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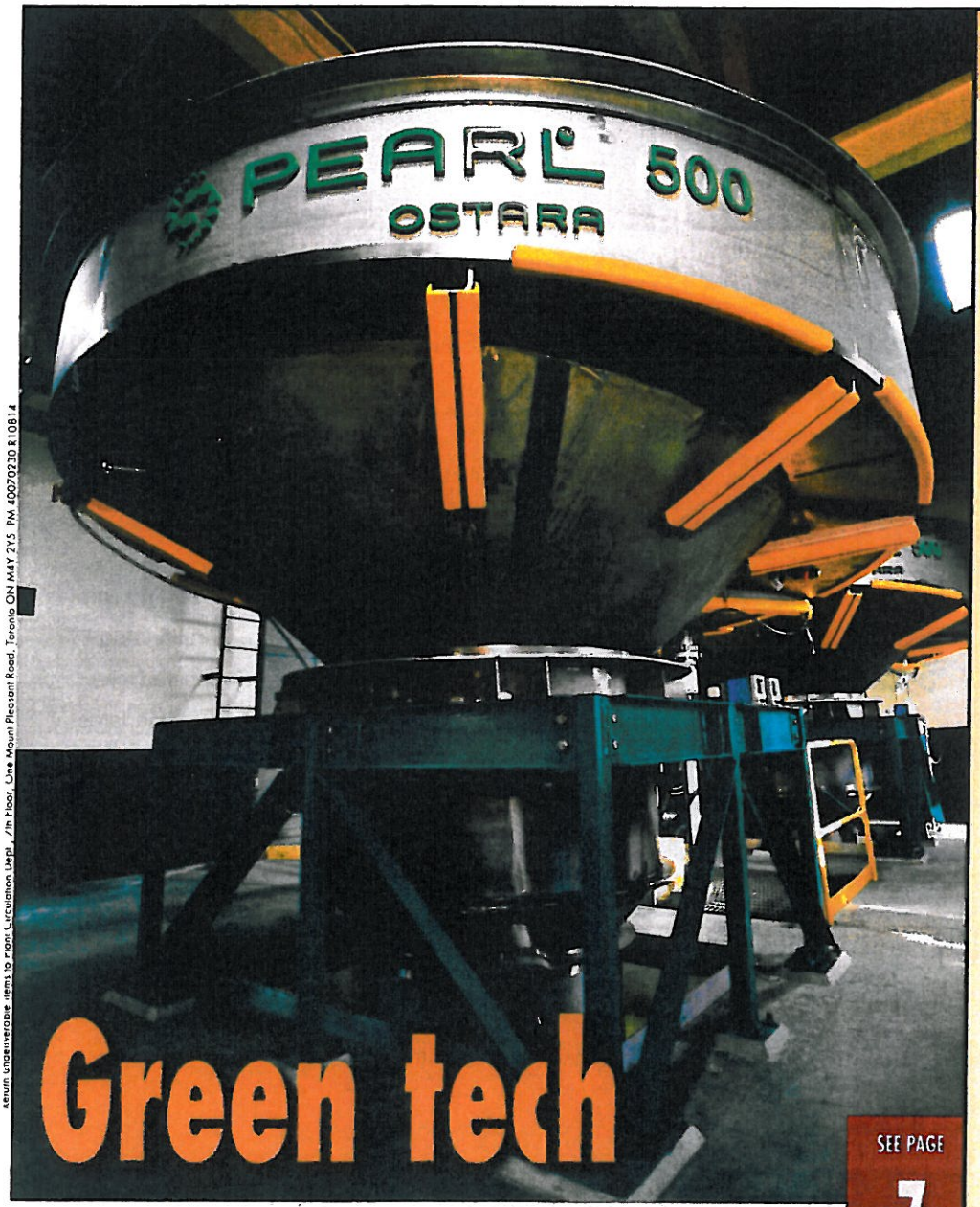

Green tech

SEE PAGE 7

There's no shortage of sewage as a raw material, so Ostara Nutrient Technology is taking the phosphorous and ammonia out of wastewater and using a reactor, like the one pictured from its Portland, Ore. facility, to turn the chemicals into fertilizer. Edmonton's Alberta Gold Bar wastewater plant was the first to install a full-scale unit. PHOTO: OSTARA

HIGHLIGHTS

Alcohol addiction is rising in the oil and gas industry.

