

# Water Usage in Papermaking

As large industrial users of water, the pulp and paper industry has long managed water in the context of a regulatory environment. While access to water is an issue of global concern, it is critical to recognize local, site-specific resources. At Sappi, we derive 100% of our process water from surface sources and return over 90% of it to the same, or nearby, sources. Water is used in all major manufacturing stages and to generate steam for use in processes and on-site power generation. As with all environmental matters, we also understand that our impact extends beyond our mill gates. Herein we present a holistic view of water usage for papermaking.

## The Importance of Our Forests

Nearly two-thirds of freshwater in the US originates from forests; as such, society and industry have a shared interest in maintaining forests and the water resource benefits of forested land. Forests act to filter precipitation into high quality surface waters. Forest management practices can help minimize impacts to surface and groundwater by controlling erosion and promoting regrowth.

## Seasonal Variability

Incoming water quality will vary over the course of the year depending on weather conditions and seasonal changes. For example, in the fall, when leaves are coming off the trees, there is more debris and organic material in the river. In the winter, water contains more dissolved oxygen and fewer contaminants. Water flow tends to be highest in the spring as snow melts in the watershed.

## 1. Sources of Water

Freshwater sources are generally described by two categories: surface water and groundwater sources. Surface water sources include streams, rivers, lakes and reservoirs. By contrast, groundwater is held underground in the soil or in pores and crevices in rock. 100 percent of Sappi's process water is derived from surface sources. The Kennebec River supplies the Somerset Mill, the Presumpscot River supplies water for Westbrook Mill and Lake Superior and the St. Louis River provide water for our Cloquet Mill.

## 2. Wood Deliveries

In addition to freshwater intake, water enters the papermaking process with raw materials. For example, a 20-ton truckload of logs contains roughly 2,400 gallons of water.

## 3. Water Use

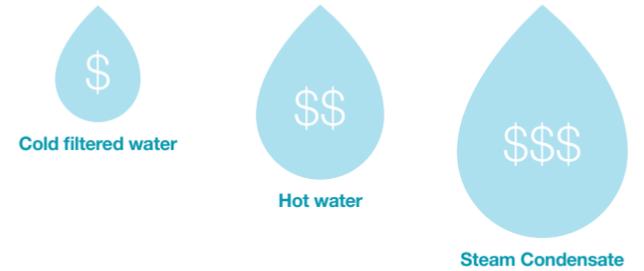
Water is used in all major process stages, including raw materials preparation (e.g., pulping and bleaching) and paper machines (e.g., pulp slurry dilution and fabric showers). Water is also used for cooling, materials transport, equipment cleaning, general facilities operations, and to generate steam for use in both thermal and mechanical processes as well as on-site electricity generation. Overall water intake has been reduced annually through various conservation efforts. Our 2013 water usage was 9.9% less than 2009.

## 4. Water Reuse

Water is reused in various forms throughout the mill and requires different levels of treatment depending on its use. For example, water used in the steam systems (boiler feedwater) must be purified to minimize corrosion. Once steam is condensed it is recaptured and reused in the steam system. By contrast, raw water can be used without any treatment for non-contact cooling systems and can be returned directly to the river as long as it is not too warm.

## Relative Cost of Water

The various water systems within the mill have vastly different costs based on electricity consumed for pumping, energy used for heating and any treatment processes required for either incoming or outgoing streams. A hose left running could cost over US\$30/day and steam leaks can be very costly if not repaired quickly.



## 7. Evaporation

Throughout the process, especially on the paper machines and cooling towers, water is converted to water vapor and is emitted from the process. These vaporized sources reenter the atmosphere and ultimately will end up as precipitation in the local ecosystem.

## 5. Hydroelectric Power

In addition to providing freshwater, local rivers provide a source of renewable energy for two of our mills. The Cloquet Mill operates four small hydroelectric generators on the St. Louis River with a total generating capacity of 6.5 megawatts (MW). The Westbrook Mill operates six small hydro stations along the Presumpscot River with a total generating capacity of 8 MW.

## 6. Wastewater Treatment

Most of the water used in the pulp and papermaking process requires treatment prior to discharge to any receiving waters. Solid materials collected in the various treatment stages are dewatered and used as a fuel for energy production. Converting waste to energy also reduces the volume of organic materials sent to landfill. At our mills, once the water is used, reused and treated, it is returned to surface water sources. In fact, over 90% of the water intake is returned.