

Safe Water for All

Ending the Drinking Water Crisis in First Nations Communities

SAULTEAUX
FIRST NATION



Saulteaux First Nation

The Saulteaux First Nation is a community of 1,200 band members located near Cochin and Jackfish Lake in Northern Saskatchewan, a two-hour drive from Saskatoon. Meaning ‘People of the Rapids’, Saulteaux is part of the larger Ojibwa or Chippewa tribe, and part of the Battleford Agency Tribal Chiefs.

The Saulteaux originally lived around the Northern Great Lakes region in Ontario. As the soil and short growing season were not suitable for farming, some band members moved west to settle in Saskatchewan. Today, the community is built around farming, forestry, and tourism, with excellent camping, hunting and fishing.

Led by Chief Kenny Moccasin, many of the challenges he and the five council members contend with are similar to those faced by other remote, rural communities in Canada: local employment, a good education for children, and the health and well-being of all residents. On top of these challenges, the Saulteaux spent a decade living with unsafe drinking water.

Not having access to safe drinking water turned everyday life into a daily struggle for the community, and took a toll on people’s health. The situation was so dire that residents often travelled to friends or relatives living in neighboring communities to shower, and many even resorted to using the facilities at provincial parks. The Saulteaux recently overcame this challenge, but the journey was not simple.

Drinking Water in Saulteaux

Almost two thirds of First Nations communities in Canada have faced inadequate or unreliable access to safe drinking water in recent years; 65 of the 70 First Nations communities in Saskatchewan have faced at least one drinking water advisory since 2004. Some communities have been under continuous drinking water advisories for a decade. With an outdated, ineffective water system that was not designed for the type of water found in the area, the Saulteaux community also suffered.

Unable to provide safe water to the Saulteaux community, the operators of the treatment plant experienced significant pressure and backlash from the people they were trying their hardest to serve. “People began to lose confidence in us. There was no light at the end of the tunnel. They don’t want an explanation; they just want to turn the faucet on without the water being brown,” said Crystal Okemow, Saulteaux’s water quality supervisor, who works alongside Harvey Thomas, plant manager.

“The smell, even the look of the water...It just tasted bad. It was hard water and stained everything. People wouldn’t wash their clothes. They complained about the smell and the way it looked,” said Crystal. “Anytime you ran the tub or used the water in the house, it smelled like a swimming pool. I felt sorry for the community,” she continued.

Too Many Chemicals

Saulteaux’s old water plant required extensive use of chemicals to treat and disinfect the water. Some of those chemicals were very corrosive and caused irritation. And while using chemicals can reduce toxins such as iron, arsenic, and highly poisonous hydrogen sulfide, they do not eliminate dissolved solids, organics, or ammonia. In the case of Saulteaux, the composition of the source water—a key factor in selecting the right treatment process—was not considered.

Saulteaux’s water had high concentrations of ammonia. Ammonia is commonly found in water sources, but high levels can indicate pollution from various sources, including animal waste. Chlorine can neutralize it, but is effective only to a point. Even with a heavy dose of chlorine, the very high ammonia levels in Saulteaux’s groundwater made purification virtually impossible.

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The ammonia weakened the effectiveness of the water filters, and the high use of chlorine continuously leached minerals and metals (including iron) from pipes and into the water supply, essentially undoing the work of the operators. “As the chlorine sat in the line, the first person to then use the faucet would end up with brown water. Conventional technology was a no-win situation for us,” said Crystal.

Understanding Saulteaux’s Need

Saulteaux’s leaders took action to end its water crisis and deliver clean and safe drinking water to their community. Chief and council members worked hard to produce evidence of the negative impact the poor-quality water was having on the health and safety of the Saulteaux community. Health Canada stepped in to do testing through accredited labs. The tests armed council with data to show the need for action.

“The key was documenting, and over a period of years, showing that the water the treatment plant was producing was not up to standards. It also required a proactive approach from the chief and council and leadership, and communication,” said Crystal.

Source water quality in rural and remote northern communities in Canada is much worse than urban areas. As a result, treating raw water with technology designed for cities simply doesn’t work. As well as the unique water composition in Saulteaux, there are other factors that had to be considered.

Access to remote, northern communities can also be a major challenge, adding significant costs to transporting materials and supplies. In addition, harsh winters can put considerable stress on the treatment process, making the water supply vulnerable.

The Solution

In 2014, Sapphire Water stepped up to work with the Saulteaux community to replace their existing water treatment plant with a new technology to effectively treat the community’s water supply. After analyzing the composition of the source water, Sapphire recommended a Sapphire Integrated Biological Reverse Osmosis Membrane (SIBROM) system. The SIBROM is a robust system employing a multi-stage design to remove ammonia, iron, manganese, arsenic, ammonium, organics, and other contaminants that act as nutrient and energy sources for bacteria, making the treated water 100% biologically stable.

There are three treatment phases in a SIBROM system: biological filtration, reverse osmosis membrane filtration, and re-mineralization to optimize the pH of the treated water. The biological pre-treatment step is most beneficial for the Saulteaux community because it significantly reduces contaminants such as ammonia, iron, manganese, and arsenic, which are prevalent in their raw water.

Parameter	Raw Water Quality	SIBROM Treated Water Quality	Canadian Drinking Water Guidelines
Ammonia (mg/l)	2.2	Below Detection	0.05*
Iron (mg/l)	4.48	0.0008	<0.3
Manganese (mg/l)	0.21	<0.0005	<0.05
Arsenic (ug/l)	13	<0.1	10

**No guideline. Recommended limit to reduce reaction with chlorine. For further technical information, please contact: sas@sapphire-water.com*

Immediately after operations began in 2014, the new SIBROM system decreased the amount of chemicals used in the treatment process to produce safe drinking water. It requires only a small amount of antiscalant to be added ahead of the reverse osmosis (RO) membranes. The new SIBROM system now uses less than 10% of the amount of chlorine that was required with Saulteaux’s old water treatment plant.

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Saulteaux Today

As with any change, there were early challenges during the transition to SIBROM. “Other than the typical learning curve for new technology, I became confident in operating the system after six months. They can also remote-in and view the problem,” said Crystal. The system is designed to make daily operations much easier and intuitive. Being able to read key plant data over the internet also means updates and routine maintenance can be performed quickly. Because the use of chemicals has dropped drastically, it costs less to operate, and the plant no longer smells like a swimming pool.

The community now places a high level of trust in its water supply. Plant managers and technicians must be knowledgeable and well-trained to keep the community’s confidence and ensure the plant runs smoothly and without major issues.

“Compared to before, the end-product is unbelievable. Before, it was...you could feel it was heavy. Water now is crisp,” said Crystal. And, she is no longer reluctant to try the water herself.



About Sapphire Water

Sapphire Water International is a Canadian company specializing in the design and implementation of long-term, leading-edge water and wastewater treatment systems for small and remote communities of up to 1,000 in population. Through its SIBROM technology, Sapphire Water delivers water to these communities that exceeds all international water quality guidelines. There are 20 full-scale SIBROM plants in operation and four under construction in Western Canada today.