Boiling Point

Small towns don't need to resort to stopgap methods to deal with poor water quality.

By Kerry Freek

In April 2008, a report in the Canadian Medical Association Journal showed there were 1,766 boil-water advisories in effect across the country. The report identified Ontario as the worst-hit area, with 679 advisories; British Columbia. followed with 530.

While the numbers are shocking, the sad truth is that it's often more cost-effective for a municipality to remain on a permanent boil water advisory than to deal with water quality issues.

In 2004, Benson, a hamlet of about 90 people located in southern Saskatchewan, faced on-and-off precautionary drinking water advisories, and the Government of Saskatchewan had issued new minimum standards for potable water. After an assessment of the existing water treatment plant, the estimated cost of replacing the system was $295,000—a price that wasn't affordable for the hamlet's residents.

Rather than choosing to "go hygienic," an option proposed by Saskatchewan Environment that would mean Benson's water would never meet the new standards and probably lose any chances of expanding, the hamlet chose to implement a new system. At Reeve Jim Packet's suggestion, residents and Saskatchewan Environment met with Regina-based Mainstream Water Solutions.

Mainstream offers a potable water solution that's especially suitable for small communities. Their ozone-assisted biofiltration system is sustainable, affordable and simple to operate—a quality of particular importance to communities that have a hard time attracting water professionals.

"Communities select ozone-assisted biofiltration technology for its simplistic design, ease of operation, savings on chemical usage, water conservation, and minimal operation and maintenance requirements," says Fidelma Horgan, a municipal engineer at PINTER & Associates Ltd. in Saskatoon (Mainstream retained PINTER in 2005 to assist with engineering the system). Low operating and maintenance requirements mean that a significant portion of Benson's investment goes right back into the community in the form of wages.

Here's how the system works. Combining the treatment steps of ozonation, biological slow sand filtration and biological activated carbon filtration can create a high quality and biologically stable drinking water free of giardia and cryptosporidium. After electricity converts oxygen to ozone, the ozone reacts with organic pollutants and breaks them down into base substances. The system produces no chemical waste and the least amount of wastewater of any current technology, important to Benson especially because its dugout water supply is often limited due to low runoff in the spring.

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"The technology is one of the most versatile water treatment technologies suitable for both groundwater and surface water applications," says Horgan. Even so, ozone isn't a solution for every small community. "In some cases it's a good fit, in some cases it's not," says Ryan Devlin, a water resources business unit leader at Stantec. "In every case the use of ozone for disinfection will be site specific and water-quality dependent."

Many recent advances have been made and this technology is growing in acceptance, says Devlin. "It's important to do a proper technology evaluation and review the total life-cycle costs (capital, operation and maintenance) of ozonation. These systems are only as good as their operation and maintenance."

In Benson, the operation of the system is straightforward, says Gail Frasz, the hamlet's water treatment operator. "There's very little chance of mechanical failure. Other than the pump maintenance, the ozone generators need periodic cleaning and an air compressor and pump are used to force air and water up through the filters during backwashing."

As a result of the system's efficiency, Frasz and Laureen Keating, the hamlet's administrator, agree that this solution meets Benson's price points. "Installation of the system was a fraction of the assessed cost of replacing the old system," says Keating. "Chemical costs have decreased—there's no longer a need for potassium permanganate, a coagulant or carbon. Maintenance costs are low due to fewer mechanical breakdowns in the gravity-fed system." Despite slightly higher electricity costs (by about $530 annually), the capital cost of a system the size of Benson's is approximately $128,000, and the operating and maintenance costs are minimal. Should the hamlet expand, it won't be difficult or costly to extend the system.

In addition, Benson's pre-system conditions—which included a surface water dugout, high turbidity (17.2 nephelometric turbidity units), bacteriological contamination, high manganese, high colour, high total organic carbon (TOC) and trihalomethane (THM) levels (300 micrograms per litre, or µg/L)—have been greatly improved. Today, the hamlet treats approximately 44 cubic metres of surface water per day. Since implementation, there has been a 98 per cent reduction in turbidity, 99 per cent reduction of manganese, and zero bacterial contamination. Colour has improved by 28 to 69 per cent, THM has been reduced to 40 µg/L, and there's been an 85 to 90 per cent chlorine reduction.

The system's success in Benson and several other small Saskatchewan communities shows that the alternative to replacing an entire treatment system at a high cost is not inaction. W

Kerry Freek is managing editor of this magazine.