PHOTO: ISTOCKPHOTO

Alcohol banned

Suncor Energy has banned alcohol at all its worker camps in Alberta as booze becomes a troubling issue for the oil and gas industry. A report from Shepell·fgi says the number of workers accessing employee assistance programs because of alcohol addiction was up 481% from 2006 through 2008.

SEE PAGE 4

BULLET POINTS

- Alberta is forecasting negative growth of 2.5% for the year, due mainly to weaker housing starts and lower-than-expected consumer spending.
- By 2035, global oil demand is projected to reach between 97 million barrels per day (mb/d) and 113 mb/d. In 2008 the total was 85 mb/d.
- Young people with dyslexia are 1.9 times more likely to be hurt on the job than those without, according to a new study from the Institute for Work & Health.

BOTTOM LINE

"This is essential to our growth. We hope to make [the IGCC plant in Alberta] economically viable and put the clean power label on this plant. We can remove the dirty label from coal, often called a four-letter word."

Bill Smith, senior vice-president, energy of Siemens Canada.

Turning sewage into a growth industry

BY NOELLE STAPINSKY

Canadians produce about 3-trillion litres of raw sewage per year coming from households, industry, commercial establishments and institutions. This wastewater is brimming with human and organic waste, biosolids, nutrients, pathogens and chemicals, all of which flows to city or regional wastewater treatment plants. Some solids and chemicals have to come out of this mess before the water returns to the environment. Ostara Nutrient Technology Inc. is turning them into fertilizer.

The Vancouver-based company is specifically interested in phosphorous and ammonia-nitrate. These chemicals aren't particularly good for the environment, and when they find their way into lakes and rivers they cause excessive algae growth, which depletes the oxygen supply needed for aquatic life. Municipalities and industry are employing biological nutrient removal (BNR), which extracts these chemicals with the biosolids. What the industry calls sludge–or even more appetizing, cake–is then re-circulated through the plant for additional treatment. The liquid within the biosolids contains compounds such as magnesium, ammonium and phosphate. Combined they create a chemical compound called struvite, which forms inside the pipes and equipment resulting in a concrete-like buildup that becomes an onerous maintenance issue.

Ostara's operation in Portland, Ore. processes about 20-million tons of sewage into pellet-sized Crystal Green fertilizer during its peak season (May to November). PHOTO: OSTARA

But in 1999 a group of researchers at the University of British Columbia (UBC) looked for a way to harness the materials for a more environmentally responsible end use. They came up with a process that captures the nutrients and transforms them into slow release fertilizer called Crystal Green. Ostara, formed in 2005, saw the value in this process and licensed it from UBC.

"Right now there are only two exits from a wastewater treatment plant. Raw sewage goes in, clean water comes out. We've essentially given them a third exit," explains Phillip Abrary, Ostara's president.

The technology uses a fluidized bed chemical reactor that crystallizes the phosphorus and ammonia and converts it into struvite.

"When you concentrate nutrients, which is what happens inside [wastewater treatment systems], that compound can be taken out in a pearl form. The trick was to get it out of the pipes and harvest the nutrients into a form that could be used by the fertilizer industry," says Abrary. "Now, we're forcing the reaction to happen within our vessel."

The reactor crystallizes the nutrients, much like an oyster. As the chemicals are added, the crystal particles build layers, growing into larger spherical pellets, which then settle to the bottom. When the material comes out of the reactor, the water is removed and it's run through a fluid bed dryer for 10 to 15 minutes, emerging in a pellet-sized form. Crystal Green fertilizer is then bagged in one-ton sacks and shipped off to a distributor for use on golf courses or in nurseries and horticultural facilities.

On the business side, it's a straightforward arrangement. The wastewater plant provides the operational staff and they're compensated for the fertilizer.

