

■ Newly designed pump has enabled Manominee Paper Co., in Menominee Mich., to add wastewater treatment pumping capacity, without plant modification

Mill Increases Wastewater Pump Capacity by 50% with New Design

AFTER UPGRADING ITS wastewater treatment plant in 1989 to include a secondary treatment system, Menominee Paper Co., in Menominee, Mich., embarked upon a \$14 million rebuild of its No. 1 paper machine. Completed in 1994, the rebuild project increased the mill's total capacity from 450 to 550 tpd, but also created pump maintenance problems in the wastewater treatment plant, which increased in volume from about 1.0 million gal/day to 1.5 million gal/day.

Menominee operates two paper machines and two secondary converting operations, producing linerboard, corrugating medium, and tubestock from 100% recycled fiber, and high-quality, lightweight machine glazed (M.G.) specialty papers from purchased bleach

F E A T U R E

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Maintenance

stock. In the mill's wastewater treatment plant, the cost of downtime, labor, and repairs on two progressive cavity pumps, which transfer sludge from final storage tanks to the plant's dewatering

system, was averaging about \$2,000/month. After careful study, however, Menominee installed two new progressive pumps with designs that permitted an increase in pumping capacity without plant modification. Since their installation in May 1994, the pumps also have operated free of any major maintenance problems.

WASTEWATER TREATMENT PLANT. Menominee's wastewater treatment plant is designed to treat the process wastewater from the mill's two paper machines, its filtration plant, and its boilers. Non-contact and contact cooling waters are discharged without treatment into the Menominee River. The 1989 EPA-approved plant expansion was constructed at a cost of \$5 million, to not only provide activated sludge treatment,



Two new progressive cavity pumps transfer sludge from final storage tanks to dewatering at Menominee Paper's wastewater treatment plant in Menominee, Mich.

but also to increase closure of its paper machine wastewater. Ninety percent of the process water used for papermaking is recycled through internal paper machine equipment and subsequent wastewater treatment plant processing.

In Menominee's wastewater treatment plant (Figure 1), wastewater from the mill is collected in a raw wastewater pumping station, screened, and pumped at about 1,100 gal/min to a 140,000-gal primary clarifier. A 440,000-gal equalization tank is used to handle any excess wastewater, and acts as a backup primary clarifier on occasion.

Primary effluent flow is treated by the secondary treatment system. Primary sludge is either transferred directly to the facility's dewatering equipment—a screw press or a belt press—or to one of two 100,000 gal combined sludge storage tanks.

Primary effluent that is to be discharged to the river is mixed with nutrients and flows by gravity to one of two 600,000-gal aeration basins. Mixed liquor is discharged to one of two 125,000-gal final clarifiers. The final clar-

ified effluent can then be discharged to the river after reaeration, recycled back to the mill, or undergo tertiary treatment. Waste activated sludge is transferred to the sludge storage tank.

Secondary effluent that is to be recycled is treated through one of three dissolved air flotation/sand filtration (DAF) units, which also provide tertiary treat-

ment being transferred to Menominee's dewatering system by one of two progressive cavity pumps at about 150 gal/min. This sludge, ranging from about 2 to 4% solids, contains string, sand, plastics, fibers, and various other debris.

Maintenance, downtime, and parts were costing the mill about \$1,000/month per pump. At the same time, as the plant began to expand capacity, the old pumps simply could not provide sufficient volume without incurring further maintenance problems.

Looking for a solution to its sludge pumping problem, Menominee turned to R.W. Baron Associates Inc., a Milwaukee, Wis.-based fluids

handling firm, which supplied the mill with two Model BN-6LT Seepex progressive cavity pumps. These pumps incorporate a new internal geometry fundamentally different from conventional designs. The positive displacement pump consists of a cast iron housing, hardened tool steel rotor, and a mold-to-size Buna-N stator.

In operation, the new pump's double external helix rotor turns within a triple internal helix stator to form cavities that

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ment when needed. The effluent is mixed with coagulant and flocculent, with the resulting flocculent collecting small suspended and colloidal particles from the water, before being discharged to the sludge storage tanks. Clarified water feeds through a sandbed and is pumped back to the mill, or discharged to the river.

PUMPING PROBLEM. In the past, combined sludge in the storage tanks was

create the pumping action. With this design, the pump provides a 50% increase in volume per revolution, compared with conventional designs. The pump's flow output is directly proportional to its speed, and its customized stator ensures an identical compression ratio along the entire length of the rotor/stator interface.

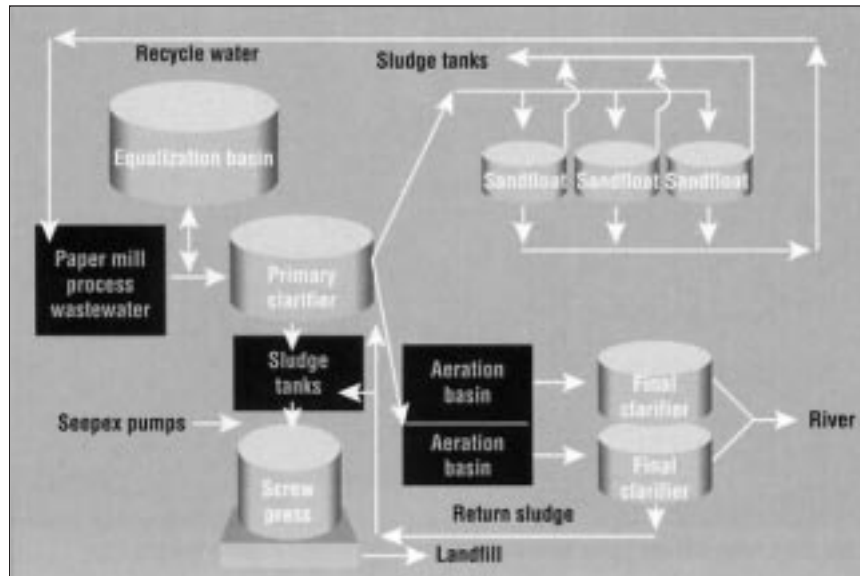
POSITIVE RESULTS. As a result of installing the new pumps, Menominee has noticed several benefits. First, the new units have increased the plant's pumping capacity to 400 gal/min per pump without having to increase the size of the pump. Thus, the newly designed pumps could be retrofitted in place of the old pumps with minimal

modification, to the existing facility. Menominee, for example, was able to use the original pump bases by merely redrilling some holes, a savings of about \$1,000/base.

The process piping also required minimal changes. If, however, the mill had to change from its 5- and 6-in. diameter piping to accommodate a larger pump with 6-1/8-in. diameter piping requirements, it would have cost \$3,000/pump.

Menominee saved another \$1,800 because no electrical rewiring was necessary. With an estimated payback on the new pumps in their first eight months of operation, the mill has purchased two more of the units to transfer overflow sludge from the DAFs back into the process flow. At the same time, mill engineers are looking for new applications for the pumps inside the mill, such as in the filter plant for mill's bleach system. ■

FIGURE 1: A flow diagram of Menominee Paper's expanded wastewater treatment system. Newly designed progressive cavity pumps are located between the sludge storage tanks and dewatering equipment.



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