

UV disinfection and Ozone oxidation in tandem at City of Terrebonne

will allow RAIM to serve more than 250,000 customers in the 50 years to come

Founded in 1986, the RAIM treats and distributes high quality potable water to its users in the cities of Terrebonne and Mascouche. A multi-barrier treatment process including a combination of Ozone oxidation and UV disinfection was implemented at the Terrebonne water treatment plant.

Located 30 minutes North-East of Montreal, Canada, the City of Terrebonne has the last drinking water intake of the many cities along the Rivière des Milles-Iles. The effluent waters from the cities upstream influence the water quality flowing to Terrebonne. Once the water reaches the intake to its treatment plant, the treatment performance process is set in place to ensure optimal quality water for 125,000 consumers.

First established in 1861 and serving solely Terrebonne, the treatment plant has evolved tremendously in recent years requiring infrastructure adaptation to serve the constantly growing population. Significant upgrades were also required after the creation of the RAIM (La Régie d'aqueduc intermunicipale des moulins) in 1986, which expanded the distribution to the merged adjacent municipalities of Mascouche and Lachenaie.

Efforts to modernize and expand the plant began in 2008 and involved the addition of a new state-of-the-art innovative multi-barrier process to treat the water. Water passing through the plant takes four to six hours from intake to the final treatment step. The process includes a grit removal phase followed by raw water pumping of 160,000 m³ per day and three sand ballasted clarification systems settling out suspended matter from the water. In addition, two Ozone generators for the oxidation of organic compounds and eleven biofiltration basins to digest the sugars and eliminate micro-particles were added. Finally, a UV disinfection step to eliminate pathogenic microorganisms feeds a 19,000m³ reserve stored in three underground reservoirs. Three pumping stations feed the distribution network covering 35 kilometers serving the area's needs.

While only minor civil work was required, the upgrade was a sound investment for the RAIM in collaboration with the partnering municipalities. Given the evident demographic growth of the city of Mascouche, it was critical to upgrade the facility to meet the demand as well as ensure that environmental regulations were met.

Ozone Oxidation for Organic Removal

Due to constantly changing waters coming from the Rivière des Milles-Iles, a multi barrier approach was required to ensure that the



RAIM (La Régie d'aqueduc intermunicipale des moulins) treats and distributes high quality potable water to its users in the cities of Terrebonne and Mascouche.

END USER:	City of Terrebonne
CLIENT:	RAIM
POPULATION:	125,000 residents
XYLEM'S ROLE:	Provided the solution of combining Ozone Oxidation and UV Disinfection. Results exceed regulation requirements.
PROCESS PRINCIPLE:	5 BX3200 with 32 lamps and 4 BX1800 with 18 lamps
END RESULT:	Plant now has a capacity of 120,000 m ³ /d to serve more than 250,000 consumers in the 50 years to come.

"...the effectiveness of the UV disinfection stage is also a major factor in surpassing the required objectives by such a wide margin."

drinking water met the high standards in place. The combination of Ozone and UV was an integral part of the plant's treatment process. The use of Ozone following clarification serves a number of purposes, primarily to break down organics into more simple and biodegradable products which are then readily removed by subsequent treatment steps such as biofiltration. An additional benefit is that Ozone breaks down the heavy polymer used in the flocculation step of the sand ballasted clarifiers. This significantly reduces the quantity of chemical products reaching the biological filters, which helps to prevent fouling and extends carbon lifetime.

To ensure continuous flow and supply to the residents, there are two WEDECO SMO700 generators at the facility, one in constant operation and one on standby. The Ozone generators are fed by liquid oxygen (LOX), housed outside the plant, and servicing is effectively performed two times per year by a Xylem service provider. Using Ozone at Terrebonne results in efficiently oxidizing organics and reducing chemical usage which provides for longer carbon lifetimes and reduced wash frequency. This also lowers operating expenses and reduces the overall energy consumption at the drinking water treatment plant.

UV Disinfection

Ultraviolet (UV) disinfection is the first step of disinfection performed following biofiltration. As the filtered water circulates through the UV reactors, the UV light penetrates the cell walls of bacteria and virus to permanently alter the DNA of the microorganism, rendering them "inactivated" and unable to reproduce. Ultraviolet disinfection was selected by the consulting engineers on the project for its effective results and low operating expenses.

Nine WEDECO UV reactors are installed at RAIM: five BX3200 with 32 lamps and four BX1800 with 18 lamps, all with automatic wipers preventing fouling of the lamps. The BX series is a u-shaped closed-vessel technology for water and wastewater applications with capacity up to 14.7MGD (55,000 m³/d), and a UVT range of 80 % to 98 %.

Liquid chlorine residual is then added as a second step of the disinfection process. Finally the pH levels are corrected to meet the required standards to the treated water.

The log reduction for Cryptosporidium, Giardia, and Viruses are regulated to be 2, 5, and 6 logs, respectively, but at the RAIM, the use of this multi-barrier approach has led to the plant achieving log reduction levels far beyond the indicated regulations. Given these results, the plant has since established its own objectives and benchmarks.

Gilles Comtois, Director at RAIM reported that "The success of this multi-barrier process is due to the fine-tuning of the operators, but the effectiveness of the UV disinfection stage is also a major factor in surpassing the required objectives by such a wide margin."

Running smoothly since its completion in 2011, the plant now has a capacity of 120,000 m³/d allowing RAIM to serve more than 250,000 consumers in the fifty years to come.



Nine ultraviolet reactors installed offering remarkable disinfection performance.



Organics and polymers broken down by two SMO700 Ozone generators.

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