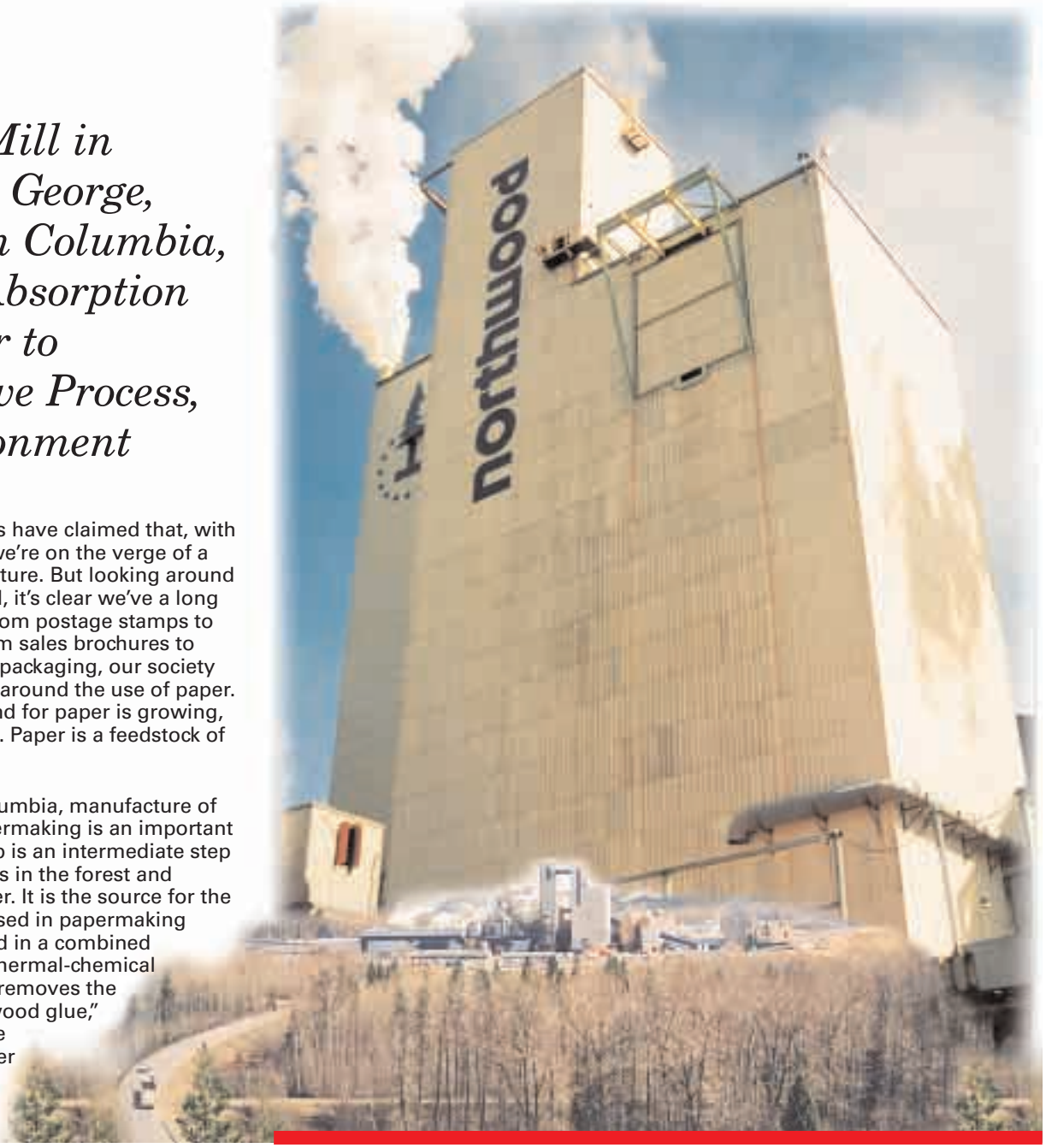
Case Study
Northwood Pulp Mill

Prince George, British Columbia



Pulp Mill in Prince George, British Columbia, Uses Absorption Chiller to Improve Process, Environment

Some experts have claimed that, with computers, we're on the verge of a paperless culture. But looking around today's world, it's clear we've a long way to go. From postage stamps to currency, from sales brochures to invoices and packaging, our society still revolves around the use of paper. World demand for paper is growing, not declining. Paper is a feedstock of civilization.

