CANADIAN CONSULTING engineer

AECOM

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Ashbridges Bay Treatment Plant P-Building and Odour Control

Summary

This project aimed to increase both the plant's overall preliminary treatment capacity and the quality of screened sewage through the headworks. AECOM's design included a few firsts (the CEPT system and the usage of ultra-high efficient turbine blowers). Our design also included a new biofilter for odour control, a green roof and a solar wall. Keeping the plant operational throughout construction was also achieved through collaboration between AECOM, the City and the contractor.

Innovation

One example of technical excellence this project exhibits is through the construction staging – a process that was engaged in by all three parties – the Plant staff, AECOM project staff and the contractor.

- **Construction Sequencing:** Construction sequencing was one of the most important things to get right on this project as the plant is a working plant and needed to be operational throughout the construction period. If the construction caused the plant to stop producing treated sewage, the result would be raw sewage spilt directly into the lake. AECOM, the City and the Contractor worked collaboratively to establish timing where certain processes of the plant could be bypassed or shut down during certain times of the day so that construction could happen. This close collaboration between the three parties mean that there were no unnecessary shut downs or the plant needing to be taken off line.

Innovative technology and treatment processes were integrated into the design of the P-Building. Some of these exciting processes include:

- **Chemically Enhanced Pre-Treatment (CEPT):** This new process combines a chemical coagulant system with a chemical polymer system which is automatically turned on during high flow rain events. The purpose of the system is to allow the solids to settle out within the primary clarifiers even in the extremely high flow events (where typically these solids would not have time to settle in the clarifiers at the high flows). This is the City of Toronto's first CEPT system!
- **Biofilter:** The headworks portion of the plant gives of considerable foul odours. The project implemented a new biofilter air scrubbing system. A new 3 cell biofilter designed to filter foul smelling air sucked from the new headwords building, the truck loading facility, the grit tank area, as well as the new covered primary influent channel. The biofilter uses bacteria grown on media inside of the filters to remove odours from the facility air. The odour producing contaminants in the air are used as food to keep the odour eating bacterial alive inside of the filters. The exhaust air is discharge to the atmosphere. The project design also includes the covering of aerated raw sewage channels with stainless steel covers. The air from inside of the channels is sent to the biofilter as well.
- **Blowers:** 4 new state of the art magnetic turbine air blowers to provide aeration of grit tanks as well as the channels before and after the screens. This is the first time in Canada these ultra-high efficient turbine blowers have been installed to provide air for aerating process in the P-Building and grit tanks which are aerated 24/7.
- **Refurbishing of Grit Tanks:** Rehabilitation of the 6 grit tanks to include a new grit pumping system, and submersible grit screw conveyor. These new conveyors aim to increase the grit removal from the original process and automate the entire process (no operator required to remove grit).
- **Green Roof:** although it is now mandatory that any new buildings constructed in the City have a percentage of its roofing be a green roof, this green roof has many benefits to the plant, the environment, and the community. The plants used will absorb water, limiting the rush of stormwater into the system. In addition, the white portion of the roof is designed to provide radiant heat control. The benefit to the community? This roof helps to reduce the urban area heat.
- **Solar Wall:** Preheats the HVAC system fresh air intake using solar radiant heat. Helps reduce natural gas usage to heat the facility during cooler and winter months.
- **Choice of construction materials:** HVAC and other vents and piping are in FRP to help prevent corrosion. This leads to longer life and less maintenance costs.

Complexity

Several factors throughout the project presented challenging and complex situations that, through collaboration with the plant's staff, AECOM project staff and the contractors, we were able to successfully resolve.

Challenging Ground Conditions: The site of the P-Building for the ABTP is located in the portion of Toronto's waterfront that is reclaimed land. Every new facility on this project is built upon a network of piles to help prevent the building from settling into the soft ground.

Constrained construction footprint: the footprint of the project was limited. ABTP is located next to a busy marina on the lakeshore of Lake Ontario. In addition, this area of the plant is surrounded by the existing plant to the south and west.

Keeping ABTP operational 24/7/365: Another challenge that was faced successfully is the difficulty in keeping treatment processes active while building new treatment areas and decommissioning other treatment areas. Again, collaboration between the City, the City's plant staff, AECOM and the Contractor was key to keeping the plant active for the City's operators.

Social and/or Economic Benefits

Social

Reduced odour emissions, collection of stormwater and limiting the rush of stormwater during an event reducing the ecological impact on lake Ontario, landscaping to provide visual enhancement and noise pollution reduction for the users of the space around the plant all go to recognize the social quality of life.

The green roof, along with all its other benefits, was designed to help reduce the urban area heat. A positive contribution to both environment and socially for the City.

