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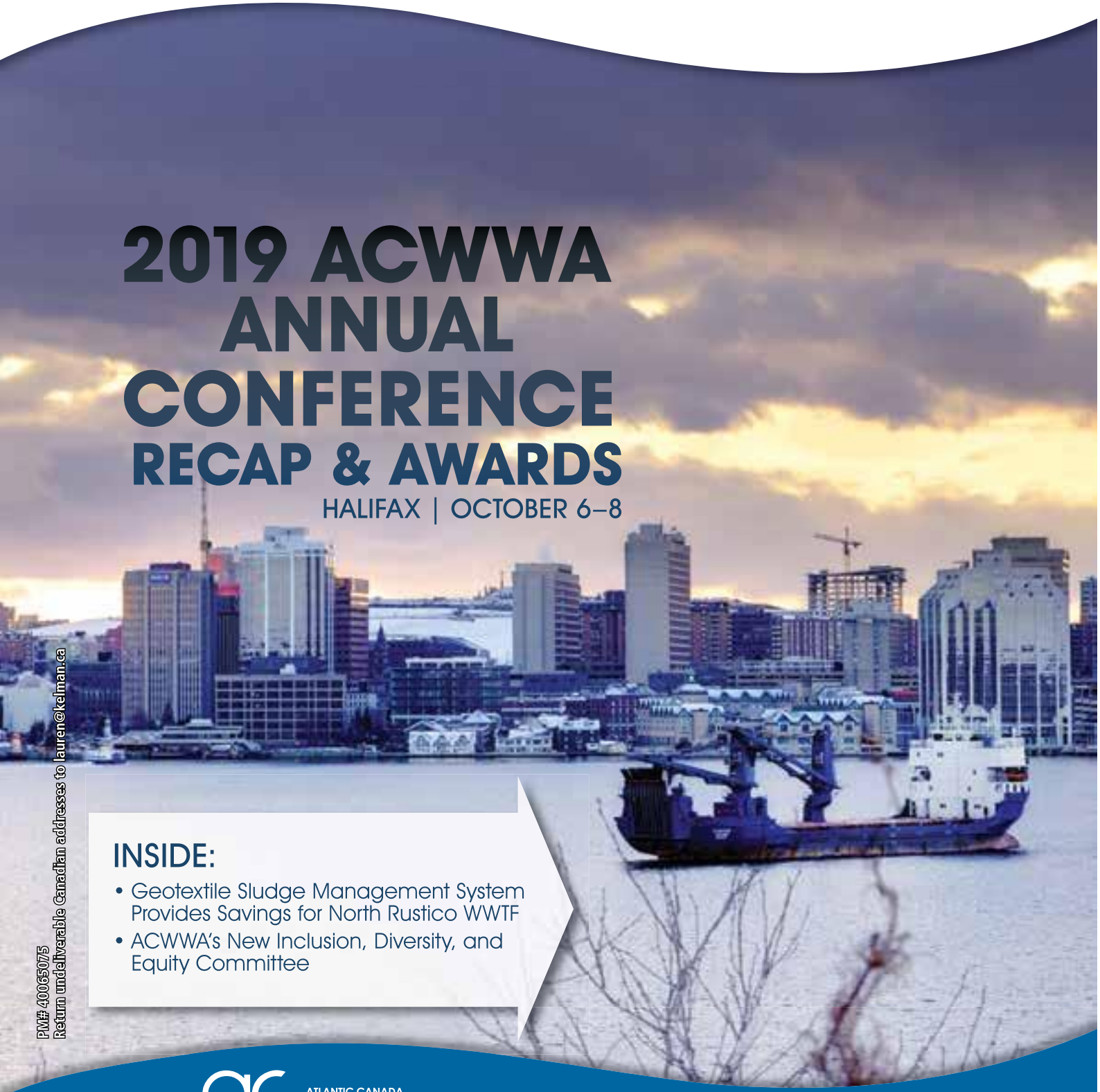

2019 ACWWA ANNUAL CONFERENCE RECAP & AWARDS

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Case study:

Geotextile sludge management system provides long-term savings for North Rustico WWTF

By Kevin Bossy, Bishop Water Technologies and Paul Saulnier, Scotia Tech Fluid Services

Sludge management can account for as much as half of a wastewater plant's annual operating budget according to studies conducted by the International Water Association and numerous other government and professional groups. Among those feeling this financial strain in Atlantic Canada was the small community of North Rustico, Prince Edward Island. Prior to 2014, the wastewater plant was disposing of as many as three truckloads of waste sludge per week, which was mostly water, and costing nearly $50,000 annually.

So when the town of about 600 residents began planning to replace its aging wastewater plant, one of the top priorities was to implement a simple, economically and environmentally sustainable process for sludge management. The result was the island's first-ever system to incorporate geotextile bags and specially selected polymers to dewater municipal waste sludge and produce composted, stabilized biosolids that are suitable for land application.

This simple, low-energy approach eliminated the expense of daily sludge hauling and enabled the North Rustico Wastewater Treatment Facility (WWTF) to become self-sufficient for sludge management. Dewatered solids are now composted onsite and either distributed on the property surrounding the plant or taken by farmers to be used as a soil amendment.

