

# CONTINUOUS, CLEAN WATER MEANS FULL STEAM AHEAD FOR ELECTRIC UTILITY

By Ed Sullivan

Filtration of process water demands continuous flow rates, micro-bic particulate removal and low maintenance – functions best performed by a high-efficiency, automated, centrifugal sand filtration system

Whether for cooling or as a product component, production processes often demand an uninterrupted stream of filtered water. If that water supply is unreliable, contaminated or maintenance-intensive, processes suffer. That invariably translates to diminish product quality, process interruptions and/or exorbitant maintenance costs.

Molded plastics, food and beverage processing, paper manufacturing, metal working, energy, countless process industries depend on filtered fresh water for no-contact cooling or as an integral product component.

“Since no two waters are the same, and all processes differ to varying degrees, those tasked with designing or modifying water treatment systems can only be successful if they balance the requirements of the system that will use the water against the physical and chemical analysis of the water to be treated,” advises Phil D’Angelo, Vice President of Technical Development for JoDAN Technologies, Ltd. (Glen Mills, PA). “There are a lot of conditions and requirements to consider: the turbidity of the water, hardness, system pressures, process purity requirements, volume demands, filter backwashes and system maintenance. Certainly, in a process filtration system, minimizing downtime for maintenance is a major consideration.”

As opposed to sidestream water filtration used in cooling towers, many process water systems require pretreatment of the water taken from surface or ground water sources. Post filtration process water is often used in combination with other water treatment technologies such as softeners, demineralizers or membranes in a continuous flow mode, feeding process equipment. For many of those applications JoDAN Technologies, a consulting firm that works



Centrifugal filtration sand filter systems are often the best solution to processed water demands.



Sonitec uses a centrifugal sand filter to process water cleaner.

with industrial and utility clients to resolve water related problems, considers the “centrifugal” sand filtration system a valuable technology. A centrifugal filtration system uses a combination of in-situ fine sand centrifugal separation combined with down-flow sand filtration, which ensures greater filtration efficiency than traditional down-flow sand filters.

Centrifugal filtration systems such as the Vortisand from Sonitec, Inc. are widely used for various process water polishing applications. This fully automated, unusually compact system provides removal of solids to a miniscule 0.45-micron with filtration up to 20 gpm/sq.ft.

A dramatic example of the advantages of centrifugal water filtration for process applications can be found in a recent JoDAN project at an electric power generation facility located in the northeastern U.S. A relatively small plant that generates 100 MWe from landfill (methane) gas, the plant generates approximately \$100,000 worth of electricity per hour during summer peak periods, and therefore could afford little or no downtime.

The power plant uses two 800 psi boilers that run on softened water from large pack bed softeners, which require very clean influent water. Previously the plant had used a large clarifier, to which ferric chloride, sodium hypochlorite and caustic were added to flocculate the suspended materials, control biologicals, and add some alkalinity for boiler water chemistry control. The clarified water then passed through existing pack bed softeners at about 250 gallons per minute (gpm).

“The system was not only supplying water for producing electricity, it was also supplying process steam to a local steel mill,” D’Angelo explains. “The steel mill dropped its requirement for steam, so the flow rates dropped from 250 gpm to approximately 50 gpm total. Consequently, the system they had in place was hydraulically too large for the flow requirements.”

For an optimal solution, JoDAN put together a filtration and softener package that would utilize the utility’s existing pack bed softeners in an intermittent process mode. However, instead of using the clarifiers in front of the softeners, a Vortisand sand filter was proposed.

“We proposed a 150 gpm centrifugal sand filter composed of three vessels, used in processing mode,” says D’Angelo. “Although the vessels only needed to be 30 inches in diameter, because of our experience with water treatment equipment, we decided to be on the conservative side and made

them 36 inches in diameter. This approach increased the available filtration surface area which optimized the linear velocity (gpm/ft<sup>2</sup>) and maximized particle loading to a differential pressure end point, which is clearly the correct approach for any filter design.”

