GTAA
PARTNERS IN PROJECT GREEN
A PEARSON ECO-BUSINESS ZONE

Municipal Water Efficiency Eco-Cluster:

# WATERLOO BREWING

## Case Study

*A program of:*

Toronto and Region Conservation Authority

# Project Summary

Waterloo Brewing's efforts to minimize their environmental footprint date back to 2007 when they retained Enviro-Stewards to complete a water conservation study suitable for participation in Waterloo Region's Water Efficient Technology (W.E.T.) program.

**A co-benefit of the water conservation measures is the avoidance of 223 tonnes/yr of GHG broken down as follows:**

- 1.4 tonnes/yr avoided by the Region to supply water and treat wastewater
- 110 tonnes/yr avoided by Waterloo Brewing for reduced evaporative losses
- 94 tonnes/yr avoided by Waterloo Brewing's supply chain for hop & grain production
- 18 tonnes/yr avoided by Waterloo Brewing's beer transfer trucks

## About Waterloo Brewing

Waterloo Brewing is Ontario's first, and largest, craft brewer. Originating in 1984, they built a new brewing and packaging facility in 2005 and have consistently worked to reduce their environmental footprint. In August 2015, they installed a world-class, state of the art brewhouse, which significantly reduced its environmental footprint. Their 10,700 $m^2$ facility is located at 400 Bingemans Centre Drive in Kitchener. The company has over 35 years of experience brewing and packaging different varieties of beer.



## Process & Resource Consumption

Waterloo Brewing's major processes include brewing, fermenting, filtering and packaging. Significant ancillary processes include CIP (clean-in-place) systems to sanitize the tanks and pipes, glycol cooling systems for process chilling, and a steam boiler for process heating (e.g. boiling). Manual cleaning is also performed to wash floors and equipment using spray nozzles and high-pressure spray systems.

**Resource consumption includes:**

### Natural gas

- Steam boiler heating
- Hot water for brewing and packaging processes and CIP
- Domestic hot water
- Hot water for manual cleaning activities

### Electricity

- Lighting
- Process machinery (chilling)
- Ancillary equipment (air compressors, pumps, controls, electronics, etc.)
- HVAC systems (heating, ventilation, and air conditioning)

### Water

- Main Product ingredient
- Steam
- CIP
- Domestic
- Manual cleaning activities
- Boiler makeup

## The Region of Waterloo's Water Efficient Technology (W.E.T)

Since Waterloo Brewing is located in Kitchener, it was potentially eligible for the Region of Waterloo's Water Efficient Technology (W.E.T) program for industrial facilities. The WET program provides up to 50/50 cost of water audits (up to a maximum of $10,000), as well as rebates of $0.40/L saved per average day or 50% of capital cost of implementation up to a maximum of $100,000.

Waterloo Brewing was an early adopter of water conservation and related resource conservation initiatives. Their initial gains were reported in a case study prepared by the Region of Waterloo and featured in a CTV news report.

**Resource consumption includes:**

- Water ($0.0022)
- Caustic ($0.0026)
- Acid ($0.0004)
- Natural Gas ($0.0012)

These original measures remain in place and hence are presently contributing about $350,000 dollars each year to Waterloo Brewing's bottom line.

# Summary of Savings

In 2015, Waterloo Brewing consolidated their King Street production facility in Waterloo into their Kitchener operations. Prior to the consolidation, beer was brewed, fermented and aged at their Waterloo facility and tankered to their Kitchener facility for filtering and packaging.

Waterloo Brewing partnered with the Region of Waterloo's Water Efficient Technology (W.E.T.) program to incorporate water efficient measures into the new brewhouse installed at the Kitchener facility.

Prior to the move, the Waterloo brewhouse required enough heat energy to boil 8% of every brew. Improvements in the boiling process in the new brewhouse reduced the required evaporation to 4%, a reduction of 50% in the required heat energy for boiling. The new Kitchener brewhouse was installed with an energy recovery system which captures half of the energy that was used for evaporation, resulting in a combined energy reduction of nearly 75%.

**Together with other efficiency measures incorporated, water and associated co-benefits include:**

- 10% less water consumed per unit of wort produced
- 2% less beer lost during trucking per unit of wort produced

The table below provides a summary of the estimated savings associated with the opportunities identified at Waterloo Brewing.

