

SLUDGE THICKENING Brockville, ON WPCC Upgrades



How Chemistry and Mechanics Deliver Cost-effective Waste Treatment

Brockville, Ontario municipal waste treatment plant gains a flexible, cost-effective sludge thickening system. Polymer chemistry is one of the leading considerations when designing a sludge thickening system.

The right polymer chemistry contributes to more effective thickening at a lower cost. However, the right chemistry must also be complemented by mechanical processes that enable the chemistry to work effectively. JWC Environmental collaborated with polymer suppliers for extensive lab trials to design a waste activated sludge (WAS) thickening system for the City of Brockville, a city of more than 23,000 people located in the southeastern part of Ontario, Canada. The Monster Drum Thickener is capable of thickening 5.25 l/second of 0.55 percent municipal sludge to up to 7 percent solids. The collaboration resulted in a cost-effective sludge thickening system that operates in just one 8-hour shift. "It runs so well and is so user friendly that an operator can start the system and leave when his shift ends at 3:30 pm, and the system shuts itself off at 6:00 pm that evening," said Ed Malcomson, supervisor of wastewater systems for the City of Brockville.

Background:

The City of Brockville was undergoing an upgrade to a secondary treatment system in order to meet more stringent effluent limits established by Ontario's Ministry of Environment including:

5-day Biochemical	Previous Effluent Limits	New Effluent Limits
Oxygen Demand (BOD5)	35.0 mg/l	25.0 mg/l
Suspended Solids	45.0 mg/l	25.0 mg/l
Total Phosphorous (P)	1.0 mg/l	1.0 mg/l

The city operated two digesters with a combined capacity of approximately 100 m³ of primary sludge per day, and the city averaged 40 to 50 m³ daily. However, achieving the new limits also increased sludge volumes, which resulted in the need for additional digester capacity. The city was faced with the decision to build another \$2.9 million digester or add two rotary drum thickeners for less than \$1 million.

PROBLEM: More stringent effluent limits results in increased sludge volumes overwhelming existing digester capacity

SOLUTION: Monster Drum Thickener

Like many smaller municipal waste treatment systems, serving fewer than 25,000 people, the City of Brockville required a WAS thickening system that would be cost effective and adaptable to changing conditions. Malcomson consulted with other treatment facilities that use centrifuge technology in Ontario and North America, before deciding on the JWC Monster Drum Thickener.

Challenge: Unlike larger municipal waste treatment plants, which tend to experience steady biological conditions and more consistent average WAS concentrations, the City of Brockville had wide variations in both — a common situation for smaller municipal waste treatment systems. In addition, the initial design specified 100 lbs/hour solids throughput; however, operating conditions went up to 200 lbs/hour, resulting in a post-installation change.

Solution: JWC recommended two Monster Drum Thickeners for their low-maintenance, easily removable wedgewire or mesh panels, and for their adaptive controls to compensate for fluctuation in sludge concentration and flow. In meeting the new effluent requirements, Malcomson's team estimated an additional 20 to 30 m³ of primary sludge and another 200 to 250 m³ of secondary sludge per day. However, since secondary sludge is much thinner — 0.5 percent compared to primary sludge, which is 3 to 4 percent — the Monster Drum Thickeners converted the 200 m³ secondary sludge into 20 m³ of 5 percent thickened waste activated sludge (TWAS). As a result, less water is sent to the digesters. Although the digesters are handling an additional 40 to 50 m³ of primary and secondary sludge, they remain within their capacity. Because of the system's flexibility, the post-installation design change was easily accommodated and did not affect project costs.

Getting the Right Chemistry



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A WAS thickening system must be designed with the interdependencies of the entire process in mind including chemistry, agitation speed and time, and screen size. Chemistries must be optimized from the start to enable effective thickening at lowest costs. Dosing systems and the mixing process must also be optimized to induce thickening and ensure high throughput.

“Our system is adaptable to allow higher throughput because we feed the sludge into the screens in a proprietary pattern that separates the water more quickly than other similar WAS thickening systems,” said Bert Irwin, of JWC. “The unique pattern allows us to treat lower concentrations at higher flows.”

Irwin worked with the City of Brockville engineers to optimize the polymer system so that it would reduce chemical costs. “Polymer selection is critical,” said Irwin. “When you find the right polymer, the thickening process is much more economical and effective.” Irwin explained that it can take up to a month to get the polymer right because the bacteria on startup tends to change after about a month of operation, which affects flow rates and overall system performance. Polymer suppliers offer blends of their primary formulations in order to cover the full range of complex biological structures. Each WAS must be tested individually to obtain the best polymer selection, which can take a significant amount of time.

The team leveraged JWC’s database of more than 50 similar installations and streamlined the polymer selection process. Thanks to the JWC installation database, they arrived at the most effective starting polymer faster without compromising project milestones. “Our installations represent nearly all the major biological treatment methodologies used in wastewater treatment plants where sludge thickening systems are applied,” said Irwin. He also worked with the polymer supplier to put in controls that would match changing conditions and prevent additional maintenance-related labor costs.

Optimizing Existing Systems

With the addition of the two JWC Monster Drum Thickeners, the treatment plant was able to meet the city’s effluent limits without replacing its two existing digesters. For the City of Brockville, that represented a cost avoidance of more than \$2 million compared to building another digester.

The new WAS thickening system also optimized the city’s waste treatment plant footprint. Each rotary drum units is enclosed and contains its own air removal equipment, which eliminates odor and the need to build a special facility to house the equipment. Long term, Malcomson believes the system will continue to keep costs in check because the new WAS thickeners require minimal maintenance and can run unmanned.

“Other treatment systems would have required us to run multiple shifts, but with the system’s automation, we only run one 8-hour shift,” said Malcomson. He explained that the City of Brockville has an operator on call in the event of any possible issues with the system, but they haven’t had to call the operator in yet.

“We have a lot of equipment to maintain, and a few pieces stand out as working well and easy to operate and maintain. The JWC Monster Drum Thickener is definitely one of them,” said Malcomson.

JWC Environmental is a world leader in solids reduction and removal system for municipal wastewater collections, headworks and bio-solids operations. We offer our legendary Muffin Monster grinders and Monster Separation Screening systems, and IPEC industrial screens systems to solve unique wastewater processing situations.

JWC Environmental also services commercial and industrial applications with our Monster Industrial, and IPEC products. We are ready to take on challenging size reduction problems in industrial processes as well as help customers run efficient and compliant industrial wastewater treatment operations.

JWC Environmental is headquartered in Santa Ana, California, and has a global network of representatives, distributors and regional service centers to provide customer support. For more information, visit us at www.jwce.com.