In British Columbia, manufacture of pulp for papermaking is an important industry. Pulp is an intermediate step between trees in the forest and finished paper. It is the source for the wood fiber used in papermaking and is created in a combined mechanical-thermal-chemical process that removes the lignin, the "wood glue," that holds the fibers together in wood.

TRANE®

World demand for paper is growing, not declining.

Northwood pulp mill uses water from the Fraser River for pulp bleaching. As water temperatures rise in the spring and summer, absorption chillers are used to chill the bleach water to hold chlorine dioxide in solution.

Finished Pulp Ships to Paper Manufacturers

Commonly in British Columbia, pulp is produced from forest products at a pulp mill and is then shipped in bundles of dry sheets to paper mills nearer the paper markets in Canada, the U.S. and around the world. Such is the case with the pulp mill of Northwood Inc. in Prince George, British Columbia (BC). The mill employs 625 and ships pulp by rail throughout North America and via ship from the ports at Vancouver, Squamish and Prince Rupert, British Columbia, to overseas markets.

Northwood is a joint venture of Canada's Noranda Forest Inc. and the Mead Corporation from the U.S. Northwood operates a range of forest product ventures including mills for kiln-dried dimension lumber and plywood, wood-preserving operations, chipping plants and the pulp mill. In addition to the processing facilities, Northwood conducts extensive forest management operations at the J.D. Little Forest Centre, the heart of the company's reforestation operation. The company has planted over 50 million tree seedlings on public lands on which it holds government harvesting licenses in British Columbia.

Feedstock for the mill is softwood chips from local sawmills and distant locations. The mill also receives wood waste to feed boilers that provide process steam, including the absorption chillers for the bleach water.

The Trane absorption chiller uses saturated steam to chill the filtered river water.

Pulp Chips A Byproduct Of Lumber Operations
Prince George is located about 400 miles north of Vancouver on the Fraser River. The Northwood pulp mill receives chipped wood from nearby sawmills by truck and from distant locations by rail. The chips are a byproduct of dimension lumber and plywood operations. In addition, reject logs are chipped and used for pulping. Over 60 percent of the feedstock for the mill is from Northwood operations at other sites. The sprawling pulp plant uses the kraft process for cooking and whitening the pulp as it is transformed from chips to sheets of finished dry pulp.

The wood processed at this plant is so-called "softwood"...chips from coniferous trees, mostly white spruce and lodgepole pine. Softwood pulp is particularly desirable because its long fibers add strength to paper. It can be bleached to a brilliant white, making it attractive for print applications. The pulp from the plant goes for many high quality paper products including currency, stamps, bond paper, tissue, magazines and business papers.

The chip feedstock is screened, digested (cooked), washed, screened and bleached before being formed into sheets of pulp and dried. It is within the chemical preparations area that the absorption chiller is used. Like many other pulp mills, this plant originally used elemental chlorine as a bleaching agent. Because of environmental concerns regarding the effluent, this mill like many others has converted to an elemental chlorine-free (ECF) bleaching operation. The process uses chlorine dioxide (ClO2) as a bleach agent because of its environmental compatibility and bleaching efficiency. The mill also uses other bleaching agents such as oxygen and hydrogen peroxide.

Chlorine Dioxide Needs Low Temperatures To Stay In Solution
Because of its chemically unstable nature, chlorine dioxide for the bleach solution is generated at the site in a chemical process involving a mixture of sulfuric acid, sodium chlorate and methanol. A total of 55 tons per day of ClO2 is produced. The chlorine dioxide is mixed with water drawn from the Fraser River to create the bleach solution.

Normally the Fraser River water goes through three annual stages. In late fall and winter, the water runs cold and clear and requires little treatment. Some filtration before mixing in the bleaching process can take place. In spring the river water becomes turbid and requires more pretreatment to remove discoloration. In late spring through early fall, the water clears and warms up. During this period of the year, the challenge is to hold the chlorine dioxide in solution.

