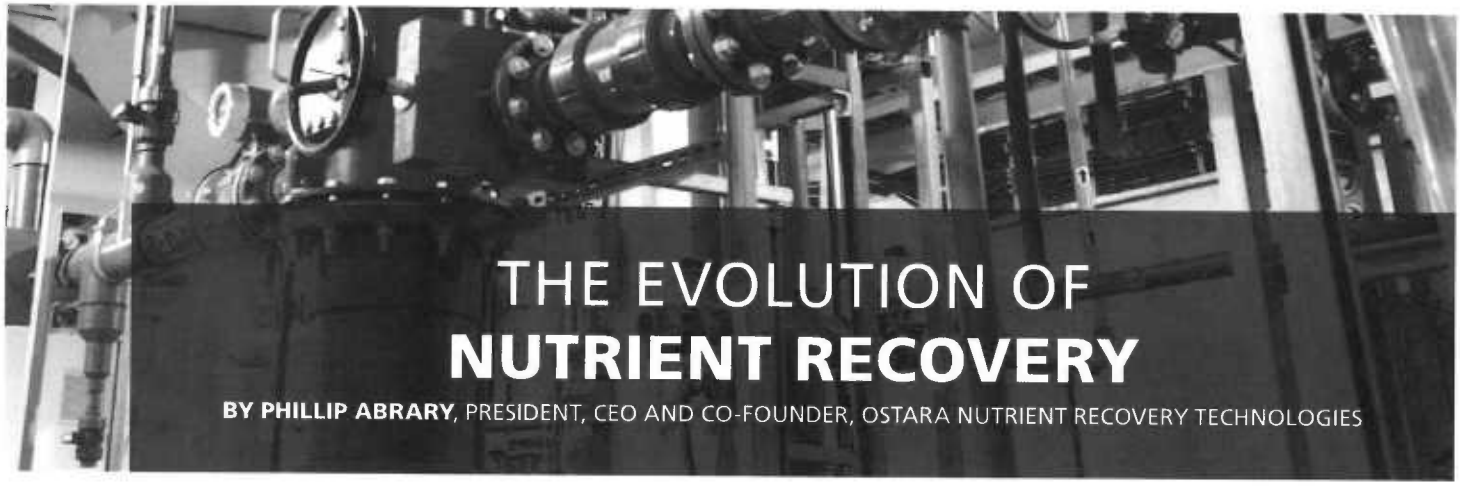

# THE EVOLUTION OF NUTRIENT RECOVERY

**BY PHILLIP ABRARY**, PRESIDENT, CEO AND CO-FOUNDER, OSTARA NUTRIENT RECOVERY TECHNOLOGIES

Ten years ago, the nutrient recovery industry didn't truly exist. Today, it is a full-circle sustainable solution being adopted by wastewater treatment plants (WWTPs) in cities and municipalities worldwide.

Traditionally, WWTPs removed phosphorus from wastewater streams by precipitating them with iron or aluminum salts, and then removing the precipitate in the plant biosolids. It was an intensive chemical process that not only generated excess biosolids, but also required the purchase of metals salts and the disposal of the metal phosphate sludge. Removal with chemical flocculants is both expensive and considered harmful to the environment. The produced biosolids were applied to land, and phosphates bound by iron or aluminum salts were not readily plant available.

The process of removing phosphorus biologically, known as Enhanced Biological Phosphorus Removal (EBPR), began in the 1960s, but wasn't common until the 1990s. Instead of chemicals, the process relies on phosphate-accumulating organisms to consume dissolved phosphates. While EBPR provides a low-cost, environmentally friendly solution for facilities to remove phosphorus, anaerobic digestion of wastewater sludges containing phosphate-accumulating organisms causes phosphorus to be released by the organisms. When released, the phosphate reacts with ammonia and magnesium already present to form struvite, which can cause severe scaling of pipes, process equipment and digesters. To prevent struvite buildup, the WWTP must resort to chemical phosphorus removal using metal salts. It also prevents released phosphorus from recirculating back to the EBPR process. In recognition of the potential value of these nutrients, alternative solutions involving the precipitation and extraction of the phosphates from post-digestion sludge dewatering liquors were developed. These processes were effective at recovering phosphorus, but unable to create a valuable product that could be successfully commercialized.

