

OVERVIEW OF EFFECTS OF DECREASED WATER USE

Introduction

Water is required for various purposes in a pulp or paper mill. Water is used to carry fibers and chemicals, to cool process equipment, for cleaning, and for many other purposes. Water is also necessary for developing the chemical bonds between cellulose fibers that give paper its strength.

In this area of the website, you will learn about what happens to other parameters when you attempt to reduce water use and effluent flows.

Definitions

There are a number of terms that are used to describe the pulp and paper industry's usage of fresh water. "Water use" is the total amount of water used by a facility for process and cooling needs. Water use is generally equivalent to water intake. "Water consumption" is the portion of water that is removed from a water source that is not immediately returned to the water source. Examples of consumptive water losses include evaporative losses and water leaving with product and solid residuals. "Effluent" is the water discharged from a facility. Effluent is often subcategorized into treated effluent (effluent that is treated biologically to remove organic material) and clean cooling water effluent (water used for cooling duties that is clean but usually of a higher temperature than the water entering a mill).

Defining a "Water Footprint"

A "footprint" is a term often used to describe the relationship between an activity, such as manufacturing a product, and an environmental endpoint of interest. The concept of water footprints has recently become part of discussions concerning the sustainability of businesses and their products. There are a number of initiatives focused on water sustainability and many of these initiatives are international. Most are sponsored by environmental non-government organizations (ENGOs), governments, business, and/or trade associations. Most initiatives have developed or are in the process of developing measures of water sustainability. These measures typically go beyond merely the use of water for manufacturing and consider potentially more significant aspects such as water consumption (or loss of water from local systems) and the ecosystem and human impacts related to the use water.

Industry Performance

The pulp and paper industry has a long history of water use reduction. Since 1959, there has been a 69% reduction in the average treated effluent flow volume at pulp and paper mills within the United States. Figure W1 shows the progress the U.S. pulp and paper industry has made in water reduction over the last half century. Figure W2 illustrates similar progress made by the Canadian pulp and paper industry. Apparent from Figure W1 is a flattening of the progression curve since the mid-1990s as further water reduction within the industry becomes more difficult due to technical and economic factors.

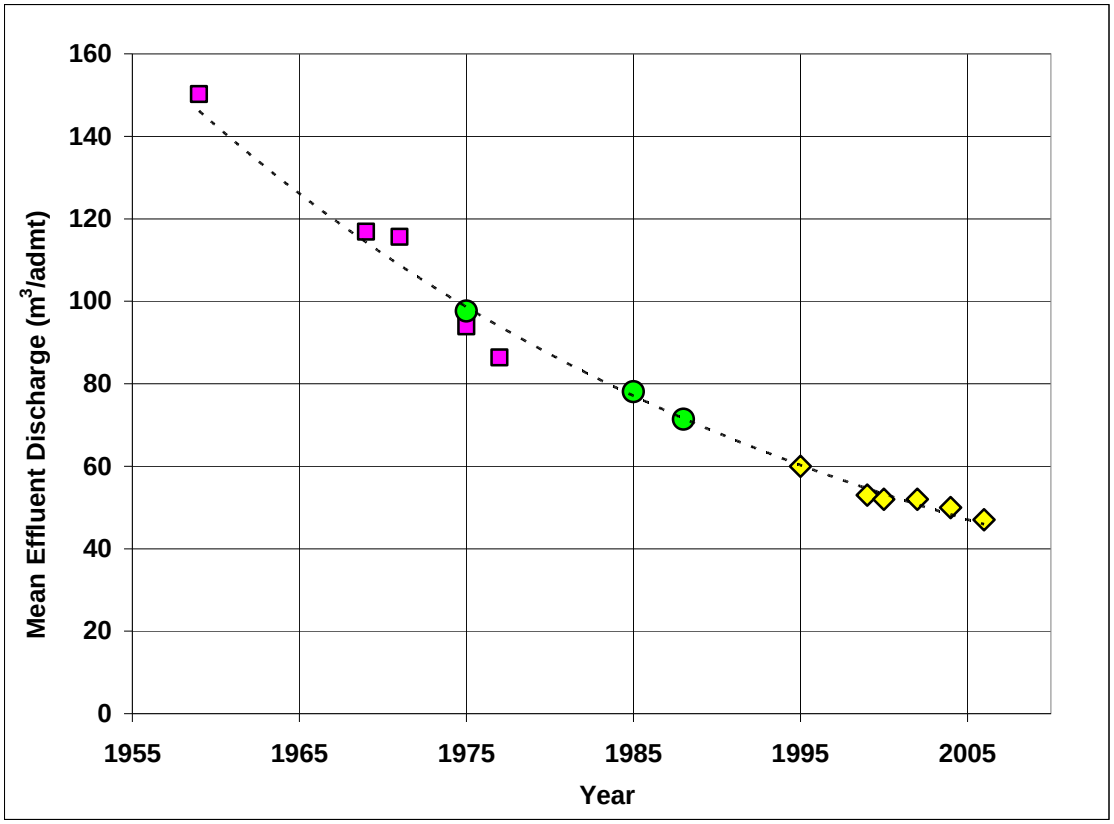

Figure W1. Reductions in Effluent Flow over Time in the U.S. Pulp and Paper Industry.
[Squares are production weighted means from NCASI (1983); circles are means from Miner and Unwin (1991); diamonds are production weighted means from NCASI (2009a). Effluent discharge is water discharged from the waste treatment facility. Some mills include cooling water discharge in their reported effluent flow, while other mills do not.]

