

A TOUR OF MADISON PAPER INDUSTRIES

ART BONIFACE

Originally the site of an integrated mill which produced groundwood, sulphite, and newsprint in the late 1890s, Madison Paper Industries today produces 87,000 short tons/year of pressurized groundwood (PGW) and 225,000 tons/year of supercalendered (SC) paper. The mill and company headquarters are located on the Kennebec River in Madison, ME, approximately 110 miles north of Portland. Madison employs 285 people, 250 of which are located in Madison.

The mill had several changes of ownership before being purchased by Myllykoski Oy, a Finnish papermaker in 1977. In 1980, Myllykoski and the New York Times formed a 60-40 partnership of Madison Paper. A US\$ 200 million modernization project resulted in a new PGW plant, the first in North America, and a new paper machine (No. 3) for the production of SC papers. This also was the first North American machine to produce SC grades. These operations were started up in October of 1981.

PRESSURE GROUNDWOOD PLANT

Madison's source for mechanical pulp is its pressure groundwood plant. The raw material source for the PGW plant is spruce and balsam fir. All wood is purchased as Madison does not own any woodlands. The company would rather rely on long-term contracts with major area wood suppliers, but it also obtains wood from local farmers and independent suppliers.

Of the wood received, 85% is tree-length, with the remainder being either 4-ft, (1.2 m) or 8-ft (2.4 m) in length. Eight-foot and tree-length wood is slashed using a unique system of two mobile slashers designed by Madison (versus conventional fixed deck slashers), and front-end loaders. By using this combination of mobile slashers and front-end loaders, Madison is able to overcome space constraints and minimize costs. The woodyard operates one shift per day, four days per week. Daily capacity is approximately 400 cords.

Normally there is a one-week supply of raw wood on hand. However, in support of the Sustainable Forestry Initiative Project of the American Forest & Paper Association (AF&PA), Madison will not receive any wood for the entire month of April. This was instituted in 1998, was very successful, and will be practiced again in 1999, reports Kevin Kuliga, director of pulping and technical operations.

The slashed wood is conveyed to the debarking drums. From these drums the peeled wood is conveyed to the five PGW grinders. Four of these grinders were installed with the original PGW plant in 1981. The fifth grinder, a Valmet model 1812P unit, was installed in 1995. This unit is an improved version of the four earlier units which were supplied by Tampella. A





A view of the Valmet Optireel

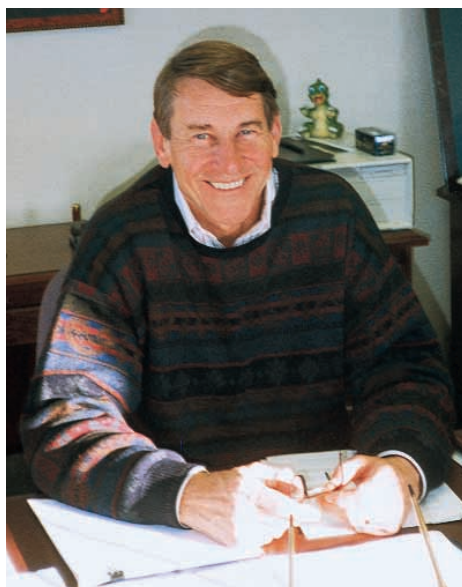
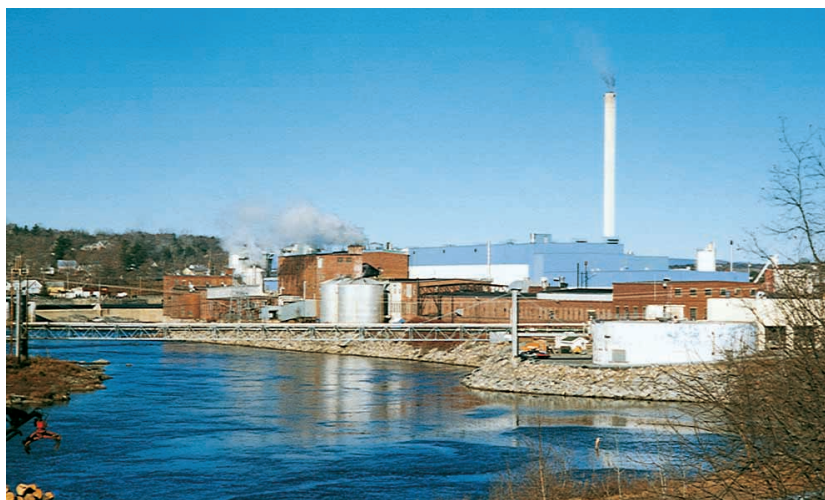
significant improvement is that the Valmet grinder and Kone Wood feed system are fully automated, whereas the batch loading of the feed pockets for the original units was only partially automated. The original plant had two 14,000 horsepower (hp) motors with each motor operating two grinders in a tandem arrangement. The fifth unit is also driven by a 14,000 hp motor with space reserved for a future sixth grinder should one be required.

