

Emerson's Ovation™ Response Optimization Improves Minnkota's Young Unit 1 Ramp Rate by 70%

RESULTS

- Improved ramp rate by 70%
- Decreased over/undershoot by 2 MW
- Reduced pressure variations by an average of 4 PSI
- Increased incremental revenue opportunity



APPLICATION

250-megawatt lignite-fired generating unit with a Babcock and Wilcox (B&W) cyclone boiler and General Electric (GE) steam turbine generator

CUSTOMER

Minnkota Power Cooperative, Inc. (Minnkota), Milton R. Young Station Unit 1 (Young) located near the city of Center, North Dakota

CHALLENGE

Minnkota's Young power station is the primary source of electric generation for more than 110,000 customers. When Unit 1 began commercial operation in 1970, it operated with some of the most innovative equipment of its time. This included use of cyclone boilers to overcome the challenges associated with burning lignite coal.

For years the Young station was base-load operated to meet stable regulation demands. When Minnkota started participating in the MidWest ISO, the units were required to change from producing megawatts at relatively constant levels to quickly and efficiently responding to daily demand changes. This presented Minnkota with several challenges. First, reaction of the units to setpoint load variations, especially during higher ramp rates over a longer period of time, caused lagging load response and overshoots in megawatt control. Second, supply changes introduced by recently added wind farms required the Young units to immediately offset megawatts to meet generation demands. Both challenges contributed to lost revenue potential. Minnkota sought a solution that improved the unit's operational response to efficiently meet constantly changing demand.

"Emerson's Ovation™ response optimization advanced power application for Young Unit 1 enables quick ramping to setpoint, reduces pressure and megawatt variability, and significantly improves unit response. All of these critical results enhance our capability to operate more profitably."

Dana Stumpf

Technical Supervisor
Milton R. Young Station
Minnkota Power Cooperative, Inc.

SOLUTION

Emerson customized an Ovation™ response optimization application to help Minnkota overcome operational challenges at the Young station. Ovation advanced power applications help utilities achieve optimized equipment performance for emissions compliance, temperature control, efficiency, and overall continuous operational improvement.

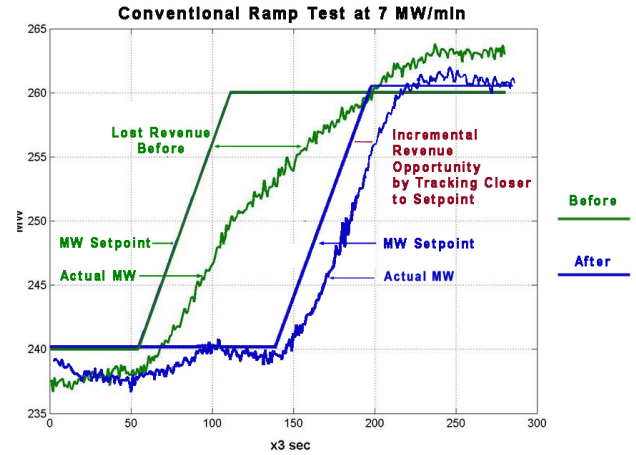
The response optimization application enhances the Young Unit 1 Ovation unit coordinated control scheme by using nonlinear dynamic feedforward and model prediction to automatically enhance the boiler and turbine response for increased ramping capabilities. Actual plant data is input to the application, creating a model of process response and unit characteristics. The result is improved performance in overall unit control through tighter load setpoint following and decreased variation in throttle pressure.

Conventional ramp tests produced dramatic results. Ramp rate was improved by 70% from 2-MW/min to 7-MW/min, megawatt over/undershoot was reduced by 2-megawatts, and throttle pressure variations were reduced by an average of 4 PSI. The tests proved that the application helped Minnkota meet the targeted megawatt and pressure setpoints, providing tighter megawatt control and lower fuel costs.

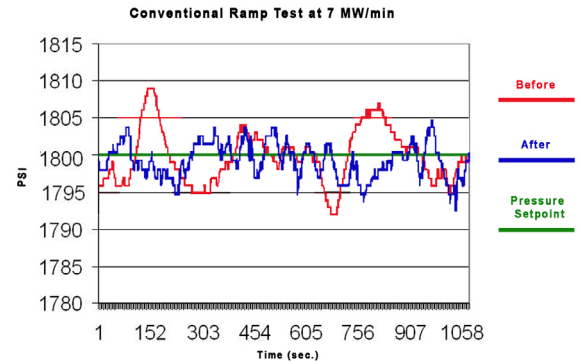
Continuously operating with the Ovation response optimization application translates into additional revenue opportunities for Minnkota. The application enables the Young station to more accurately hit targeted setpoints with minimal megawatt overshoot, thereby contributing to the following benefits:

- Reduced fuel costs
- Accelerated ramp rates to targeted setpoints
- Improved revenue generation
- Enhanced ability to follow load demand, enabling competition in the ancillary power services market

As an additional benefit, Ovation response optimization has also been instrumental in helping Young Unit 1 pass its routine turbine steam inlet valve tests.



Conventional ramp tests showed that tighter megawatt control with the Ovation response optimization application increased revenue profitability.



Ovation response optimization reduced Young Unit 1 pressure variations around setpoint which lowered fuel usage and costs.