

Bonnybrook WWTP - Calgary, AB

Heavyweight Grit Removal System for Canadian Wastewater Treatment Plant

Wastewater Case Study Project Profile

Objective

Calgary's Bonnybrook wastewater treatment plant was feeling the impacts of grit from their under-performing aerated grit tanks. 20% of their digester volume was being used as grit storage and each year the plant spent 6,000 man-hours removing grit. Limited space was available for a grit system upgrade.

Solution

An Advanced Grit Management® system with 10 HeadCell® separators, 10 SlurryCup™ washing units, and 5 Grit Snail® dewatering escalators improved grit capture from <30% to 95%.

Benefits

- The upgraded grit removal performance protected downstream processes and met future capacity needs
- Improved operating efficiency and performance while reducing maintenance and energy costs
- Helped the plant meet increasing flow requirements from a growing population base
- Protected the plant over wide variations in flow

The **world's largest HeadCell®** grit removal, classifying and dewatering system is installed at Calgary's Bonnybrook WWTP to reduce maintenance and operating costs. The new system is designed to treat a peak flow rate of 368 Mgal/d (1,393 MLD).

Bonnybrook's Grit Challenge

The largest city in Alberta and the fourth largest in Canada with over one million people, Calgary is situated on the confluence of the Bow and Elbow Rivers. Warm dry summers produce plenty of wind-blown dust and sand and in the severe northern prairie winters, heavy ice and snow are frequently interrupted by warm Chinook winds that sweep up from the south as the Arctic fronts temporarily retreat. The resultant rapid thaws can leave the **streets awash with runoff and sand** used for winter road safety.

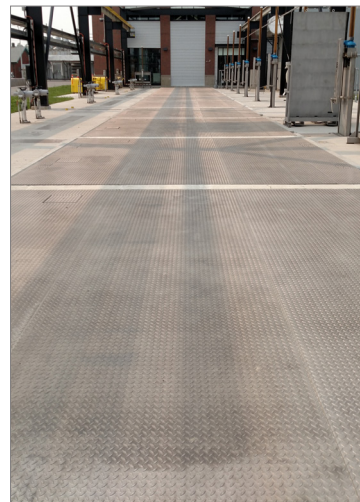
While much of Calgary's sewer system is sanitary sewer, significant portions of the old sewers are CSO systems. The collected wastewater leads to high concentrations of grit in the raw sewage as well as much additional grit carried in highway runoff.

Bonnybrook, one of Calgary's three wastewater treatment plants, was being upgraded to serve the City's **growing population**. The new system had to be built in the **limited space** available and still cope with the unique characteristics of the influent wastewater.

"High performance grit removal is important to achieve lower operation and maintenance costs and retain the specified capacity of downstream process units, such as bioreactors, fermenters and digesters," says Senior Project Engineer Zorica Knezevic, City of Calgary Water Resources. "For example, we had noted that up to **20% of the digesters' tank volume was taken by settled grit** with the previous technology. Wear and tear on equipment was also a factor, and removing grit was part of periodic maintenance; we estimated it at approximately 6,000 man hours annually."

Equipment Selection

Consulting engineering firm Stantec was hired to design the new headworks and pre-qualify the suppliers. Ryan Roberts, P.Eng., PMP, VP – Water at Stantec, comments: "For the headworks project, we included maintenance costs in the lifecycle evaluation of technology options and project justification. The project scope includes screening and grit removal; screenings washing and compacting; grit classification and dewatering; solids conveyance and storage; and flow distribution and measurement."



Bonnybrook's Covered HeadCell Units (Left) SlurryCup Units (Right)

*"High performance grit removal
... achieve[s] lower operation &
maintenance costs & retain[s] ...
capacity of ... bioreactors, fermenters,
& digesters."*

Zorica Knezevic, Calgary Water Resources

“As the removal efficiency of the existing aerated grit tanks was low, and passed on much grit to accumulate in downstream processes, a grit characterization was necessary to develop an accurate design basis for a cost-benefit evaluation of the various treatment alternatives considered.” The study found that the **existing grit system was removing only 26-29%** of the influent grit. It also identified the reason: virtually all of the influent grit had a settling velocity lower than a 212 micron (μm) sphere of silica sand, the conventional design point, for which the original plant was designed.

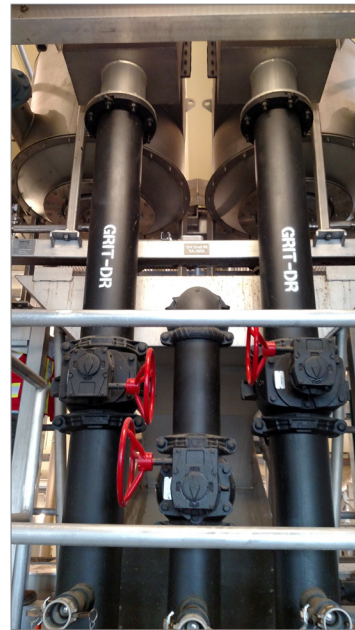
By having the grit characterization data available, Stantec was able to work with the City to determine the grit removal system performance requirements that formed part of the system specification for equipment pre-selection.

Hydro International's HeadCell system was pre-selected based on its ability to remove grit particles as fine as 75 μm along with other performance and operational features, and its **proven track record** at other regional installations with similar performance requirements.

The Solution

The complete headworks process includes new 6 mm bar screens, screenings washer/compactors and new screenings conveyors. Each of the 10 HeadCell units then removes and concentrates fine grit, which is pumped to a SlurryCup classifier unit that cleans the grit to minimize the associated organic material. Washed out organic material is returned to the treatment plant.

The washed grit slurry flows by gravity to a Grit Snail dewatering unit to produce a dewatered grit with an average of no more than 20% volatile solids by weight and greater than 60% total solids. Dewatered grit is sent to landfill. There are five Grit Snail units, each with two SlurryCup units mounted on top. This configuration saves space and capital cost.



Guaranteed Grit Removal Rate

Each of the HeadCell units supplied to the upgraded Bonnybrook WWTP meets the peak flow specification of removing 95% of all grit 150 micron and larger, at Specific Gravity (SG) 2.65, at a flow of 368 Mgal/d (1,393 MLD) from screened sewage. At the normal flow design maximum of 110 Mgal/d (416 MLD) the units will remove **95% of all grit 75 μm** (SG 2.65) and larger from screened sewage. The first sewage flowed through the system in late August 2014.

Commissioning included successful performance testing of the Hydro grit removal system by an independent third party. Zorica Knezevic concludes: “After commissioning, the Bonnybrook grit removal plant **continues to perform well.**”



Bonnybrook's 5 Grit Snail Units Output Grit with Greater than 60% TS