SHOWCASE PROJECT: EASTMAN CHEMICAL: IMPROVED CONTROL OF PROCESS WATER SYSTEMS IN HYDROCARBON CRACKING PLANT

SOLUTION OVERVIEW

Eastman Chemical Company has a corporate goal to reduce the energy intensity of its manufacturing facilities by more than 20% over 12 years. Energy intensity is measured as the MMBtu of energy used per kkg (thousand kilograms) of production. For its integrated Longview, Texas site, the intensity was approximately 11.5 MMBtu/kkg in 2017. The hydrocarbon cracking plants, which produce ethylene and propylene through thermal cracking of ethane and propane, are one of Eastman's higher energy intensity manufacturing units, with a 2017 energy intensity of 19.6 MMBtu/kkg in 2017. This means that energy improvement projects in the hydrocarbon cracking plants can be very impactful toward achieving Eastman's energy intensity reduction goals.

Specific to this project, the statistical variability of the process water system was impacting the efficient use of steam and condensate systems in the hydrocarbon cracking plant. A key metric in this statistical variability is the standard deviation of the process and the process capability. During periods of time when the process was operating outside of the allowable process variability, process water control issues had damaged the internals in the process water stripper, which further aggravated the system variability.

SECTOR TYPE

Industrial

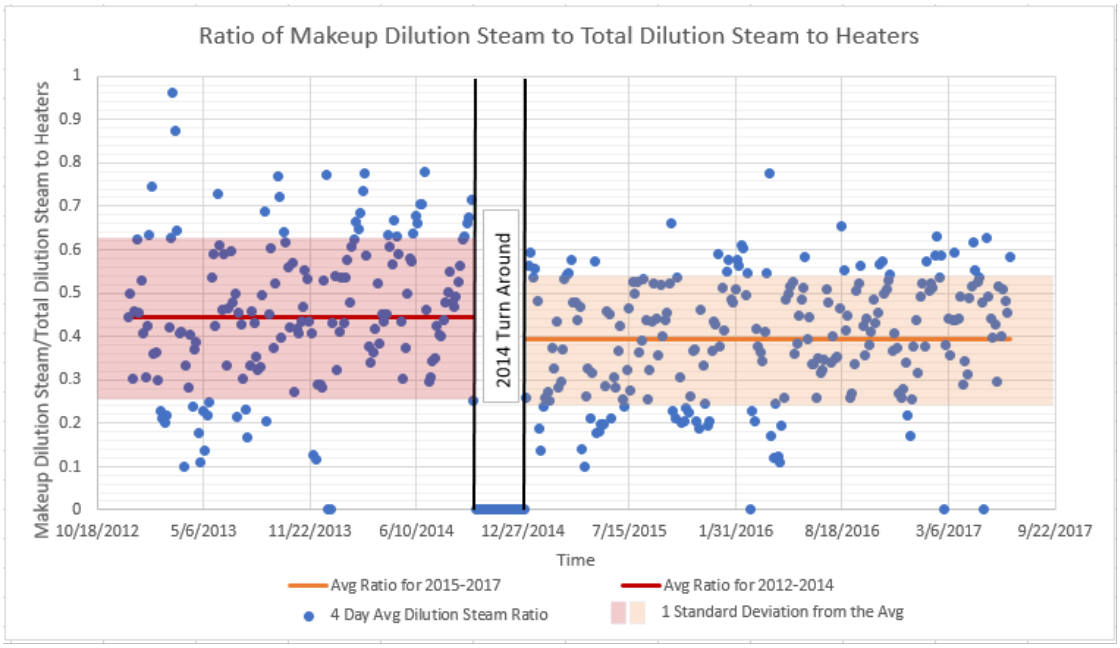
LOCATION

Longview, Texas

SOLUTIONS

Excessive variability of the measured energy inefficiency was observed in the process water system for several years. During excursions in control of the facility, warm process water would be routed to the on-site wastewater treatment facility and subsequently the water was replaced with fresh cold water. During the 5 year maintenance turnaround in 2014, where the hydrocarbon cracking plant is completely shut down for major maintenance, the process water stripper was inspected internally, and the observed tray damage was repaired. Upon returning to operation after the turnaround, the system showed reduced variability. The previous process variability, resulting from the tray damage, was the limiting factor that prevented optimization of the system. A program was pursued over the next two years to implement an advanced tiered level control system to optimize water usage and reduce steam use in the dilution steam generator.

By replacing the damaged internals in the process water stripper and by implementing an advanced control strategy for the process water stripper, the quench tower, and the dilution steam generator, the variability of the entire system was reduced. An 11% reduction in steam usage and an 81% reduction (4.8 MM Gallons per year) in make-up water was seen within the hydrocarbon cracking plant.

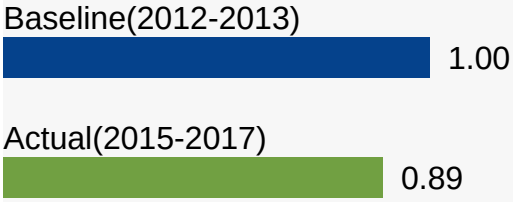


Graph showing reduction in steam use and process variability

OTHER BENEFITS

Eastman has two additional hydrocarbon cracking plants that potentially can use an advanced control system on their process water systems, and implementation in these areas will be considered in the future. Extending beyond the hydrocarbon cracking plants, the use of advanced controls to improve energy efficiency is viable in multiple facilities and is being used across the company to improve the efficiency of many processes. The key to select a candidate for advanced control is to evaluate the process data and observe the extent of energy inefficiencies as the process operates further away form the desired target. The advanced control will drive the process back to the optimum operating conditions.

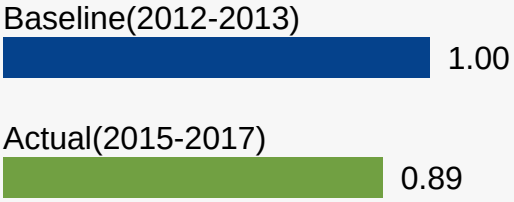
Annual Energy Use



Energy Savings

11%

Annual Energy Cost



Cost Savings

11%