Process absorption chillers installed at Northwood are single-stage units.

At temperatures above 12 C (54 F), chlorine dioxide gas does not readily absorb into solution, dramatically reducing the effectiveness of the chlorine dioxide production process. Thus, as the water temperatures increase in the spring, steps need to be taken to hold solution temperatures below 12 C. In fact, for maximum absorption efficiency, the target temperature is 4.5 C (40 F). This is where the absorption chiller is used in the process.

Absorption Chiller To Refrigerate Bleach Solution
The mill uses a 900-ton Trane single-stage absorption chiller operated by process steam to refrigerate river water for the chlorine dioxide solution, keeping it at the target temperature. The process steam to operate the chiller originates on site from boilers fueled by byproduct wood from the nearby mills and from the chip screen rejects at the mill. In addition to the chiller, the steam is used in a variety of processes with peak usage in the winter months.

In this way the Northwood complex fully utilizes the forest resources remaining after production of veneer, sawed dimension lumber and chips for pulping. Because other process requirements peak in the winter, the use of the steam for chiller operation in the warm weather months does not require increased steam production capacity.

The Trane absorption chiller uses saturated steam to chill the filtered river water to the target temperature before it absorbs the chlorine dioxide gas. The chiller can be independently controlled through its own UCP2™ unit control, but in normal operation it is interfaced with the central bleach plant process control system.

Steam Absorption A Good Fit For Steam Supply

"The supply of the chiller was a consultive process that recognized the local Trane office's expertise n process cooling. As part of the contract, Trane BC was responsible for the detail design of the new piping and process cooling system. There were several advantages to Northwood. First, was peace of mind in that the process design and equipment came from the same company. Second, the design and installation was fast-tracked as the system had to be designed, purchased and installed in the off-season. Finally, changes could be made to the design to incorporate additional features desired by the mill as the installation was progressing."

According to John King from the Vancouver Trane office, the use of absorption chillers for this particular application is growing. "Most pulp mills have surplus process steam in the warm months, so this application is a natural. Absorption chillers normally require relatively little attention. Here at Northwood, they check tube cleanliness regularly and clean the tubes as required. They've learned to equip the chiller with cupronickel tubes to resist pitting and corrosion from the somewhat acid river water standing in the tubes when the chiller is not in operation. Very little attention is required after the unit is started up in the spring."

King explains that operator training is important. "When we started out, the mill operators didn't understand how you can get chilled water from steam. We have training modules that teach the basics of the absorption process. They learn what they have to know, what to watch for. But the unit usually runs with minimal attention."

At Northwood, the river temperatures in the spring are monitored and typically chiller start-up is scheduled in late April. In a typical year, the mill refrigerates the bleach water for about six months. The plant operators dial in their setpoints and the unit follows the demand for chilled water. One of the things most liked about the absorber is that it just runs.

Peter Hoemberg, general manager at Trane's Vancouver sales office, tells about the growing acceptance of absorption for the pulp bleaching process. "We've traveled to a lot of the mills here in British Columbia to explain this opportunity. The word is getting around that absorption is a very logical solution for this need for process chilled water. It's a perfect fit."

In the past 10 years, pulp mills around the world have converted to the ECF bleaching process. Walter Linck from Trane notes that the reliability of absorption machines is also a factor in their choice for the bleach process. "The only moving part on an absorption machine is the solution pump and this can be replaced in a matter of hours, often by mill personnel. There is normally no need for redundant chiller capacity, so money isn't tied up in spare equipment."

The Northwood mill is an example of an industrial operation that uses heat energy from a process byproduct to make the overall operation more efficient and reliable. The use of an absorption chiller in the bleaching process is a perfect fit, both from the standpoint of system efficiency and resource utilization.

TRANE®

The Trane Company
Worldwide Applied Systems Group
3600 Pammel Creek Road
La Crosse, WI 54601-7599

www.trane.com

An American Standard Company

Literature Order Number	CASE-SLX010-EN
Date	April 1999
Supersedes	New
Stocking Location	La Crosse–Inland