

Ontario's environment: challenge & opportunity

Constant changes in environmental standards and stricter regulations have contributed to exciting developments in technology and industrial innovation. Here are some of the policy, legislative and regulatory changes in Ontario and how these changes have affected two innovative Canadian environmental companies. Both of them have exceptional technologies as well as large installed bases and are commercial successes.

by James Sbrolla and John Nicholson, MSc, P.Eng.

Since the beginning of the year, fossil fuel power plants in Ontario have been subject to stringent new caps on their emissions of nitrogen oxides (NOx) and sulphur dioxide (SO₂). Both gases are air pollutants and chief contributors to smog and acid rain. Under the new emissions caps, Ontario Power Generation's six fossil fuel stations will have to limit their total NOx emissions to 36 kt, and their SO₂ emissions to 157.5 kt for this year. From there, the caps will get tougher and tougher until 2007, when the cap for NOx will be 53 per cent lower than today, while SO₂ emissions limits will drop by 25 per cent.

Along with strict emissions limits, Ontario's environmental protection framework for the electricity sector also includes a new emissions reduction trading system, in effect as of January 1, 2002. This system prescribes national and international emissions caps. In the future, if a company wants to exceed its assigned limit, it must "buy" the additional amount from another company whose emissions fall

short of their allowed limit. This provides all Ontario businesses and municipalities with incentives to reduce air pollution.

Fresh air

One Ontario-based environmental technology company has an opportunity to benefit from these changes in the regulatory landscape. TurboSonic Technologies Inc. designs and markets air pollution control technologies and custom spray atomizing solutions to industrial customers worldwide.

One of the Waterloo, Ont.-based company's products is a wet electrostatic precipitator (WESP) that removes sub-micron particulate, heavy metals, dioxins and furans, mists, and fumes from process gas streams, and delivers performance that exceeds U.S. Environmental Protection Agency regulations (which are tougher than Ontario regulations) through a combination of a vertical downflow and hexagonal

tube design with rigid mast electrodes. Continuous self-cleaning irrigation of the tubes eliminates maintenance and downtime related to internal contaminant deposition.

Other advantages of the WESP include integrated systems, complete with gas quenching, sub-cooling and absorption; and a superior high-voltage insulator compartment designed to eliminate breakage and reduce maintenance. Also, the WESP does not require a tubesheet or a mist eliminator (an outlet plenum design eliminates droplet carryover), and has no moving parts.

Improvements of the TurboSonic WESP over others on the market include: lower maintenance, washdown water that can be recirculated, lower operating costs (it consumes as little as 10 per cent of scrubber energy), a lower pressure drop (less than 50 mm Water Gauge), Canadian Standards Association and Underwriter Laboratories-approved power components, and a higher removal efficiency compared to other scrubber designs.

"There are countless opportunities for that technology to work with industry and improve the environment," according to Hector Franco, P.Eng., of HA Franco and Associates. "Besides power generation, other sectors that can benefit through the use of a WESP in reducing emissions include forest products, sewage and medical waste combustion, chemical, and food and beverage, to name just a few."

Scrubbing smog

Another new technology designed by the company is an improved wet scrubber that uses atomizing nozzles to produce extremely fine droplets. A wet scrubber treats industrial process gas streams, removing sub-micron and larger particulate, acid gases, odours, fumes and vapors.

The surface area of the droplets, along with the ability to control droplet size and distribution, are the keys to efficient scrubbing of particulate and solute gas contaminants. This results in the removal of solid, liquid and gaseous contaminants in a single scrubber with less than a 50mm-pressure drop across the scrubber system. Also, there is no internal media to maintain, and capital and operating costs are as low as 50 per cent of other solutions.

Other benefits of the company's wet scrubber include low maintenance and erosion and plug resistant atomizing nozzles, which reduce or eliminate downtime. Vertical and horizontal configurations are available and the system can easily be retrofitted into existing facilities. Also, chemical and heat recovery and recirculation systems can be incorporated into custom designs. Compared to other designs, the system has low energy and chemical consumption, minimal water usage (which decreases effluent treatment costs and can eliminate the need to recirculate), and high product recovery.

The company has also developed a patented process for flue gas desulphurization (FGD) that may enable Ontario

companies using it to take advantage of emissions trading in SOx under the Kyoto Accord. Besides reducing SOx emissions that can be sold through the emissions trading system, the recovered SO₂ is processed into a usable by-product. Its recovery system uses a proprietary solvent developed and supplied by the Dow Chemical Co. TurboSonic's process represents a 25 per cent savings over the capital costs of traditional mineral-based FGD. The new process also offers significant savings over the existing process where tail gases from existing Claus plants and acid plants require further SO₂ removal. Also, the system has essentially no waste by-products. The design can accommodate pre-treatment to remove gaseous and particulate contaminants like HCl and SO₃.

TurboSonic anticipates that its new technology will be useful in reducing emissions from any industrial plant with

enforcement to put a stop to activities that threaten water quality; and tough penalties for non-compliance.