The success of this project was recognized in 2014 with the Excellence in Water Stewardship Award from the Council of Federation, which is comprised of Canada's provincial and territorial Premiers.

From left: Preston Silliker, Head Operator; Lenny Blacquiere, Assistant Operator; and Les Standen, Chairman, North Rustico Water and Sewer Committee in front of the sludge dewatering cells at the North Rustico WWTF.

Stakeholders weigh in to select the best sludge management option

"This was a truly collaborative effort," says Les Standen, Chairman of the North Rustico Water and Sewer Committee and Deputy Mayor. "We brought everyone together to design our new plant and ensure it met our operational, environmental, and financial goals. Our operators played a key advisory role in addition to consulting engineers, equipment vendors, and our Water and Sewer Committee."

Several factors were considered as the town evaluated sludge management options. Some of the most important included: operational cost savings for the community; a simple process that does not add significantly to operator responsibilities; easily expandable to accommodate community growth; and operational flexibility. Although North Rustico only has about 600 permanent residents, this number can swell to as much as 10,000 during the tourist season, especially when visitors flood in for its popular Canada Day celebration. Each process in the new treatment plant would have to be adaptable to the variable flow and wastewater characteristics that would be experienced throughout the year.

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The island's first geotextile dewatering system for municipal sludge handling

In 2014, North Rustico commissioned a new sequential batch reactor (SBR) wastewater treatment plant designed to handle peak flows of 2,600 m^3/day (0.69 MGD). The plant was also equipped with a new sludge management system, supplied by Ontario-based Bishop Water Technologies. The award-winning Bishop Solids Management Solution incorporates Geotube® geotextile dewatering containers, a unique non-mechanical polymer mixing and activation system and a computerized control system that is integrated to the plant SCADA.

The process is simple. Waste sludge from the plant is first pumped to a storage tank, which usually takes about six to 12 weeks to fill, depending on the time of year. Once full, the storage tank is aerated for several days to create a homogeneous sludge mixture.

Assistant Operator Lenny Blacquiere was part of the original operations team for the new plant and was one of the first to begin using the Bishop Solids Management Solution. He says that once aeration is complete, he performs a simple jar test to measure the solids concentration of the sludge and calculate the polymer dose. "After the jar test is done, I just set the dose parameters on the control panel, open a few valves, start the pumps and the rest is pretty much automatic," Blacquiere says.

The dewatering system is equipped with a unique Venturi Emulsion Polymer Activation System (VEPAS), which mixes and activates polymer in a single step before injecting it directly into the sludge flow line. Its venturi-based design also eliminates many of the components typically found in mechanical polymer systems that take so much time to clean, such as mixers and aging tanks.

"Once we finish pumping out the sludge storage tank, it only takes about an hour to completely disassemble, clean and reassemble the VEPAS," Blacquiere says. By comparison, conventional polymer systems can take several hours or more to clean.

Polymer is essential to accelerate and enhance the dewatering process and to prevent blockage of the microscopic pores in the woven polyethylene fibres of the geotextile bag. The VEPAS at North Rustico also incorporates PLC controls and sensors that measure the flow rate of the sludge and automatically adjust the polymer dose to maintain optimal dewatering performance.

The sludge is pumped at a rate of about 250 L/min into one of four Geotube® containers that are positioned on a large concrete lay-down area. Each container measures 57 feet (17.4 m) in length and 45 feet (13.7 m) in circumference. As the bag is filled and dewatering occurs, clear filtrate passes through the pores of the Geotube® containers, is collected inside the lay down area and directed back to the plant headworks for additional treatment.

Dewatering containers provide years of trouble-free service

Head Operator Preston Silliker says the plant began operating with two dewatering bags, but an additional cell and two more containers were added in 2018. "With four dewatering containers we can alternate their use to maximize the capacity of each bag and also provide plenty of time for the sludge to dewater and compost," Silliker says. "We can leave the bags on the pads for several seasons. As they dewater, the volume decreases and more space becomes available for us to top them up again and again. Winter freeze also helps since they tend to loose a lot of water in the spring when they thaw."

As an example, in the prior season some Geotube® containers were pumped to about 30 inches (76 cm) in height just before winter. In the spring, their height decreased by half, to about 15 inches (38 cm), which enables them to continue accepting sludge throughout the following season.

One additional Geotube® container can be set up in a greenhouse during the winter months, enabling sludge to be pumped and dewatered year round.

The Bishop Solids Management Solution has enabled North Rustcio WWTF to become self-sufficient for sludge handling and save tens of thousands of dollars annually in operating costs.

Long-lasting benefits

"Each dewatering container is lasts for about three years before it's full," says Silliker. "When we open it up, the material inside is dry and light like peat and has no odour. We worked with the Department of Environment, Water and Climate Change to test that there are no harmful residuals in the biosolids and that it can be safely spread on farmland and our property."

"This system has provided many benefits to plant operation and our community," Standen says. Not only do we have onsite sludge treatment, but also significant savings in labour and hauling fees. We've had this new plant for five years now and haven't had to raise rates, in part because this new sludge management system is helping save money for the community and keep rates low."

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