"We build the plant for them to produce the product, get it into bags and they're paid a portion of the revenue to offset the costs of operating the facility. The moment [the fertilizer] is put on a truck, they don't have to think about it," says Abrary.

First installation

This technology was first tested at various pilot facilities in Penticton, BC and Vancouver. But Edmonton's Alberta Gold Bar wastewater treatment plant was the first to install a full-scale unit. Gold Bar receives 500,000 litres of waste from more than 700,000 people per day, and the Ostara system treats 20% of that liquid.

A pilot project set up in May 2007 at the Tigard, Ore.-based Durham Advanced Wastewater Treatment facility is Ostara's second full-scale operation and its first in the US. Operated by Clean Water Services, the Portland facility processes about 20 million gallons of sewage during its peak season from May to November.

Oregon has very stringent phosphorus laws that restrict how much can be discharged into the environment. Wastewater facilities are limited to 0.1 milligrams of phosphorous per month, while elsewhere the average is about 0.2 milligrams.

"We had a phosphorous detergent ban applied state-wide back in the 1980s. That reduced the phosphorous coming into the plant by 22 per cent," says Rob Baur, Clean Water's operation analyst.

Because Clean Water's Portland facility releases its treated water into the nearby, slow moving Tualatin River, it had to attain low phosphorous levels, necessitating a move towards biological phosphorous removal. While making this transition, Clean Water ran into problems with the struvite plugging its pipes.

That's when Clean Water and Ostara united. Baur was presenting a paper at a Water Environment Federation conference on how Clean Water had resolved its struvite problem, using Kynar [piping]–a kind of Teflon–that stuvite won't stick to.

"I was talking about how to avoid struvite, and they were making it on purpose," laughs Baur. "Ostara started installing it [the piping] in their pilot units."

The installation of the full-scale Ostara technology started in November and it's expected to be producing Crystal Green as early as this spring.

"Instead of starting with a cement slab and building on top of the ground, then having to construct a building around [the reactors], we're putting them in an existing building that happens to be half underground," says Baur.

The top part of the funnel shaped reactor will be at ground level extending into the lower level of the facility that housed six-pump stations that were 60 feet deep.

The process takes the phosphorous from the liquid stream to the solid stream squeezing the water out of the sludge. That nutrient-rich liquid–called centrate–is diverted to the reactors to remove the phosphorous, and some of the ammonia, and that will go back into the plant to be treated for residual chemicals.

Growing success

To Baur it's a win-win investment. Diverting the nutrients it would otherwise need to recycle and re-treat delays capital expenditures for plant expansion while generating revenue. He says this process will reduce the phosphorous by 30%, exceeding the statewide detergent ban. And the end product looks like something you'd pick up at a hardware store–dustless and spherical.

The Durham facility is located near a lucrative market, the billion-dollar container nursery industry. Crystal Green releases nutrients over nine months, so a nursery can grow the plants, send them to a store for retail and they'll still be getting nutrients from the fertilizer.

Clean Water estimates running this technology will take less than half of a full-time employee's time and Baur estimates a five-year return on investment.

That fits into Ostara's payback target of three-to-five years.

"In the municipal wastwater sector, the cost of one of our facilities is 1% of the total cost of building one of their facilities," says Abrary. "The customer doesn't have to buy the equipment... they can also contract us on a treatment basis, so they would pay us on a monthly fee for the treatment of their waste."

Ostara is now targeting the corn ethanol market.

"Corn distillage that's produced as a result of the process is really high in nutrients. We've actually piloted with that application and were able to extract those nutrients," says Abara. The company is also looking at food processing and animal waste applications. "Someone has to deal with those nutrients. They can't just be discharged back into the environment."

Ostara's process is green in another important way. Traditionally, phosphate has been mined. Reclaiming the chemical from wastewater is easier than extracting it from the ground, and it eliminates the assault on the environment. There's another major plus: wastewater is a resource that's unlikely to run out.

Contact Noelle Stapinsky at Noelle.stapinsky@rci.rogers.com