The PGW is fed to a screening system. With the installation of the fifth grinder, this system was upgraded by adding Valmet fine-slotted screens which operate in series with the existing perforated basket screens. The new screens occupy the secondary stage in the rejects loops and have resulted in essentially a shive-free pulp.

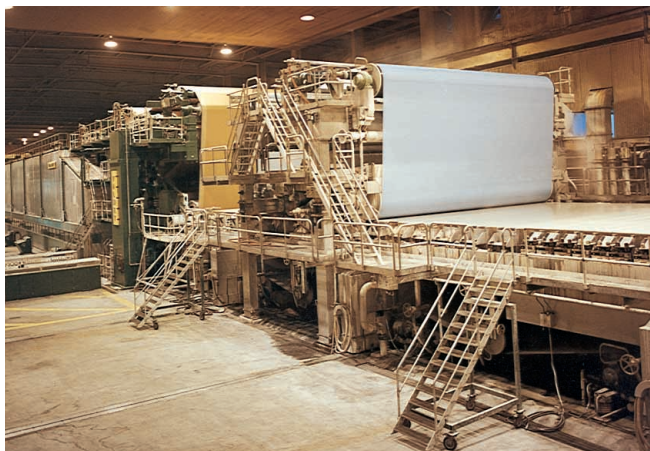
Some tear strength improvement has also been achieved. The screens are operated at a feed consistency of 1.1%.

The screened stock is then sent to a bull screen where approximately five percent of the raw PGW is rejected. These rejects, at approximately 40% consistency, are treated in a Jeffrey shredder and then, along with the screening system final rejects and cleaner rejects, are dewatered to 25% to 30% in two Thune presses. Total feed to these presses is approximately one-third of the feed to the PGW plant. From these presses, the pulp is fed to two Andritz-Sprout-Bauer model 45-1B reject refiners. These refiners are each equipped with 3500 hp motors. The pulp is then fed to a two-stage screening arrangement with the second stage accepts being combined with the main stream screen accepts as feed to a 4-stage Celleco cleaning system. These cleaners are operated at 0.5% consistency. Pulp freeness is in the range of 40 to 50 Canadian Standard Freeness.

Following the cleaners, the pulp is thickened on three pressure drum thickeners. The original two units were supplied by Rauma Reppola, while the third unit, installed with the expansion of the PGW plant, was supplied by Sunds Defibrator (who acquired the Rauma line of equipment). Each of the drums measures 4 meters (13.1 ft) in diameter by 8 meters (26.2 ft) in length. Thickener filtrate is used as grinder shower water. The thickened pulp is diluted and stored at medium, 5% to 6%, consistency. The pulp is then further diluted to about 3.5% consistency and pumped 0.6 miles to the paper mill. Whitewater from the paper mill is pumped back to the PGW plant for makeup.



Roy Barry (left), president, CEO, and COO of Madison Paper Industries; the mill in Madison, ME (above)



The No. 3 paper machine at Madison

STOCK PREP AND PAPERMAKING

Furnish to the paper machine is made up of PGW, purchased northern softwood kraft, broke, and, depending on client requirements, recycled fiber, which is also purchased. The recycled fiber comes in the form of bales, rolls, or wet lap. The PGW is treated with Sunds Converflo refiners and the kraft with Beloit DD refiners.

The PGW is bleached in the stock prep area using sodium hydrosulfide. This chemical is now received in refrigerated trucks in liquid form and stored in insulated tanks. This more stable, and therefore safer, method of receiving and preparing the bleaching chemical replaces the former system of receiving the sodium hydrosulfide in dry form and slurring it with water. The newer method eliminates the fire hazard potential.

