

Evaluation of Water/Wastewater Treatment & Energy Savings Data

Summary:

During the past few years Water/Wastewater Treatment & Compliance (WWTC) has taken a number of steps to avoid significant energy costs through participation in conservation initiatives, obtaining funding through available rebate programs and increasing operational efficiency through capital investment in existing assets. This work has resulted in the following accomplishments:

- \$510,600 in electricity cost avoidance at the Sudbury Wastewater Treatment Plant (SWWTP) through participation in the Industrial Conservation Initiative (ICI) since 2016;
- \$466,500 in rebates for the installation of energy efficient equipment and associated engineering studies through the Industrial Accelerator Program (IAP) since 2012;
- \$180,000 in anticipated annual electrical savings resulting from maintenance performed at the Sudbury Wastewater Treatment Plant in 2018.

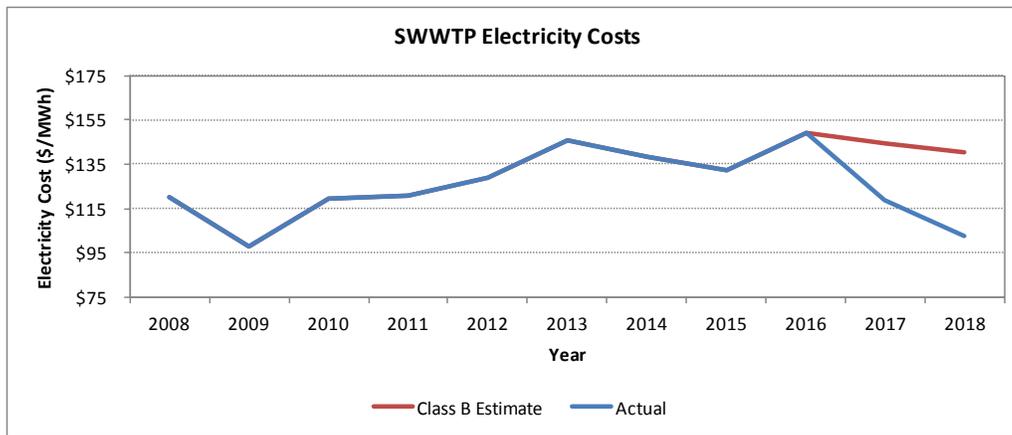
These savings have had a significant impact on the cost of services delivered, and have been achieved while maintaining our high quality treatment and effluent standards.

Cost Avoidance:

Global adjustment (GA) is the portion of total electricity costs that contributes to building new infrastructure, maintaining existing resources and funding conservation and management programs across Ontario. The GA charge for “Class A” industrial facilities, those with a peak demand of 1 Megawatt (MW) or greater, is determined by measuring their percentage contribution to the top five hours of peak electricity demand in Ontario from May 1st to April 30th each year. This value is then used to calculate a billing factor which determines the amount of total GA charges for the province (also known as the “Global Adjustment Pool”) that are allocated to each customer for the following year.

Due to the size of the annual Global Adjustment Pool, these charges can represent a significant portion of total energy billing. Within Water/Wastewater only one facility classifies as a “Class A” customer, the Sudbury Wastewater Plant, where approximately 54% of total billing from 2015-2018 was due to GA. In an effort to mitigate these expenses, the facility participates in the Independent Electricity System Operator of Ontario (IESO) Industrial Conservation Initiative (ICI) Program (also known as “peak power response” or “high five response”). By reducing consumption during the 5 peak demand hours, staff can significantly reduce the GA billing factor for the facility.

The SWWTP was re-classified as a “Class A” customer in July 2017, and started participating in the ICI program at that time. The change in billing structure, and participation in peak power response had an immediate impact, as shown in the following chart:



For the second half of 2017 the total cost of electricity was reduced to \$93/MWh, lowering the average cost paid in 2017 from an estimated \$144/MWh to \$119/MWh. This represented approximately \$211,900 in savings compared to estimated “Class B” pricing for the year. Average costs in 2018 were further reduced from an estimated \$141/MWh to \$102/MWh, representing approximately \$298,700 in cost avoidance.

Estimating the performance of the plant based on the top 5 electrical demand hours currently registered for the period from May 1st 2018 to April 30th 2019 indicates that the SWWTP electrical costs should drop an additional \$91,500 (for the period from May 1st 2019 to April 30th 2020) over the current level of savings achieved in 2018. It is important to note that these actual and estimated savings are somewhat independent of plant flow rates as they are calculated based on the GA factor determined during the 5 peak hours.

The potential also exists to completely eliminate GA costs for the facility with the installation of a new standby generator. The planned capital project for a new generator will allow the SWWTP to completely remove itself from the Ontario power grid during the top five hours of peak electricity demand in Ontario, completely eliminating the GA charge. This would be a total cost savings of \$500,000-600,000/year compared to estimated “Class B” prices.

Equipment Rebates

As part of the planned capital program to upgrade our Water & Wastewater facilities, we are continually identifying opportunities to install energy efficient equipment. When these opportunities represent measurable savings, we are also then able to obtain rebates for engineering studies and equipment procurement through the IESO Industrial Accelerator Program (IAP).

