

ARLA FOODS WATER CONSERVATION THROUGH YORK REGION WATER CONSULTATION PROGRAM

Arla Foods Inc. (Arla), a Canadian subsidiary of Arla Foods in Denmark, is located at 675 Rivermede Road, Vaughan. A core component of Arla's success has been their relentless dedication to sustainable growth. The company is committed to reducing their energy and water consumption by three per cent annually within their operations. Since 2014, the company's participation in The Regional Municipality of York (York Region)'s Water Use and Wastewater Quality Consultation and Capacity Buyback Incentive Program has resulted in large amount of water reduction. The continuous improvement process is an ongoing effort to reach Arla's environmental sustainable target.



Executive Summary

Arla Foods is a cheese manufacturing facility that produces a wide range of fresh cheeses, including bocconcini, mozzarella, ricotta, mascarpone, parmesan, and asiago, among others. On a regular basis, Arla is using a lot of water in their production; as an ingredient, cooling water, and sanitation. In order to achieve their environmental sustainable strategy, target, and continual improvement, Arla looked for an external party to assess their process with fresh eyes. York Region's Water Consultation and Incentive program was a perfect fit for their desire.

York Region offers water-use and wastewater consultations programs free of charge to industrial, commercial, and institutional (ICI) high water users in York Region under its Water Use and Wastewater Quality Consultation Program (the Programs). The purpose of these consultations is to identify long-term water-saving measures. If facilities choose to implement the opportunities identified in the water use consultation report, the contracted consultant will then return to the facility to verify the water savings and recommend an incentive amount based on the volume of water saved per day.

Through the Program, Arla has already reduced over 32 per cent of their total water consumption since 2014. By implementing a suite of water saving measures — from replacing spray nozzles with more efficient models to reusing their process water — Arla has been able to reduce its annual water consumption by more than 37,000 cubic metres (m³), which equates to a savings of \$143,000. The company also received a water savings incentive of \$19,487 from York Region and has had additional savings of over \$142,000 annually from a reduction in natural gas, cleaning chemical and labour costs.

Background

Arla Foods consumes large amounts of water for their production of various cheeses. The main ingredient of their product is fresh raw milk which has been delivered to the facility by truck. Delivery trucks are cleaned internally using clean-in-place (CIP) system plus a manual hose down externally. In order to produce cheese, milk is constantly passing through their system; this cooking process requires water to be filled and drained daily for cleaning purposes. The Reverse Osmosis (RO) system has been used in the processes to concentrate the whey where clean water is then sent to sewer line.

Before water saving implementation, there was a holding tank that was jacketed and cooled with once-through chilled water. The spray water was being used constantly in several processes to clean or remove leftover cheese from container or conveyor. Most cleaning is done using a CIP system but there is also a large tank that is filled each day for cleaning parts.

In 2014, Arla participated in York Regions Water Use Consultation program where York Region's consultant conducted an in-plant water audit to determine where their water was being consumed. The results from the audit were summarized as follows; process water balance, water saving opportunities, estimated investment required, gross savings, payback period, and eligible incentive amount from York Region.

The consultation report from York Region was used as Arla's business case to get approval from head office. Several water savings opportunities were approved and implemented which resulted in large reduction of water usage (Annual water consumption declined from 118,000 m³ in 2014 to 50,000 m³ in 2016).

Program Description and Results

Arla Foods, York Region, and the third party consultant worked together under the York Region Water Consultation program to conserve water at the facility. The program started off with a kick-off meeting to discuss the water use equipment and included an onsite visit. From the kick-off meeting major water-consuming processes and main water supply location were identified, the consultant then returned to the facility for the complete pre-audit.