Madison now includes precipitated calcium carbonate (PCC) in their furnish. An on-site PCC plant was recently constructed by Specialty Minerals Company, which also owns and operates the facility. The benefits achieved with this material include improved print quality, brightness, and opacity. Here, Madison benefited from the experience of Myllykoski, which preceded the Madison installation with a similar installation. Rus Drechsler, director of paper production, said this is a good example of how Madison, by being part of an organization with some 23 paper machines, is able to innovate and overcome the limitations of a single-machine mill.

The furnish is fed to a six-stage cleaner system followed by a three-stage screening arrangement prior to entering the No. 3 paper machine's headbox. This machine is a Valmet Symformer R. It was originally equipped with a single wire and dandy roll, but was reconfigured in 1989 with the addition of a top wire. The original speed rating was 3500 ft/min (1067 m/min), which was controlled with an analog sectional drive. The original machine line was equipped with two Bruderhaus supercalenders, a Wartsila winder and a Wartsila

wrapper. Production was 150,000 short tons (136,077 metric tons) per year.

In the last decade, Madison has made several changes to the machine to bring annual capacity to the current level of 225,000 short tons (204,116 metric tons) and an average speed of 4000 feet (1219 m) per minute. These changes included a new Valmet headbox, adding the top wire, going to an ABB digital sectional drive, reconfiguring the dryer section to include vacuum rolls, the installation of a Valmet Opti-Reel (the first in North America), the addition of a second winder (Valmet JR1000), modernization of the Wartsila winder to include a Beloit articulating roll and upgraded controls, and the addition of a third supercalender (Valmet 10-roll unit).

Another area of improvement is the control of sheet profile. There are four cross directional systems on the paper machine designed to improve sheet profile. They include automatic slice control at the headbox, a steam box at the press section, zone controlled crown on the third press roll, and a VIB remoisturizing system.

A current project is the addition of a Voith Twister roll wrapper, the first in North America. At the time of this writing, this unit was one month into the startup phase. Initial reception on the part of customers has been very positive. This wrapper has several advantages over the original unit. It will allow Madison to machine wrap 3-m wide rolls for the newer rotogravure presses. Since the new wrapper requires only one width of wrapping medium, the mill will be able to reduce its wrapping material inventory requirements. The original wrapper will be removed in the very near future.

UTILITIES

Electrical power is sourced from two MPI hydroelectric stations, which generate 23 megawatts (MW), a steam tur-



Christopher Bean (left), Madison's director of maintenance, engineering and utilities; Kevin J. Kuliga (right), the mill's director of pulp and technical operations



Views inside the mill—from the press section to the headbox (left) and the supercalendering and winding areas (above)

bine-generator (3 MW), and a local utility tie line, which can draw up to 40 MW. The upper or Anson station produces 9 MW and the lower Abenaki station 14 MW.

Both stations have unique design features. At the Anson station, MPI replaced the wooden flashboards with inflatable heavy-duty, nylon-reinforced rubber wiers, the first in Maine, in 1997. The dam is 630 feet (192m) in length, and handles 2000 ft³ (57 m³) to 120,000 ft³ (3398 m³) per second of flow. Due to the harsh winters, a significant amount of ice and debris must be dealt with. As a result, the wooden flashboard system would have to undergo major repairs about 4 times per year. Each of these outages would require a workforce of up to 20 people for 8 hours.

The rubber dams are operated by low-pressure air (less than 7 psi), either manually or automatically. The new system monitors the upstream impoundment level and bladder air pressure, and has been integrated into MPI's existing control system.

Now, with over a year's experience, Chris Bean, director of engineering, maintenance and utilities, states the following has been achieved:

- greatly reduced maintenance
- a much safer maintenance work environment
- a more stable head pond resulting in more favorable conditions for wildlife and recreational use
- increased power generation.

The supplier of these inflatable rubber dams was Bridgestone Engineered Products Co. Detail design engineering was a cooperative effort between MPI and Kleinschmidt Associates (KA). MPI and KA recently received

an award for this project from the Maine Consulting Engineers Association.

The Abenaki station originally produced 4 MW of electricity. However, with the startup of the PGW plant in 1981 and the shutdown of the old groundwood mill, MPI converted four of the groundwood grinder turbines to turbine generators, increasing the power generated to 14 MW.

