



SHOWCASE PROJECT: PEPSICO: CONDENSING ECONOMIZER INSTALLATION

SOLUTION OVERVIEW



BETTER PROJECT WINNER 2019 PepsiCo is a food and beverage company made up of six divisions: PepsiCo Beverages North America; Frito-Lay North America; Quaker Foods North America; Latin America; Europe Sub-Saharan Africa; and Asia, Middle East and North Africa. Gatorade is a business unit of PepsiCo Beverages North America and its Tolleson, Arizona, site is one PepsiCo's largest Gatorade manufacturing sites in the country.

As part of the company's 2025 25% greenhouse gas (GHG) reduction goal, it set out to reduce the energy usage of the Gatorade pasteurization process. Pasteurization is a process in which certain foods, such as milk and fruit juice, are treated with heat to eliminate pathogens and extend shelf life.

With a budget of \$1.5 million, the Tolleson plant upgraded its pasteurization process by installing a condensing economizer to recover heat energy from the plant's steam system. Condensing economizers can be installed with little complexity when used to preheat cool water in a storage tank and controlled to a maximum temperature set point. Boiler condensing economizers have been installed at several Gatorade facilities in the past where thermal energy was transferred to heat process ingredient water to reduce fuel usage.

The challenge at this site was that there were multiple heat recovery systems, as well as a solar thermal system which heats all ingredient water, and therefore no thermal sink was readily available for the boiler exhaust.

SECTOR TYPE

Industrial

LOCATION

Tolleson, Arizona

FINANCIAL OVERVIEW

\$1.5 million

SOLUTIONS

The Tolleson site already possessed other heat recovery systems and there was no available thermal sink for the boiler exhaust. As a result, the team designed a custom project to recover the significant amount of energy available in the boiler exhaust. The team decided to investigate heating the product in the pasteurization process with the recovered energy. This had never been done in the past because of the complexities of the manufacturing process, including strict food safety and quality control limitations and guidelines.

The project involved recovering heat from the boiler exhaust via a direct contact condensing economizer. Exhaust is vented to the economizer in conjunction with the steam from each of the site's deaerators and condensate return tanks. Dampers (a valve or plate that regulates the flow of air inside a duct) installed at each broiler stack ensure proper draft and combustion flow to the economizer. This allows water in direct contact with the boiler exhaust to be heated and piped throughout the facility to the heat sinks (a temperature regulator). As a result, the hot water is used to pre-heat boiler water and Gatorade product through air gap plate and frame heat exchangers. Hot water flow is then regulated via control valves set to certain temperatures at an extremely steady state. Overall, the heat recovery system is monitored by a programmable logic control (PLC) system.

Measurement and verification of upgrades at the Tolleson facility demonstrate that the project reduced the thermal load (demand for heat energy) of the site by approximately 40,000 MMBTU, a reduction of 10% of fuel usage (natural gas) at the site. The fuel savings caused approximately 5% reduction in primary energy intensity at the Tolleson, Arizona, site. Additionally, the project resulted in fuel intensity reduction of 5% for all Gatorade plants in North America.

The project was then rolled out to other sites, the result of which additional thermal load recovery was added to the system to include the steam heated shrink label machines in the loop. Previously steam from the label machines had been vented to the atmosphere. Including this in the custom economizer solution resulted in a 25% increase in energy recovery.

Looking forward, the company is developing a further extension of this project which will improve capture and utilization the abundance of solar energy at the site. The site currently has a 9 MMBTU solar thermal system dedicated to heating water. The system will be tied to the new economizer water loop and used to assist in the pasteurization process.

OTHER BENEFITS

The economizer now operates as a cooling system for the solar thermal process, helping to keep the solar farm operating at peak performance. Having been known to overheat in past summers, the system has become more reliable as a result of the upgrades.

Measurable non-energy benefits of the condensing economizer are:

- Enabled recovery of 2 million gallons of water from the boiler stack in the economizer. Water

generated is used in cooling towers. This water will also be added to the steam system as boiler make up water due to a low pH and hardness.

- This project delivered a 1.5% reduction in GHG emissions at the Tolleson plant with the potential to implement in three other sites. Overall, by expanding this project to the other sites, it is estimated that a 25% GHG reduction in the Gatorade manufacturing process can be achieved.

Annual Energy Use

Baseline()



Actual()



Energy Savings

5%

Annual Energy Cost

Baseline()



Actual()



Cost Savings

5%





