GE Power & Water
Water & Process Technologies

Case Study

GE's RO System Helps Unilever Reduce Water, Natural Gas Consumption and Chemical Usage

Challenge

In the face of rising and unpredictable energy prices, the ongoing campaign to improve energy efficiency is necessary for the Unilever plant in Rexdale, Ontario to remain competitive. The Rexdale plant consumes huge quantities of energy for the annual production of 185 million pounds of margarine and other vegetable-oil products, and energy expenditures represent 15% of all production costs.

To meet an aggressive goal of reducing energy consumption by at least 6% per year, the Rexdale plant's Energy Team has implemented, and carefully documented, 120 projects since 1999, saving more than $4.2 million in energy costs, based on 2006 prices, and avoiding about 23,000 tons of greenhouse gas emissions.

The initiatives of the plant's Energy Team are also part of the Unilever corporate commitment to environmentally responsible practices at its 365 manufacturing sites across six continents. In 2005 for the seventh year running, Unilever led the food industry category of the Dow Jones Sustainability World Indexes (DJSI World), based on assessment of corporate economic, environmental and social performance.

"By 2003, our Energy Team at the Rexdale plant had already attacked many of the more obvious ways of reducing energy consumption, but we needed to take additional initiatives to keep pace with our company goal of achieving further reductions of 6% per year," explains Doug Dittburner, chief engineer and head of the Energy Team at the Unilever plant in Rexdale, Ontario.

"We turned to GE Water & Process Technologies to investigate whether we could achieve significant, measurable improvements in the efficiency of our steam plant operations."

Solution

The Energy Team worked with GE to analyze the total cost of purchasing and treating water used to produce the 218 million pounds of steam that the plant uses each year. Municipal water, chemically softened and dealkalized, was the source of 100% of the boiler make-up water.

GE recommended a reverse osmosis (RO) system to replace the water softeners and chloride anion dealkalizers. RO is a mechanical process involving the reversal of flow through a semi-permeable membrane from a high salinity, or concentrated, solution to the high purity, or "permeate," stream on the opposite side of the membrane. Pressure is used as the driving force for the separation.

A "turn key" system was commissioned in the Rexdale plant in January 2005. The RO system not only softens and purifies municipal water, but it also re-uses process water captured throughout the plant for use as boiler make-up, significantly reducing the consumption of municipal water. The "concentrate" waste from the RO process is used in the

plant's cooling tower and evaporative condenser for ammonia.

Results

The higher quality RO feed water allows the boilers to operate at 100 feedwater cycles instead of 10, dramatically increasing energy efficiency. Blowdown has been reduced by more than 80%, with a bleed off of only 1%.

"The results of the RO project have greatly exceeded our expectations, and they are easily measured," says Dittburner. "In the first year of operation, we calculated that the project produced a net savings of $378,166 [based on 2006 prices], even after accounting for the full cost of operating and maintaining the RO system. We calculate that the RO system will pay for itself in less than 16 months."

By converting to the RO system, the plant is consuming 13 million gallons less of municipal water ($68,000) and 8% less natural gas ($299,000). The plant is also saving $11,700 in boiler chemicals and $22,000 in commodity softening chemicals, allowing 240,000 less pounds of chemicals into the sanitary sewer.

These costs savings do not include the benefits of eliminating the backbreaking work of handling 3,976 bags of salt, each weighing 44 lbs, and the related labor and storage costs.

The RO system also qualified the Rexdale plant for a $50,000 incentive grant from the city of Toronto for decreased water consumption and a $14,000 incentive grant from local gas utility, Enbridge Consumers Gas.

According to Dittburner, "The RO project is easily justified by the direct financial benefit to Unilever, but we are also proud of the environmental benefits. The project has led to our producing 1.6 million fewer kilograms of CO_2, as well as reductions in methane and nitrous oxides. We are also consuming far less chemicals and reducing the environmental impact of producing and transporting those chemicals."