Steam is provided by three package boilers rated at 85,000 pounds per hour (lb/h); 100,000 lb/h (45,400, kg/h); and 105,000 lb/h. Pressure is at 250 psi. A back-pressure unit reduces the 250 psi steam to 40 psi for use at the dryers and generates up to 3 MW of power. The boilers are equipped with low-NO_x burners. Approximately 75% of the stack gases from these units is fed to the Specialty Minerals PCC plant. The carbon dioxide content of the flue gases is used in the formation of the PCC. This plant began operation in 1998. In addition to paper product benefits previously stated, the stack emissions now contain less particulates and less carbon dioxide.

Raw water is sourced from the Kennebec River. Treatment consists of mechanical strainers for the removal of course material and river debris, and pressurized sand filters.

Effluent from all of the operations, both pulping and papermaking, are combined and sent to the Anson-Madison Sanitary District, a joint industrial-municipal treatment plant that performs primary and secondary treatment, and sludge handling. MPI's portion of the flow rate to this plant is approximately 2.5 million gallons (9467 m³) per day.

TRAINING

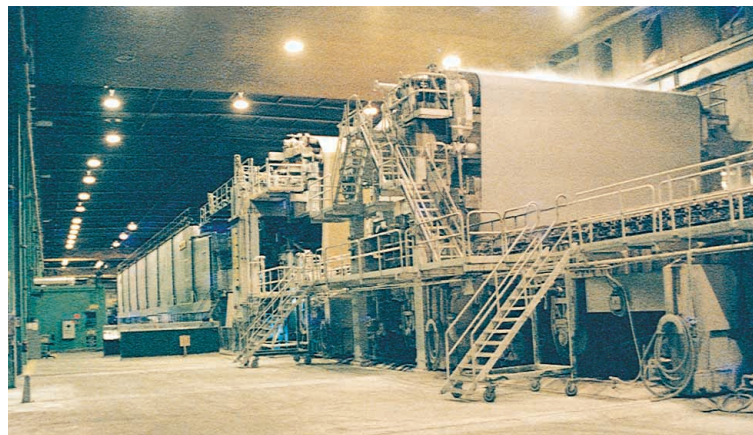
In late 1994, Glen Foss, Madison's director of human resources, headed up a state study on the future of Maine's paper industry. This study revealed a shrinking labor force knowledgeable in the technical aspects of pulping and papermaking. Taking a cue from its Finnish owner, where pulp and paper technology is a part of the public school curriculum, Madison spearheaded the effort to institute a similar type program. With support and input from other Maine mills, colleges, including Kennebec Valley Technical College (KVTC), unions, and state agencies, there is today a technical training program starting at the junior year at two Maine high schools, one of which is the Madison high school.

Madison high school juniors and seniors can attend classes one day each week at MPI's Training Center. Courses include occupational health, safety, and introduction to pulp and papermaking, with the balance of the week attending normal high school classes. Upon graduating, students may further their education at KVTC in the 2+2 program (2 years high school plus 2 years at KVTC) and receive an associate degree. Those receiving their associate degree can then opt to attend the University of Maine for three years (2+2+3 program) and receive a B.S. degree in mechanical engineering. In addition to building up a pool of technically trained workers, a major benefit of the program has been the "motivation to learn, where in many instances this was lacking at the high school level," states Foss.

Madison's Training Center is also very active with upgrading the skills of the mill work force. Approximately 30% of the employees are taking credited courses in subjects ranging from controls technology to the German language. By using the mill training center, employees are able to attend classes they may not have been able to at non-mill site locations, due to their 12-hour, 3 days on and 3 days off, work schedule.

SALES AND MARKETING

Madison Paper has its own sales and marketing organization—Madison International Sales Company—with offices in Stamford, CT, and Chicago, IL. Since 1996, Madison International has also