All of the Contractors involved in the successful delivery of this project were local to Ontario,

Economic

With the solar panel there is a reduction in natural gas usage to heat the HVAC clean air intake system. This provides an economic savings (operational) for the plant.

Construction materials chosen: aluminum helps to prevent corrosion. This choice in material leads to longer life of the infrastructure and less maintenance costs.

All of the Contractors involved in the successful delivery of this project were local to Ontario, keeping the money within the local economy.

Environmental Benefits

This project has several environmental benefits that resulted from the design:

Reduced odour emissions – covers on the aerated raw sewage channels and the new biofilter work to reduce the odours from the plant.

Enhanced upstream processes (smaller screens, CEPT) helps downstream processes be more efficient.

Solar panel - provides heat to the HVAC system, which reduces the usage of natural gas normally used to heat the facility in cooler months, including the winter.

Green roof – the main function of the roof is to collect water during rain/snow events and limit the rush of stormwater that enters the system. In addition, it is also designed to assist with radiant heat control, leading to help reduce the urban area heat.

Landscaping – trees were removed during construction and more trees were planted along the outside perimeter of the plant, as well as on the plant site. These trees will not only provide a visual enhancement, buffering the marina and its users from the plant; but also, they are there to help buffer the noise, and as trees do, help clean the air.

Meeting Client's Needs

The City of Toronto has experienced growth in size and population, which has increased the demands on the existing infrastructure. ABTP's original plant was experiencing extensive problems with its screening and grit capabilities which allowed significant debris to enter the plants preliminary treatment tanks (and affecting all downstream processes). With this growth also came increased odour complaints and social pressures for cleaner air. Growing out of this was the P-Building and Odour Control Project.

The objectives of this project are:

- increase the plants overall preliminary treatment capacity
- increase the quality of screened sewage through the headworks
- reduce the odourous emissions of the facility

On the following page are Figures 1 and 2 which highlight components of the project that address the objectives above, as well as innovative design to address environmental, social and economic concerns of both the City of Toronto and its citizens.

The components are highlighted with numbers in the yellow hexagons:

1: Screen handling building (Headworks) - Six (6) perforated fine screens (6mm) each capable of handling a flow rate of 400MLD. Screened material flows through sluicing channels to washer compactors (4 total) then conveyed (shaftless screw conveyors) to the truck loading facility (2 truck bays capable of handling 50ft trailers).

2: Solar wall - uses solar radiant heat to preheat the fresh air intake for the HVAC system. Reduces costs and fuel to heat the facility in cooler months.

3: Primary Treatment and Polymer - upgrades to the existing scum and sludge pumping. Upgrades to channel aeration including installation of odour control measures. Conversation of the facility from screening (ten (10) 25mm bar screens) to a new chemical (polymer) facility for improved solids retention during high flow events.

4: Green roof - per City of Toronto guidelines, a certain percentage of each newly constructed building must have a green roof. The benefits ABTP will see from this are mainly environmental and social. The roof is designed to absorb stormwater during a rain event, limiting the amount of stormwater that will enter into the treatment system, which impacts the overall treatment process. Another benefit that will be realized is the control of radiant heat. This roof will contribute to the overall reduction of urban area heat.

5: Biofilter - three (3) cell biofilter to treat odourous air collected from channels, tanks, equipment, and truck loading facility through the new P Building. As the Ashbridges Bay Treatment plant is within an urban area and across the bay from a marina and one of Toronto's biggest and most popular beaches, controlling odours generated by the treatment process is a high priority for the City.

6: Grit Tanks and CEPT system - upgrades to the existing six (6) grit tanks from clamshell bucket and grit hoppers to submerged screw conveyors and two grit pumps per tank. Grit is pumped back into the Headworks for processing through hydrocyclones (6 total) and classifiers (2 total) the conveyed by screw conveyors to the truck loading facility. Old grit hopper area was converted into a new CEPT (chemical enhanced primary treatment) facility for enhanced solids retention during high flow events.

Figure 1 (top) and 2 (bottom): Components of the P-Building and Odour Control Project

7: Landscaping - both a visual enhancement and an environmental enhancement for the City. With the marina across the inlet, the trees will provide both a visual enhancement and help to reduce the noise pollution from the plant. A side benefit from all these trees too, is that a function of trees is to help clean the surrounding air.

8: Workshop and office space - New workshop facility including welding and storage rooms. Offices and a lunch room are on the second floor for the plant operations staff.

ASHBRIDGES BAY TREATMENT PLANT P BUILDING AND ODOUR CONTROL - ENHANCING OUR COMMUNITY.

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