In the early 2000s, a group of researchers in the Department of Civil Engineering at the University of British Columbia (UBC) invented a process to recover phosphorus in a fluidized bed reactor. The purpose was to create a high-value fertilizer. What set this process apart from others was its ability to create a pure product that would be suitable for fertilizer consumers, increasing the chances of commercial adoption. The technology provided a second outlet for the released phosphorus by turning it into a granular fertilizer and allowing phosphorus to be recovered. It also meant money no longer had to be spent on sludge-producing metal salts.

## OSTARA NUTRIENT RECOVERY TECHNOLOGIES INC.

In 2005, when the UBC technology passed the pilot stage and was ready for commercialization, Ostara Nutrient Recovery Technologies Inc. was formed and licensed it. Within two years, Ostara scaled up the technology by a factor of 100 from laboratory to commercial scale with a demonstration facility at the City of Edmonton's Gold Bar WWTP. This full-scale demonstration facility, which produced marketable fertilizer, was instrumental in convincing other municipalities to invest in this process. Within a year, Ostara sold its first system to Clean Water Services in Oregon. The Edmonton facility, operated by EPCOR, has since been upgraded and by the spring of 2016 will launch Canada's largest nutrient recovery facility.

The product created from Ostara's process is a 99.6 per cent pure crystalline phosphate fertilizer, marketed as Crystal Green®. Ostara has led the research and market development of Crystal Green, which is now being sold to the agriculture and turf industries in North America and Europe. Revenues from the sale of Crystal Green are shared with municipalities, helping to offset the capital cost of installation of the nutrient recovery process.

The fertilizer is considered unique due to its water insolubility and continuous release properties, meaning it releases responsibly,


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***Figure 1: Photo of Ostara nutrient recovery facility in Saskatoon***
*Using Ostara's Pearl 2000 system, Saskatoon's nutrient recovery facility has an annual production capacity of 730 metric tons of Crystal Green fertilizer, and the City receives revenue from the sale of the Root-Activated™ fertilizer.*




significantly reducing the risk of leaching and run-off. This helps to protect adjacent waterways from excessive nutrients, which can result in algae blooms that destroy precious ecosystems.

Environmental policy is now focussed on reducing nutrient runoff in places like Lake Winnipeg. Last summer, Ontario Premier Kathleen Wynne and the governors of both Michigan and Ohio signed an agreement to dramatically reduce the input of phosphorus into the western waters of Lake Erie by 40 per cent over the next decade. Phosphorus management is also a concern in BC's Fraser and Okanagan Valleys and other watersheds where water quality is a worry.

As a result of this growing concern and increased recognition of the issue by provincial and federal governments, municipalities across North America are actively seeking innovative technologies to respond to increasingly stringent phosphorus limits – and to do their part to help clean up the environment. Municipalities in North America and Europe now have a viable cost effective nutrient recovery system to manage these excessive nutrients. Ostara has multiple facilities throughout North America and Europe today and is set to open the world's largest nutrient recovery facility, in partnership with the City of Chicago, later this year.

As WWTPs face increasingly stringent phosphorus limits, the evolution of nutrient recovery to a cost-effective and environmentally friendly process to manage nutrients is welcome news.

In fact, WWTPs no longer view themselves as sewage or waste treatment facilities but instead as "resource recovery centers," where water, energy and nutrients are recovered and recycled for beneficial reuse.

Nutrient recovery has undergone a significant evolution over the past decade, and is well positioned to help municipalities fight the growing threat of nutrient pollution, while at the same time controlling costs. We are proud to be able to do our part.

For more information, please visit *www.ostara.com.*



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