The No. 3 machine

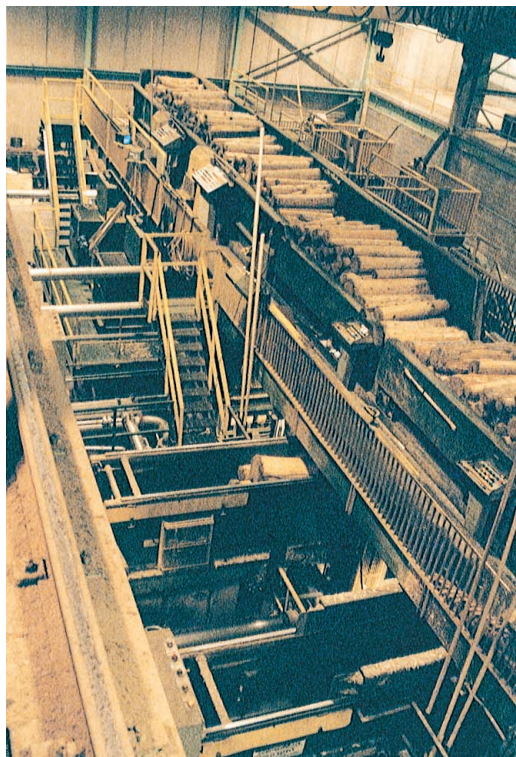
been responsible for the North American paper sales of its Finnish partner, Myllykoski Company, and their alliance partners. These partners include Metsa-Serla (Finnish), MD Plattling, MD Albbbruck and Lang Papier (German) and Biberist (Swiss). The total production of MPI, Myllykoski, and the European partners, totals some 2 million tons/year. Last year approximately 200,000 tons were imported from the European mills into the United States. An additional 45,000 tons were imported into Canada. The Canadian sales location is in Montreal, QC. Madison International Sales will also soon have a sales office in Mexico, to cover Central and South America.

With the inclusion of the 13 European mills, which operate 23 paper machines, Madison International Sales is able to offer its customers SCB, SCA, SCA+, Nos. 4 and 5 coated groundwood, and No.1 fine coated papers.

This flexibility and single sourcing capability has been well-received by domestic customers. Some of their major customers include JC Penny, K-Mart, Sears, the New York Times Company, Hearst Publications, Rolling Stone magazine, and Brylane.

MANAGEMENT PHILOSOPHY

Roy Barry, president and CEO, is a veteran of more than 30 years in the paper industry, with most of his career spent in management positions with the SAPPI (formerly SD Warren) mills in Westbrook and Skowhegan, ME, and Muskegan, MI, and the former



The log feed to pressure grinders at Madison's PGW plant



Madison's new Voith "Twister" roll wrapper



The inflatable rubber dam at the Anson power station

Scott mill in Winslow, ME. He joined Madison Paper in August, 1994 as president and COO, and became president and CEO in June, 1995. Among his accomplishments was being named PIMA's Executive of the Year for 1998. He believes the "foundation for a successful business is to allow people to grow and take responsibility and feel ownership as well as accountability. We strive to create an open and honest environment and appreciate everyone's contributions."

In support of this philosophy, MPI has a unique bonus plan called Performance Improvement Plan, or PIP. The Plan is simple, taking into account production less any returns from customers. The status for the month is posted daily. The inclusion of customer returns in the Plan supports Roy's strong belief in customer satisfaction. Roy states "we must have a true passion for quality and delighting our customers. Having all MPI employees sharing and demonstrating this belief is our greatest strength." **TJ**

Boniface is a freelance writer based in Cape Elizabeth, ME.

HISTORICAL MILESTONES

- 1889** Five investors, including Grover Cleveland, organize to build pulp mill
- 1891** 35 tons/day sulphite mill begins operation
- 1898** Mill sold to Great Northern Paper Company
- 1899** Groundwood mill and two newsprint paper machines startup
- 1909** Abenaki groundwood mill, hydroelectric dam built by Hollingsworth & Whitney, 0.6 miles south of Madison
- 1923** Anson hydroelectric plant built; PM No. 1 rebuilt
- 1955** GNP sells Madison, Anson facilities to Economy Corp. (Louis Calder, Sr.)
- 1961** Economy Corp. purchases Abenaki facilities from Scott Paper
- 1960s** Facilities willed by Louis Calder, Jr. to 11 charities which form a non-profit trust, Kennebec River Pulp & Paper Co. (KRP&P)
- 1976** KRP&P acquired by Penntech Papers
- 1977** Operations shut down in March, mortgage foreclosed in September
- 1977** Myllykoski Oy acquires KRP&P assets, invests US\$ 8.5 million to reactivate facilities as Madison Paper Company, a wholly owned subsidiary
- 1978** PM No. 1 restarts on June 22
- 1980** Myllykoski and New York Times form partnership and found Madison Paper Industries
- 1981** US\$ 200 million project completed with new PGW plant, PM No. 3 for the first North American production of supercalendered paper
- 1992** PM No. 3 undergoes major rebuild
- 1996** PGW plant expands with No. 5 grinder installation
- 1999** New Twister wrapper, first in North America, begins operating