The first effort to establish tougher drinking water standards was the introduction of the Drinking Water Protection Regulation (Ont. Reg. 459/00). Implemented in August 2000, it prescribes strict and mandatory requirements for tougher water standards and policies for its protection. The regulation makes absolutely clear what steps must be taken to test and treat drinking water, and what must be done to protect the public when it does not meet acceptable standards. The regulation also identifies who is accountable for drinking water safety, and supports the public's right to timely and accurate information on drinking water quality.

Those facilities captured by the regulation require a certificate of approval under Section 52 of the *Ontario Water Resources Act* if these facilities serve six or

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a boiler, as well as metallurgical smelters, pulp mills, petroleum refineries, gas processing plants, chemical plants and iron and steel mills.

Water works

Through Operation Clean Water, Ontario has embarked on the most comprehensive strategy it has ever undertaken to ensure safe drinking water and the protection of public health. Operation Clean Water addresses large and smaller water facilities and includes action on several fronts to protect the ground and surface waters that supply Ontario's drinking water. The objectives are: tough and clear standards and requirements to improve and protect the quality of drinking water; effective inspection and

more private residences or supply more than 50,000L of water daily on any given day and have the capacity to supply 250,000L or more a day.

Under the regulation there must be regular and frequent testing for a wide range of parameters, including total coliforms, fecal coliforms and *E. coli*. As well, all drinking water entering distribution systems must be disinfected to kill disease-bearing organisms. Waterworks that use surface waters as their source must also use chemically-assisted filtration or other, equally effective technologies.

The regulation also prescribes clear reporting procedures, notification requirements when water does not meet ministry standards, a new licensing system for laboratory analysts and an accreditation



Seprotech's custom-designed system for fatty acid recovery in the chemical industry solves industrial waste management problems that are becoming more pressing as a result of new environment regulations.

system for water testing labs, along with inspections.

In addition, municipalities were required by Ont. Reg. 459/00 to submit an engineer's report to the Ministry of the Environment. The engineer's report assesses water treatment plants and their ability to comply with the regulation. This is the first step in the process leading to a new consolidated Certificate of Approval for all municipal waterworks.

The Ministry of the Environment rigorously reviews the engineers' reports and the new certificate will consolidate all past approvals into a single document with comprehensive conditions of approval. It will also provide directions to the municipality for physical upgrades necessary to ensure compliance with the regulation, and a date when the upgrades must be completed. Subsequent engineer's reports are required within three years of previous reports.

Another component of Operation Clean Water is the Drinking Water Protection Regulation for Smaller Waterworks Serving Designated Facilities (Ont. Reg. 505/01). This strengthens the protection of sensitive populations, which include the young, the elderly and people with compromised immune systems. This regulation places strict requirements on schools, day nurseries, nursing and retirement homes and social and health care facilities that have their own water supply system and do not fall under Ont. Reg. 459/00.

Operation Clean Water also includes funding programs and consultations on protecting groundwater. The government is providing \$10 million in funding for groundwater studies. The primary goal of this funding is to establish important information on groundwater resources at a local and regional level and associated potential risks to those resources.

In addition, the government launched the Provincial Groundwater Monitoring Network in cooperation with Conservation Ontario, its member authorities and municipalities across the province. The network provides an early warning system for changes in water levels caused by climate conditions or human activities and information on regional trends in groundwater quality.

Heavy cleaning

The current trend toward clean water opens several opportunities for Canadian companies. Seprotech Systems Inc. has 15 years of experience in the water treatment industry, and selects and integrates the best available and proven water treatment technologies to solve difficult and diverse water quality problems, including water production, wastewater treatment and purification process applications. Its cross-flow membrane separation technology includes reverse osmosis, and nano-ultra- and micro-filtration.

Recently, the company was approached by The Centre For Research in Particle

Physics (CRPP) at Carleton University in Ottawa to help design a treatment system for both light and heavy water used by the Sudbury Neutrino Observatory (SNO).

Gregory Choryhanna, Seprotech's director of process development, and Ken McFarlane, P.Eng., operations engineer at SNO, along with CRPP and SNO scientists were set on a path to design and manufacture systems to produce the most radioactively pure light and heavy water on Earth.

"We came to Seprotech because it had the technical and engineering skills to provide us with systems we required for our project, and could provide the experience in water treatment systems to successfully complete its role, both technically and within budget," says McFarlane. "In many instances performance criteria were established well beyond the capabilities of conventional systems and components."

In summer 2001, SNO released data on its work to date, discoveries that could not have taken place without the water treatment systems supplied by Seprotech, which has developed new applications to reclaim water and spent chemical solutions to maximize recycling and reduce waste. In addition to SNO, the company has worked with firms in the power generation, pulp and paper, steel, chemical and textiles industries.

New processes based on modern technology will have to be developed to help industry and government conserve and ensure safe water use and supply. Conventional technology in use for the last 75 years requires cost-effective improvement to ensure stable supplies to citizens and industry so that the economy can grow while the environment is protected.

Tougher environmental regulations present a challenge to industry in the province. But challenges also present opportunities. At least in Ontario, there are solutions to the need to reduce pollution and protect our natural resources. ♦

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