Since 2012, a number of initiatives ranging from engineering studies to capital improvements have been completed at both water and wastewater facilities, resulting in the following rebates:

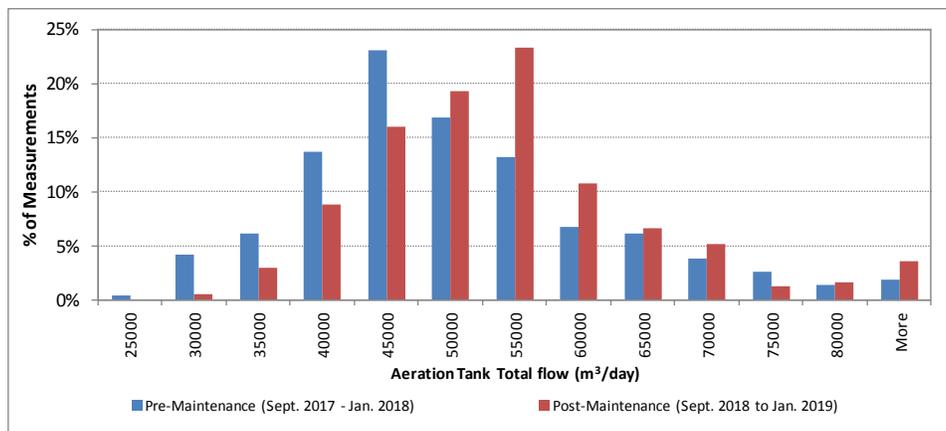
Facility	Rebates Received
Wanapitei Water Treatment Plant	\$ 111,773
David St. Water Treatment Plant	\$ 31,410
Sudbury Wastewater Treatment Plant	\$ 244,000
Azilda Wastewater Treatment Plant	\$ 42,471
Chelmsford Wastewater Treatment Plant	\$ 11,879
Valley East Wastewater Treatment Plant	\$ 10,000
Coniston Wastewater Treatment Plant	\$ 10,000
Levack Wastewater Treatment Plant	\$ 2,780
Dowling Wastewater Treatment Plant	\$ 2,252
Total Rebates Received	\$ 466,565

It is anticipated that as we complete capital assessments and upgrades at our outlying water and wastewater facilities in the coming years we will continue to participate in the IAP to access additional rebates.

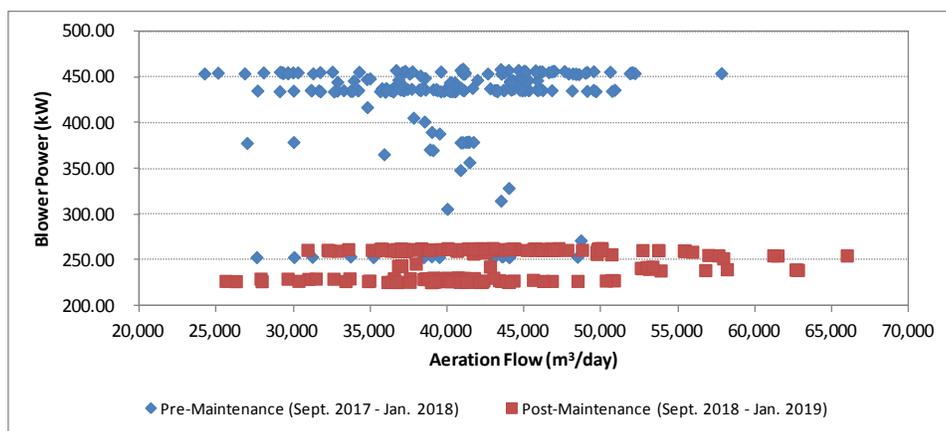
Operational Savings

The complex nature of water and wastewater treatment facilities provides ample opportunities to achieve measurable savings through process optimization. For example, planned maintenance was completed in September 2018 to clean and repair the diffusers in three of the eight aeration tanks at the SWWTP. It was anticipated that by performing this work that the amount of air required to achieve the targeted treatment could be significantly reduced, thereby achieving energy savings.

To assess the improvements made, data from September 15th to January 10th was compared for 2017/2018 and 2018/2019. For the purposes of the analysis it is important to note that although the summer had noticeably less precipitation, the inlet flows to the SWWTP were slightly higher during the fall and winter of 2018/2019 (average 42,667 m³/day) compared to 2017/2018 (average 40,581 m³/day), as shown below:



After repairs to the aeration diffusers were complete, operators were able to maintain average Dissolved Oxygen (DO) levels at approximately 1.0 ppm while using one blower instead of two. This resulted in a step change in energy consumption, which is evident in the total blower power data below:



The cleaning work was completed by an external contractor, with the diffuser maintenance done by WWTC operators. Overall costs for the setup, cleaning and equipment components were approximately \$117,200, and it is estimated that the plant will save approximately \$180,000 in electrical costs over an average year as a result of not having to run the second blower.

Additional cleaning and maintenance is planned for 2019, which will allow for further optimization. It is also expected that with the increased process efficiency the savings will be sustainable regardless of variations in average annual precipitation levels. Future budgets will then be adjusted to reflect actual savings once sufficient data has been collected and verified.

Ongoing and Future Projects

The Growth & Infrastructure department is committed to maintaining the effective operation of water & wastewater facilities while optimizing our processes to benefit water ratepayers within the City of Greater Sudbury. To support this goal, Infrastructure Capital Planning is working with operations staff to upgrade existing facilities, increase operational efficiency and improve safety while meeting regulatory requirements through the following projects:

- Wanapitei WTP – Installation of new energy efficient blower;
- Azilda WWTP – Assessment of completed capital upgrades to aeration system & installation of refurbished aeration blower;
- Chelmsford WWTP – Assessment of completed capital upgrades to aeration system, including the installation of three new energy efficient blowers;
- Valley East WWTP – Planned upgrades to the existing aeration and electrical systems for 2019;
- Coniston WWTP – Capital needs assessment as part of Asset Management Plan for 2019, and;
- Sudbury WWTP – Installation of second energy efficient blower and Standby Generator Project planned for 2019.