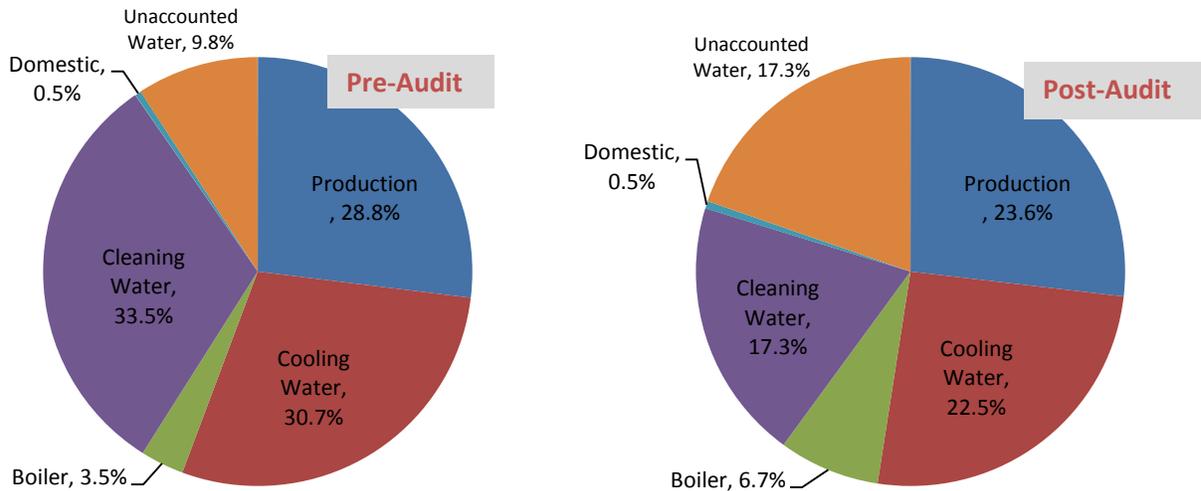
Water Balance

Clamp-on ultrasonic flow meters were installed on several locations to record flow rate in litres per minute; the main water supply pipeline, RO system, product cooling water line, and CIP system. Some meters were left on the equipment for a week to monitor and develop a water use profile while some processes required just a spot check for the constant flow rate.

Arla's Commitment

"WE STRIVE FOR THE BEST ENVIRONMENTAL PRACTICES AND WORK TO CONTINUOUSLY REDUCE OUR ENVIRONMENTAL IMPACT, ALL THE WAY FROM THE FARM TO THE CONSUMER."

When comparing their municipal water bills from 2014 to 2016 Arla’s total water consumption was reduced by more than 50%. The water balance was developed from the measures (see charts below), although there have been significant process changes since the last water balance was developed in late 2014 (pre-audit). There was also a large volume of unaccounted for water at the time of the assessment which came from baseline water consumption recorded during non-production hours. This consumption needs to be further investigated and eliminated if possible.



Water Conservation Opportunities

After the consultant conducted the pre-audit, the results and recommendations for water saving opportunities were provided to Arla in the water consultation report. Most of the recommendations have been implemented and in some cases Arla went above and beyond to advance reduction by eliminating the water use process altogether.

In 2016, Arla completed multiple retrofits and changes to their processes and applied for York Region’s Capacity Buyback incentive. A verification assessment was performed to determine the post-implementation water consumption of the opportunities recommended. The water saving opportunities were grouped into five(5) levels of complexity, from simple changes with no investment required to the most complicated projects that require further research and budget, which are listed below:

1. Change operational system

- **Minimize water volume and frequency of clean-in-place (CIP)**

During the 2014 assessment, two 4,500 L sanitary tanks for product were filled and drained four times daily. Arla evaluated this process and validated that the CIP system needs to use only 1,500 L for each tank, twice daily. Savings are therefore estimated at 7,800 m³ per year (83% of the water previously used for this purpose or a 6% reduction in Arla’s overall municipal water consumption)

- **Improve scheduling, reduce packaging cleaning time**

Arla was able to improve scheduling in the packaging area such that longer runs of products are done before cleaning is required, reducing cleaning time by a reported 25% in the packaging area. This translates to annual water savings of 1,147 m³ (a 12% reduction in water previously used for this purpose or a 1% reduction in Arla's overall municipal water consumption)

2. Replace existing equipment with more water efficient equipment.

Arla has been trialling various low-flow spray gun models to ensure employee acceptance before replacing all spray guns. They have been able to find a spray gun with a lower flow (29 LPM at 80 psi versus 32.5 LPM at 80psi (60 LPM at 350 psi) for the old spray guns), and have replaced the most-used spray guns around the facility with these. They are also trialling an even lower-flow model (18.5 LPM) and will install them if they are accepted well by employees.

