Canadian Plant Squeezes More Water From Biosolids While Shrinking Its Fuel Costs

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An Ontario treatment plant finds a cost-effective dewatering solution that reduces its natural gas bill substantially.

Waste activated sludge from five wastewater treatment plants across the city arrived daily at the Greenway Wastewater Treatment Plant in London, Ontario.

After it was combined with Greenway's primary sludge in holding tanks, operators fed 2.5 percent wet sludge at 200 gpm to four 2-meter belt filter presses 325 days a year. "We average 65,000 wet tons annually," says Randy Bartholomew, supervisor.

Pumps delivered cake at 23 percent solids to a fluidized bed incinerator, but the material was too wet to ensure total combustion without cofiring 41.67 million cubic feet of natural gas per year.

"Our polymer supplier recommended different products to help dry up the cake," Bartholomew says. "The operators tried different feed rates and controlling how the belt presses ran, but they were at the limit of their capabilities regardless of the changes."

London officials, seeing an opportunity to save energy under the city's Corporate Energy Conservation and Demand Management Plan, posted a request for proposals. "Three centrifuge manufacturers ran dewatering pilots for us," Bartholomew says. "The C7E Decanter solid bowl centrifuges from Flottweg gave us the desired 26 percent cake solids. They also were cost-effective, enabling us to maximize our asset renewal budget."

Since startup in 2013, burning drier cake has saved the city $184,800 a year on natural gas, and the dewatering upgrade received a $45,000 incentive from Union Gas. The project won the 2014 Ontario Public Works Association Technical Innovation Award.

Structural modifications

The 44.9 mgd (design) activated sludge plant averages 31.7 mgd from 200,000 customers, and incinerates 17,000 dry tons of biosolids annually. Ash is landfilled.

To prepare for the three centrifuges (one is on standby), a contractor removed an out-of-service multiple-hearth incinerator and built new floors

in the dewatering building to support the weight of the units. There's a reinforced concrete pad on the main floor for the centrifuges and another pad on the upper floor for the odor-control system.

Flottweg Separation Technology representatives observed the installation. "Operators ran the belt presses until we took down the incinerator to complete some repairs," Bartholomew says. "At that point, we switched to our secondary dewatering system and hauled the cake to the landfill." The plant uses the Schwing Bioset alkaline stabilization/pasteurization reactor process, yielding Class A biosolids.

Startup involved turning a valve to switch from one piping system to another. "Within 15 to 20 minutes, the first cake arrived at 26 percent solids," Bartholomew says. "The centrifuge control panels had integrated seamlessly with our SCADA system."

How they work

Each 15.75- by 5.6- by 4.5-foot-high centrifuge weighs more than 9 tons filled and operates independently with dedicated piping. Solids enter a feed compartment in the center of the conveyor screw. Then centrifugal force at 3,000 times the intensity of gravity flings the material through distribution ports into the cylindrical bowl.

The high-speed rotation of the bowl presses the solids against its inside wall, squeezing the out liquid. Simultaneously, the conveyor, rotating at a slightly different speed, pushes the solids toward the tapered end of the bowl to fall through the discharge chute. Retention time is determined by the differential speed.

An 88 gpm piston pump (Schwing Bioset) on each centrifuge sends the cake to the incinerator via piping that feeds the fluidized bed from opposing sides. Centrate flows over weirs at the front of the bowl, collects in a chamber and discharges by gravity to the plant's treatment train.

Fine-tuning

To optimize centrifuge efficiency, operators tested different polymer concentrations, feed rates and torque settings. The automatic control systems on the centrifuges acted as fail-safes. If the torque exceeded the optimum separation value, the system increased the differential speed to convey solids from the bowl faster. Conversely, it reduced the differential speed when the torque decreased.

Operators had fed dry polymer to the belt presses, but Flottweg Separation Technology representatives recommended liquid polymer for the centrifuges. "The switch makes it hard to evaluate polymer savings," Bartholomew says. "All I can say is our cost for the compound hasn't

changed.” Depending on sludge quality, operators feed 317 to 343 gpm into two centrifuges. The polymer dose varies, as higher levels of WAS are more difficult to dewater.

The centrifuges brought advantages beyond conserving energy. “The belt presses were a hands-on operation, and their room was smelly and dirty,” Bartholomew says. “The centrifuge room is one-third the size of the press room, and the centrifuges’ sealed construction has reduced odors and contamination dramatically.”

Operators found it easy to learn Flottweg Separation Technology’s Touch Controls and to customize dewatering parameters. The remote maintenance/control options let them start the centrifuges and walk away. “Now they monitor cake dryness, torque level, speed and other values on our SCADA system,” Bartholomew says. “They still do inspections throughout the day, but automation has made dewatering a much easier operation.”