Now, based on the Softwater Storage Tank level (SWST), river water comes into the plant where it is pre-treated with chemicals before going into the Vortisand filtration system. The filtered water then flows into a 72,000-gallon filtered water storage reservoir. Before entering the boiler, the water passes through a 1-micron absolute pleated filter as well as KDF redox media to remove chlorine, and then into the packed bed water softeners and, finally, into the SWST at 150 gpm. When the SWST is full, the system shuts down until the SWST levels are 2/3 full and the process starts over again.

“When the Vortisand system reaches about a 9 to 10-psi differential, each of the three Vortisand vessels automatically backwashes in sequence,” says D’Angelo. “One of the benefits of this filtration technology is that even while a given filter vessel is backwashing, two filter vessels are on-line. Because they are sized at 36-inch diameter, they can easily handle the 150 GPM demand. As a result, the power plant has no downtime, which is of vital importance in any process application.”

D’Angelo adds that the filter vessels are backwashed using chlorinated soft water, which controls biologicals. “When you backwash a sand filter, you backwash from the bottom up,” he says “It is advantageous to add chlorine or bromine upflow through the filter sand bed in order to avoid any buildup of biological materials. By doing it this way, we’re keeping that sand clean all of the time and reducing maintenance requirements and costs.”

The new utility plant water treatment system has been running consistently since May 2006. “It has performed extremely well since startup,” D’Angelo says.

With its microbial filtering capabilities and high flow rates, the Vortisand filter system is used in a myriad of process applications. Mike Assimus, National Sales Manager at MSC Liquid Filtration Technologies (Enfield, CT), says the system is used to clean water that is used by a major paper manufacturer in the process of making paper wipes used in industrial and medical applications.

“The plant is using well water that is fairly turbid,” says Assimus. “They are using 12 Vortisand vessels in an variable-flow system that can handle 600-1,000 gpm, depending on the process requirements.”

Filtering the water at a .45-2 micron nominal level is vital because the water flows through high-pressure pumps that impel it to the paper machine, where it is used to form the product. “The water has to be clean to protect the pump and spray nozzles at the water application point, and also must be pure to create a product that is suitable for medical applications,” Assimus says. “The spray nozzles have very fine orifices, and if there are any contaminants in them, then the spray will be uneven. Also, impure water under high pressure could cause erosion of the nozzle, also excessive wear and tear on the pumps.”

Assimus notes that any downtime due to water system interruptions would be highly problematic because the paper plant has to run fulltime to barely keep up with orders. “They have noticed a decrease in the wear on these nozzles since the Vortisand system was installed,” he says. “Not only is that a maintenance time-saver, but a significant money saver as well.”

Other design features of the vortexing sand filter system save on process uptime and maintenance costs as well. Alain

Blais, Sonitec president, says some major breweries are using the technology for pre-filtration in front of reverse osmosis equipment in the making of beer.

“This removes any particles from the water and ensures a great taste,” he says. “But the Vortisand design also reduces the backwashing frequency of the other filtration technologies (e.g. carbon) also used in the process, and reduces the amount of water used. And, very important, there is less maintenance and more process uptime.”

Blais adds that a Kansas City soft drink bottler uses the Vortisand filtration system because it is much more compact than the multimedia filtration system that was used previously. “Because this centrifugal technology operates much more efficiently, including a much higher velocity, it takes perhaps 70% less space,” he says. “A conventional filter operates at 4-5 gpm/sq. ft. of surface area, while the Vortisand operates at 15-17 gpm/sq. ft. Plus, it uses 70% less water for backwashing than the conventional multimedia filter system.”

Sonitec Inc. manufactures innovative products and technologies aimed at improving the quality of the water used in cooling and heating processes in order to improve energy efficiency and environmental performance. In addition to Vortisand, Sonitec water purification and pollution prevention products include Membrane Separation technology.

*Ed Sullivan is a technology writer based in Hermosa Beach, California*

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