## Environmental Savings

| Water savings ($m^3$/yr) | Water GhG savings[1] (tonnes $CO_2$eq/yr) |
|---|---|
| 23,569 | 2 |

| Electricity savings (kWh/yr) | Electricity GhG savings[4] (tonnes $CO_2$eq/yr) |
|---|---|
| 93,424 | 5 |

| Natural Gas savings ($m^3$/yr) | Natural Gas GhG savings[2] (tonnes $CO_2$eq/yr) |
|---|---|
| 88,837 | 167 |

| Raw material (barley) savings (kg/yr) | Raw material (barley) GhG savings[5] (tonnes $CO_2$eq/yr) - grain supply chain GhG savings |
|---|---|
| 56,517 | 32 |

| Beer savings (hL/yr) |
|---|
| 3,600 |

| Total GhG savings (tonnes $CO_2$eq/yr) |
|---|
| 223 |

| Total Transportation GhG savings[8] (tonnes $CO_2$eq/yr) |
|---|
| 18 |

## Economic Savings

| Economic savings ($/yr) |
|---|
| $350,000 |

**NOTES:**
GHG savings estimates based on the following:

[1]**Associated with water use in Ontario:**
0.05 kg$CO_2$e/kWh * 1.2 kWh/$m^3$ = 0.06 kg$CO_2$e/$m^3$

*References: 0.05 kg$CO_2$e/kWh – Region of Waterloo Factor, Includes Sewer Surcharges 1.2 kWh/$m^3$ – adapted from Water Research Foundation & Electric Power Research Institute: Electricity Use and Management in the Municipal Water Supply and Wastewater Industries, 2013*

[2]**Associated with natural gas combustion in Ontario:**
Ontario natural gas combustion = 1.879 kg $CO_2$e/$m^3$
Rounded up to: 1.88 kg $CO_2$e/$m^3$
Assumes a boiler efficiency of 80%, a heat exchanger efficiency of 90%, incoming water temperature of 12°C, and boiler blowdown temperature of 90°C.

[4]**Associated with electricity in Ontario:**
Electricity production = 0.05 kg $CO_2$e/KWh

[5]**Associated with barley supply chain:**
Barley production = 0.57 kg $CO_2$e/kg barley

[6]**Barley consumption in beer production:**
Amount of barley consumed = 7.3 kg barley/hL beer

[7]**Associated with caustic:**
Caustic production = 0.177 kg $CO_2$e/L

*References: The European Chlor-Alkali industry*

[8]**Associated with tanker trips:**
Tanker emissions = 1.11 kg $CO_2$e/km
One round-trip kilometer: 14 km

## Summary

1. Waterloo Brewing was able to participate in the Region of Waterloo's WET program, which helped identify water conservation opportunities that had associated energy and greenhouse gas benefits.
2. The brewery continued to implement measures that decreased their GHG emissions, such as:
   - 1.4 tonnes/yr avoided by the Region to supply water and treat wastewater
   - 110 tonnes/yr avoided by Waterloo Brewing for reduced evaporative losses
   - 94 tonnes/yr avoided by Waterloo Brewing's supply chain for hop & grain production
   - 8 tonnes/yr avoided by Waterloo Brewing's beer transfer trucks

---

## Contact Us

**Eric Meliton, BSc.** | Program Manager, Water Stewardship
Partners in Project Green | Community Engagement and Outreach
Toronto and Region Conservation Authority (TRCA)
101 Exchange Avenue, Vaughan, ON L4K 5R6
T: 416.661.6600 ext. 5890 | E: emeliton@trca.on.ca

**partnersinprojectgreen.com**

*This initiative was made possible in part through the financial support of the Independent Electricity System Operator's (IESO) Education and Capacity Building Program. Toronto and Region Conservation Authority is solely responsible for implementation of, and the content of any materials produced by, this initiative, and the IESO has no responsibility or liability whatsoever in the event that any person suffers any losses or damages of any kind as a result of the initiative.*

*In collaboration with:*

ieso Independent Electricity System Operator

Region of Waterloo

Toronto and Region Conservation Authority