Water savings associated with this opportunity were calculated based on the flow rates of the new and old spray guns and the operating hours reported by Arla staff. Water savings associated with this opportunity were verified to be 437 m³ annually (4% of the water used by the spray guns, or 0.3% of Arla's overall municipal water consumption).



Before –Old spray gun(32.5 at 80 psi)



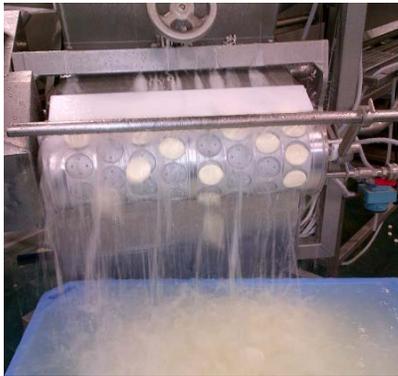
After – New spray gun(red, 29.3 LPM at 80 psi),
Newest spray gun (white, 18.5 LPM at 80 psi)



3. Modify the equipment or installing water saving devices.

- **Modified process to capture cooling water**

Installation of tank and tunnel to capture product resulted in decreased need to use totes and continuous running of fresh water for cooling. The overall savings associated with this opportunity were 85% reduction in tote cooling calculated based on measured consumption during water use assessment and staff-estimated. This resulted in verified savings of 975 m³/year of municipal water (a 1% reduction in Arla's overall municipal water consumption).



Before –Pushing cheese into tote



After – Capture cheese and water

- ***Add chemical tank to improve cleaning process***

A sanitizing tank was added to improve the efficiency of clean-out-of-place (COP) system, reducing the need to empty the tank by half. To do this, a sanitizing tank was added to the COP process, such that the COP tank is emptied just twice per week instead of four times per week. The overall savings associated with this opportunity are estimated to be 698 m³/year of municipal water (50% of the water used in COP or a 1% reduction in Arla's overall municipal water consumption).

- ***Install acid recovery system for raw CIP***

Arla started recovering the acid portion of the raw CIP cycle, saving water and acid, and has reduced washing times for tanker trucks. The overall savings associated with this opportunity are estimated to be 2,220 m³/year of municipal water (70% of the water used for these purposes, or a 2% reduction in Arla's overall municipal water consumption). Savings were calculated based on the previous truck washing procedure (500 LPM for 300 seconds, twice daily), reported previous consumption of 900 L for each of eight daily acid washes, and assumes the system recovers 70% of the water.



Before –Old CIP system



After – New CIP system

4. Change to less or no water process

- **Replace water-cooled with air-cooled equipment**

Arla replaced jacketed tank that used chilled water pass through and straight to the drain with an air-cooled system that does not use water. This alternative resulted in more water savings, since the cooling system does not use water. Savings were found to be 17,472 m³/year of municipal water (100% reduction of water used or a 13.6% reduction in Arla's overall municipal water consumption)



Before –Cooling water going to drain



After – New air-cooled system

- **Eliminate water spray bar**

The spray bar used for cooling product was deemed unnecessary and was removed, such that this process no longer consumes water. The overall savings associated with this opportunity were verified to be 1,398 m³/year of municipal water (100% reduction of water used or a 1% reduction in Arla's overall municipal water consumption)

- **Eliminate hot water tank**

There was a hot water tank in the production room that used a constant flow of hot water. Due to process improvements in the production room, the hot water tank was no longer necessary. The overall savings associated with this opportunity were verified to be 2,134 m³/year of municipal water (100% of reduction in water use or a 2% reduction in Arla's overall municipal water consumption).

5. Reuse water

- **Capture and reuse water in cooling tunnel**

As Arla modified the process to capture product and water by installation of tank and tunnel as mentioned above, the majority of captured water is reused in the cooling tunnel. Savings for this opportunity were calculated based on flow monitoring data for the production room from November of 2014 and February of 2017 (subtracting cheese tote cooling water) and normalized to production. Water savings associated with this opportunity were verified to be 3,579 m³ annually (11% of the water used or 3% of Arla's overall municipal water consumption).