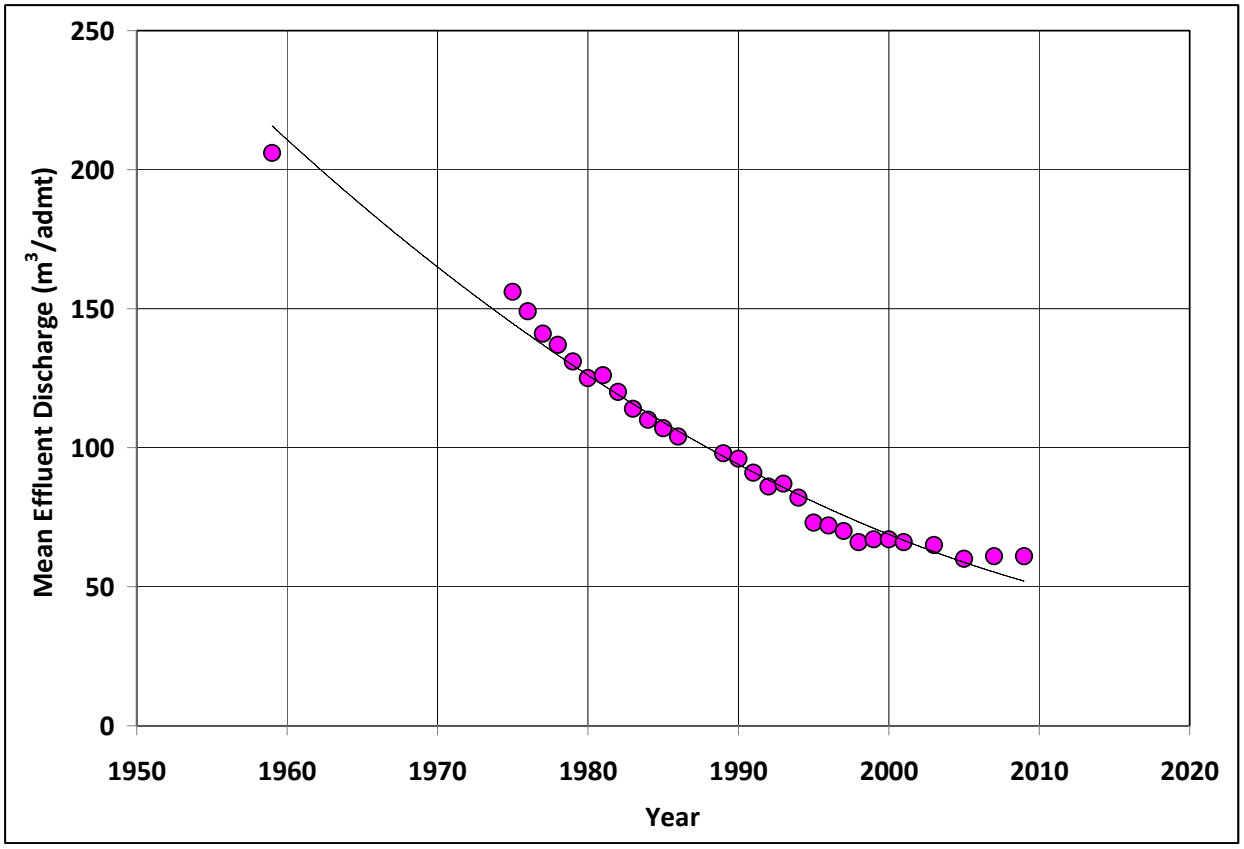

Figure W2. Reductions in Effluent Flow over Time in the Canadian Pulp and Paper Industry
[Source: Forest Products Association of Canada]

Water profiles published for the forest products sector in the U.S. and Canada (NCASI 2009a, 2010) illustrate the nature and extent of water use, recycle, and release associated with the North American forest products sector. Forests act to process precipitation into high-quality surface waters, and in North America, most surface waters are derived from forested areas. Forest management can affect water quality, but the use of forestry best management practices greatly minimizes harmful effects. Manufacturing of pulp and paper is water-use intensive relative to most other industries, although the amount of water consumed (i.e., evaporated or exported with product or residuals) represents a small fraction of the overall water used.

Opportunities for Improvement

There continue to be a number of significant water use reduction opportunities within pulp and paper mills. These opportunities are generally site-specific in nature, and require the consideration of a given operation's unique characteristics. Decisions made by a given facility incorporate consideration of the related co-benefits and trade-offs that are discussed elsewhere in this Tool.

A number of references have detailed information on water use reduction within the pulp and paper industry, to help guide specific facilities towards approaches that may be appropriate for their operations. One reference (NCASI 2009b) looks at the operating practices at low water use mills in North America and Scandinavia and has a section on water conservation principles, with many specific examples of mill opportunities for water reduction. A second publication on water use reduction within the pulp and paper

industry (Browne 2001) provides overviews of water reduction possibilities by mill process type, as well as engineering methods and techniques for reducing water.

Challenges to Further Water Reduction

Recycling of water used in the pulp and paper process is limited by the accumulation of dissolved matter from wood and other raw materials entering the process. Using recycled water within the process entails replacing fresh water with recycled water. Contaminants will accumulate within the process if the recycle stream contains contaminants not present in the fresh water, or present at higher concentrations. Some of the problems associated with contaminant accumulation are deposition and scaling, foaming, corrosion, stream dead load, and degradation of the end product quality parameters. While strategies for controlling these contaminants can be developed, the degree to which further water reduction can be achieved becomes a site-specific challenge.

References

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