

Utility Slashes Fuel Usage at Large Power Generating Unit using Emerson's Combined Cycle Optimization Strategies

RESULTS

- 67% reduction in average 2x1 hot start fuel usage
- 31% reduction in average transition fuel usage
- Enables faster startups for a unit that averages 50 hot starts and 300 hot transitions a year
- Emissions expected to be reduced accordingly

APPLICATION

Combined cycle plant equipped with GE 7FA .04 combustion turbines with advanced gas path, heat recovery steam generators and a Westinghouse steam turbine

CHALLENGE

A shift to more flexible operations has increased the cycling frequency of combined cycle units.

Investments to improve the full operational cycle from startup to shutdown can provide repeatable and sustainable results.

Optimizing unit starting performance improves efficiency and reduces fuel usage, startup time and emissions which ultimately increases plant reliability.



“Over the last decade, we’ve seen combined cycle plants shift from baseload to more flexible operation with increased cycling frequency. Our extensive balance-of-plant experience has shown that for power blocks experiencing heavy cycling, it is critical to look at the complete operational cycle from shutdown back through the startup in order to drive maximum performance. We can help our customers adapt to this changing operating environment, and achieve quantifiable and sustainable combined cycle performance improvements.”

Bob Yeager
President
Emerson Automation Solutions
Power & Water

SOLUTION

Emerson has completed a combined cycle optimization project that generated significant operational improvements and slashed average fuel usage at a large power-generating unit operated by one of the largest utilities in the U.S.

To help the utility reduce fuel costs during unit startup, Emerson combined its expertise in combined cycle plant control and operations with several of its Ovation™ advanced power applications. The result was a 67 percent reduction in average 2x1 hot start fuel usage. Additionally, average transition fuel usage – the fuel used to bring another combustion turbine/heat recovery steam generator (HRSG) train online and blend it with the running units – was reduced by 31 percent.

These fuel reductions and corresponding improvement in startup time are particularly significant, as this unit averages 50 hot starts and 300 hot transitions a year. Emissions are also expected to decline accordingly.

Based on the success of this project, Emerson will implement its combined cycle optimization program at several additional units owned by this utility.

Emerson's combined cycle optimization program is based on a highly structured process involving close collaboration with the customer. The initial stages of the optimization project entail collecting historical process data to generate models of the plant's current operating performance in order to identify opportunities for improvement. Emerson then develops and deploys dynamic performance metrics, which are created in standard Ovation logic, that serve as the basis for tracking and validating improvements throughout the project.

Once the optimized startup process is validated through analysis and testing, Emerson's power experts focus on reducing variability through increased task automation and reduced dependency on manual operator intervention. Advanced control strategies that actively control HRSG energy distribution to coordinate combustion turbine firing, steam turbine generator loading, and steam bypass and attemperation result in steam flows and conditions that minimize energy losses within engineering constraints.

Specifically, Emerson implemented two Ovation advanced applications as part of the combined cycle optimization project. Advanced sequence automation encodes standard operating procedures into the Ovation control system which streamlines startup procedures and provides consistent starting and loading. The main steam header blending application combines cascaded setpoint generation, full bypass capability analysis and updated control strategies to minimize the amount of steam bypassed to the condenser.