CASE STUDY

SASKATOON WASTEWATER TREATMENT PLANT
CITY OF SASKATOON

NUTRIENT RECOVERY WITH WASSTRIP® PROCESS RESTORES SASKATOON PLANT'S EFFICIENCY

BACKGROUND

BUILT IN 1971, SASKATOON'S WASTEWATER TREATMENT Plant (WWTP) has undergone numerous improvements and expansions over the years to keep up with evolving regulatory requirements and to serve the growing population of Saskatoon. The first major expansion in 1991 saw the plant upgraded from a primary treatment facility to an enhanced primary treatment facility. In 1996, secondary treatment facilities were added, and the City installed a new biological phosphorus removal (Bio-P) process to meet phosphorus discharge permit limits introduced for the South Saskatchewan River. Saskatoon was one of the first cities in Canada to employ this process, which uses microbes to remove phosphorus in the influent used water stream, thus avoiding the need for chemical treatment.

Today, the facility is designated a Class 4 treatment facility, the highest level of certification in Canada and cleans 85 million litres (22 million gallons) of water each day, with the capacity to expand to 300 million litres (80 million gallons), if needed.

THE CHALLENGE

With the implementation of Bio-P removal, the facility saw an increase in phosphorus and other nutrients from the sludge handling process recirculating within the plant resulting in greater nutrient loads on the main treatment process. A common challenge with the Bio-P process is the concentration of phosphorus, ammonia and magnesium in the sludge handling process causing the formation of struvite (magnesium ammonium phosphate), which coats pipes, valves and other equipment and reduces flow capacities while requiring increased maintenance.

Although the facility was effectively managing build-up through regular maintenance, struvite had been steadily

Saskatoon WWTP - Snapshot

Location:	Saskatoon, Saskatchewan
Population Served:	200,000
Treatment Flow:	22 MGD
Treatment Level:	Biological Nutrient Removal
Effluent P-Limit:	0.2 mg/L

increasing in the dewatering lagoons. In 2010, the 12km pipeline transporting digested sludge to the lagoons became so clogged that it brought the system to a standstill. Upon further inspection, the City found that a second pipeline was also severely blocked - creating enough pressure in the force main to cause an emergency closure of the system. After a costly process to locate the blockages and flush the struvite out, the facility was still not able to resume normal operations. It became clear that a more sustainable solution was needed to prevent struvite formation. In 2010, the City commissioned Stantec to prepare an independent struvite mitigation study to reduce side stream nutrient loads and reduce potential for struvite scale and build-up. The study reviewed options such as operational changes, the addition of chemical flocculants, or a nutrient recovery system.

THE SOLUTION

Ostara's Pearl® nutrient recovery process was found to be the most beneficial solution to the facility's struvite problem and restoring plant reliability. The Pearl process removes phosphorus and nitrogen from wastewater streams, then converts the recovered nutrients into high-value fertilizer. More cost-effective than chemical addition or operational changes,

Ostara's Pearl system proved to be financially favorable to the City over the long term, while providing substantial environmental advantages.

The Saskatoon WWTP is the first commercial nutrient recovery facility in Canada. It features a Pearl 2000 reactor, which has an annual production capacity of 730 tonnes of Crystal Green®, the slow-release, eco-friendly fertilizer created from the harvested nutrients. The City receives a share of the revenue generated from fertilizer sales which helps offset the costs of the system. Crystal Green is used in blends by the agriculture, turf and horticulture sectors throughout Canada and the United States.

The Saskatoon facility also employs WASSTRIP®, a process, developed in partnership with Clean Water Services that enhances the efficacy of the Pearl process in plants that are using Bio-P removal. In the WASSTRIP process, waste activated sludge is held under anaerobic conditions prior to thickening to allow struvite precursors to be removed. This allows up to 40% more phosphorus to be made available for recovery, thus further controlling struvite scale formations throughout the sludge treatment stream.

Nutrient Recovery at Saskatoon WWTP	
Number of Pearl 2000 reactors	1
Treatment capacity per reactor	5,000 m3/d
Effluent orthophosphate	28 mg-P/L
Orthophosphate removal efficiency	66%
Phosphorus removal	158 kg/day
Effluent ammonia	184 mg-N/day
Ammonia removal efficiency	11%
Nitrogen removal	72 kg/day
Struvite production capacity	457 tons/year
Process target pH	8
Building footprint	145 m2.

Figure 1 - Design Parameters and Performance of Ostara Nutrient Recovery Facility at Saskatoon WWTP

BENEFITS

- Reduced struvite build-up and plant maintenance issues
- Lower operating and maintenance costs
- Smaller supernatant nutrient load returned for treatment – improved efficiency and reliability
- Improved digestion performance
- Minimal need for chemical dosing – lower chemical and solids disposal costs
- Improved system capacity

The total financial value of these benefits creates a compelling economic opportunity for the City. Further, Ostara's solution also delivers numerous environmental benefits by reducing greenhouse gas emissions and helping to conserve natural resources.

OSTARA

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