Arkansas Electric Cooperative Corporation (AECC)

AECC Benefits from Sustainable Emissions Monitoring, Reduced Operating Costs and Greater Accuracy through Software CEM® from Rockwell Automation.

The Challenges

AECC, like most companies today, must meet stringent regulatory standards for environmental quality with a continuous emissions monitoring system (CEMS) that provides reliable and accurate data. With that always in the forefront of their minds, the company was faced with a decision. The analyzers that monitor emissions on seven multi-stage gas turbines needed replacement. Unfortunately, those analyzers were deemed obsolete by the manufacturer. The company considered options to either replace their analyzers with new, costly analyzers or replace their hardware-based continuous emissions monitoring system with an alternate solution.

AECC recognized that replacing their current system with another hardware-based CEMS would require a significant capital investment. In addition, the ongoing maintenance needs of a hardware CEMS would produce considerable expenses over its lifetime.

AECC, based in Little Rock, serves about 490,000 members of Arkansas’ 17 electric distribution cooperatives. Long considered one of the top generation and transmission cooperatives in the nation, AECC has assets of about $1.1 billion and annual energy sales of about $669 million. AECC provides power to its members - the 17 electric distribution cooperatives - through its diverse generation assets, which include three hydropower plants, three natural gas/oil-fired plants and two natural gas-fired-only plants. AECC also co-owns portions of three low-sulfur coal-fired plants.

Key Benefits:

- Based on a $50,000+ operating cost savings per year, compared to a hardware-based CEM system, a projected $500,000 USD cost of ownership savings over ten years should be realized
- One year return-on-investment over a CEMS hardware replacement investment
- Average initial RATA certification for Software CEM installations is < +/- 7.5%
  - US EPA regulatory requirement for Clean Air Markets Division (CAMD) is +/- 10%
  - CAMD operates under the USEPA 40CFR Part 75
- Increased availability means a reduced risk of fines or penalties associated with monitor downtime
- Reduced compliance costs associated with automated monitoring, recordkeeping and reporting

Taking into account their environmental responsibilities and overall objectives to implement cost reduction strategies, management decided it was time to devise a solution that would help them meet their goals. Specifically, the company needed to replace their analyzers, reduce maintenance labor, eliminate consumables, including calibration gases and mechanical rebuild kits, reduce data substitution use and minimize their total cost of operation. AECC also wanted to invest in technologies that would allow for better flexibility, reliability and increased ROI on its assets.
Software CEM Solution

AECC thoroughly evaluated the option to implement a software-based system and chose Software CEM from Rockwell Automation to help achieve its emissions compliance requirements. The model-based, Predictive Emissions Monitoring System (PEMS) utilizes powerful hybrid models of the process with real-time sensor validation to provide predictive emissions values with unparalleled accuracy. The use of hybrid modeling, through empirical models and first principles knowledge, gives AECC the best representation of its process behavior.

Unlike historical reporting systems that provide latent information from hardware-based CEMS, Software CEM operates in real-time using existing process sensor data. These process values enable the plant to monitor operating conditions that could affect final emissions output. Software CEM uses a patented sensor validation system as a qualifier to detect sensor failures and set appropriate alarms. The system utilizes existing sensors to generate a model of all sensors in the process. This allows data validation to continue accurate emissions predictions during a sensor failure, providing for near 100% uptime. In addition, this predictive methodology gives AECC the ability to simultaneously incorporate process behavior and feedback into the control strategy of its gas turbines.

Software CEM also has the versatility to predict emissions in the extreme operating ranges of unit operations. When AECC initially considered a hardware CEMS, they understood the challenges of ultra-low NO\textsubscript{X} emission limits that exist with high signal to noise levels on analyzers. The result is often poor readings and potential NO\textsubscript{X} absorption into the sample line. A heated sample line can have as much as a 1-2ppm NO\textsubscript{X} absorption. On 40ppm LowNO\textsubscript{X} applications, there is no effect. However, for UltraLow NO\textsubscript{X} applications where the NO\textsubscript{X} is less than 5 or 10ppm, it becomes a significant issue for hardware-based CEMS. With Software CEM, these problems are alleviated since there are no analyzers or system samplers required to predict emissions in extreme operating environments.

The Results

In addition to helping prevent fines for non-compliance, Software CEM is helping AECC save more than $50,000 per year in costs relative to operating a hardware-based CEM system. Further cost savings will be achieved over the life cycle of the project due to the higher reliability and lower maintenance costs of the system.

Cost savings will result from:

- Reduced need for skilled maintenance labor associated with routine maintenance
- Reduced consumable costs associated with calibration gases and hardware parts (analyzers, probes, pumps & etc.)
- Elimination of hazardous materials and their storage for calibrations
- Reduced energy consumption with the elimination of heated sample lines and climate controlled environments

Overall, the project has been successful and the system was certified through a Relative Accuracy Test Audit (RATA) as per 40CFR Part 75. Software CEM certified its initial RATA at better than 7.5\% relative accuracy and surpassed the US EPA, CAMD requirements of +/- 10\%.

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