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Turning Wastewater Into a Revenue Stream

Safely getting rid of what we flush away each day is the unglamorous role of the wastewater treatment plant. But a new process that turns sewage into high-quality fertilizer proves that creative minds can find inspiration for innovation just about anywhere.

Municipal facilities, such as Clean Water Services' Durham Advanced Wastewater Treatment Plant in Tigard, Oregon, are charged with processing waste with minimal environmental impact while controlling the cost to consumers. The facility has gone above and beyond its duty by teaming with Ostara Nutrient Recovery Technologies of Vancouver, B.C. to introduce technology that creates a revenue stream out of something that previously was a liability.

In May 2009, the plant installed Ostara's Pearl nutrient recovery system, which converts waste into small round pellets rich in phosphorus, magnesium, and nitrogen. The prills, as they are called, are a slow release fertilizer that keep most of the nutrients in the soil much longer than liquid or powder fertilizers because they take from three to nine months in the ground to fully dissolve, according to Ostara President and CEO Phillip Abrary.

The contract between the organizations requires Ostara to pay for the fertilizer that is produced each day from the 1,500 kg rated facility. The fertilizer, which comes in prills of various sizes, is marketed as Crystal Green and is sold to golf courses to nurture turf, and to nurseries for growing ornamental shrubs and plants, such as azaleas and forsythia.

The process should be viewed as sustainable because it reduces the amount of chemicals used in treating the waste and cuts the plant's carbon footprint, according to Rob Baur, Clean Water Services' Senior Operations Analyst. Creating the sustainable system required substantial innovation on the part of Baur, who has received two patents for his efforts.

Historically the phosphorus that is inherent in the waste stream was treated by chemical means, but Clean Water Services wanted to switch to a biological process that instead would use bacteria to feast on the waste. The first patent received in 2002 was for fermentation for making volatile fatty acids that are needed by bacteria for the biological phosphorous separation process.

However, using this "bio p" process had the unintended consequence of building up the mineral struvite in the treatment plant's pipes. The hard struvite had to be chiseled out of the pipes, which required costly maintenance of the plant pipes.

Rather than pooh-poohing this onerous task, Baur, whose father would take the family to fertilizer plants on vacation, developed a solution. Patent number two was for a treatment system that removed phosphorus and magnesium from the waste that also prevented the buildup of struvite in the pipes. This WASSTRIP technology removes up to half of the phosphorus and 75 per cent of the magnesium, which is then diverted to Ostara's Pearl reactor where it forms struvite as Crystal Green, converting a maintenance expense into revenue.

Because the chemical composition of the waste stream into the plant varies, continuous testing is required, and the data is sent to Ostara's headquarters, where engineers remotely control the reactor recipe to keep the system running optimally. The three-step treatment process requires about 10 days for waste to go through the system.

Clean Water Services' charter requires reducing the cost to residents and lowering the environmental impact. Because of this "We have been forced to be at the leading edge of technology, and have been forced to create some of that technology ourselves," said Baur. His concern for clean water flows outside of his job; Baur is also a founder of the conservation group Tualatin RiverKeepers.

Ostara licenses their technology in three of the wastewater treatment plants that have implemented its Pearl system: the Durham plant, plus others in Hampton Roads, Virginia, and in York, Pennsylvania. In November, 2010, the Hampton Roads Sanitation District and Ostara was awarded the Innovation Award from The National Council of Public-Private Partnerships for the struvite recovery system. Clean Water Service's is currently in design to add the Ostara process to its Rock Creek plant, which is 50 per cent larger, and will feature two new Pearl 2000 reactors, each four times as big as the ones currently installed in the Durham plant.

According to Ostara, their Pearl nutrient recovery system could benefit up to 200 wastewater treatment plants in North America.

Baur says the Durham facility, located southwest of Portland, is on track to meet the project's seven-year payback goal. Cleanwater Services saved $1.1 million by retrofitting an existing building, and the plant is also saving on its utility bill by using clean energy from a 500 kilowatt engine generator that runs on biogas produced in their anaerobic digesters. Producing the fertilizer locally also reduces carbon emissions as phosphorus is usually shipped to the Northwest from Florida, where it is mined.

In addition to the unlikely role of inventor, Baur also has the unique distinction amongst his peers of providing commentary on a DVD for the TV show *The Simpsons*. He was asked to chime in on an episode where Homer grows a "tomacco" plant after he gained fame for proving that the tomato/tobacco hybrid can be grown.

John Gartner is the co-founder and editor emeritus of the Matter Network.

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