Microfiltration membrane plant provides a reliable source of water for Petrolia

Petrolia water works building.

The system's pipes, pumps and filtration modules.

As one of the first sites for crude oil production in North America in the mid 1800s, the Town of Petrolia, Ontario, located on the shores of Lake Huron, became known as "Canada's Victorian Oil Town." In the following years, as the oil industry was booming and Petrolia began to flourish and grow in population, establishing a safe supply of drinking water emerged as a primary concern.

In 1896, the Petrolia town leaders decided to build a water treatment facility, the Petrolia Water Treatment Plant, in neighboring Brights Grove to supply water to this booming oil town. Water filtration technology was in its infancy and this plant was no different, as it consisted solely of a settling tank. As technology progressed during the 1920s, the Ontario government began to set minimum water quality standards. In 1929, the Department of Health recommended chlorine disinfection and Petrolia complied by installing a gas chlorination system.

By the early 1980s, multimedia filtration technology using anthracite, sand, gravel and stone became more prevalent. In 1984, Petrolia installed one packaged treatment plant, the Neptune Microfloc with upflow clarifiers. This system served Petrolia well for 20 years, when it became clear that the filters and clarifiers had reached their lifespan. Steel storage tanks began to show signs of stress, and the clarifiers were rebuilt multiple times due to metal fatigue.

Changing times, changing technologies

On the advice of Waterworks Environmental Services, Inc., the operators of the Brights Grove facility since 1989, the Town Council decided to incorporate new technology to handle the changing needs of the town. Petrolia had not only seen a significant rise in population, but also an increased level of turbidity (at times greater than 200 NTU) in Lake Huron, especially during the spring run-off and fall turnover when temperatures and flows were low.

The goal was to deliver a supply of drinking water safely and economically without sacrificing the final water quality. In 2002, the Town of Petrolia retained KMK Consultants Limited, of Brampton, Ontario, to work with the Town Council and Waterworks Environmental Services to design and manage an upgrade to the Water Treatment Plant that would serve a population of 9,000 people.

Evaluating the options

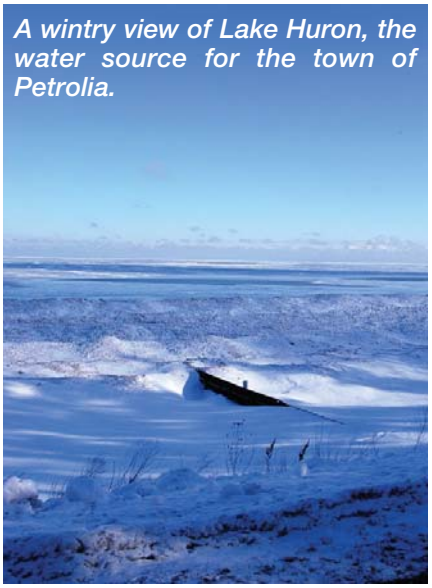
Initially, the team considered shutting down the entire Brights Grove Plant and joining the Sarnia Water System in a neighbouring larger city. However, after further discussion, it was determined that joining an existing system was not feasible for Petrolia and its increased capacity and filtration requirements. There were high capital expenses associated with joining the existing system, and preliminary research showed that the town and its residents would benefit most from

building a new plant equipped with modern technology.

Extensive research on different types of water treatment systems ensued. Pressure membranes emerged as the technology that could best remove the varying levels of turbidity, bacteria, parasites, and other contaminants in Lake Huron's water.

In mid-2002, Terry Blackmore, Director of Operations for Petrolia, KMK and Waterworks Environmental presented their findings to the Petrolia Town Council, along with the recommendation to proceed with pilot testing of pressure membrane systems. With the Council's approval, requests for proposals were then sent out.

Three companies were invited to participate in the pilot program, which began in the fall of 2002. Side-by-side testing was planned for the fall, the most pivotal and difficult time of year for the Brights Grove Plant. Increased winds on the Great Lakes cause stronger currents, which stir up contaminants in the water. In addition, colder water is more dense and difficult to push through the filters. By measuring the systems' performances under the worst conditions, the piloting team hoped to identify a system that would operate efficiently throughout the year. The pilot testing lasted for six months, into the early part of 2003.



A wintry view of Lake Huron, the water source for the town of Petrolia.

At the conclusion of the pilot testing, the results were compiled and presented in a comprehensive engineering report. The Pall Aria™ membrane system was chosen, based on overall performance, reliability and cost-effectiveness. There were no broken membrane fibers, the equipment performed flawlessly, even in the harshest conditions, and most importantly, the system produced excellent quality drinking water.

The raw water is drawn from Lake Huron through the intake pipe, which is connected to the low lift pumps suction header. The water is then pumped through screens to the Pall Aria system, which consists of three trains of microfiltration membrane modules and auxiliary equipment. Chlorine is added to disinfect the filtered water, and fluoride is added prior to storage. The treated water is then pumped to a nearby reservoir and booster pumping station in the town of Mandaumin. From there, the water is pumped once again to an elevated storage tank in Petrolia.

The last step is for the town's residents to simply turn on the tap.

For more information,
E-mail: vlad.petran@uma.aecom.com