CURTISS-WRIGHT

Best Practices in Plant Reliability and Performance

A FAMOS SUCCESS STORY FEATURING NRG ENERGY

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Organization

NRG Energy's WA Parish Generating Station is a 3.6-gigawatt dual-fired power plant located southwest of Houston, Texas.

Challenge

Performance engineers wanted a more efficient and comprehensive way to monitor, analyze, and visualize plant performance data to detect the subtle anomalies that impact production operations.

Solution

Integrate existing applications with Curtiss-Wright software and services to automate plant monitoring and provide predictive analysis to avoid unexpected outages.

Results

Performance engineers are better equipped to maximize generation potential by minimizing and preventing plant outages. Additional support from Curtiss-Wright assists plant personnel with 24/7 monitoring activity.

NRG Energy's WA Parish Generating Station is the largest conventional power station in Texas and one of the largest in the United States. To monitor equipment and system status, the station uses state-of-the-art software from Curtiss-Wright to monitor plant performance and identify system and equipment anomalies.

Following NRG Energy's customer-focused strategy, the WA Parish Generating Station has established a performance engineering team geared for resiliency and quick response, based on the recognition that electricity is a critical part of a connected and digital population. As with any large electricity provider, optimizing power generation potential requires constant monitoring of equipment to prevent derates and minimize the severity of outages.

While facility operators at the station monitor all systems, the plant operators rely on Curtiss-Wright's advanced FAMOS technology to detect small deviations in performance that may not be immediately evident. "In the aggregate, even small variances in performance can add up to a significant loss of economy, savings, and efficiency," points out Mitch Levings, performance engineer at the WA Parish Generating Station. "We use Curtiss-Wright's Fleet Asset Management and Optimization Solutions [FAMOS] software to identify inefficiencies in our production operation. FAMOS finds issues and incidents that we might otherwise miss."

SELECTING THE BEST TOOLS FOR THE JOB

As a performance engineer, Mitch Levings is tasked with monitoring all ten of NRG Parish's generation units: four coal-fired boilers, four natural-gas fired boilers, a small gas turbine, and a gas turbine cogeneration unit to power a carbon capture facility. He says his team selected the FAMOS suite not only for its advanced pattern recognition

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functionality, known as PdP, but also because it integrates with two other FAMOS modules that the company has been using for some time, PEPSE and PMAX.

The three software components of FAMOS can be used together to provide a more complete view of plant operations and performance: PdP is an advanced pattern recognition monitoring application that utilizes data signals from digital control systems, historians, and other monitoring systems to detect abnormal operating conditions; PMAX is a thermal performance monitoring system for monitoring plant operations and maximizing performance; and PEPSE models plant and equipment performance by generating "what if" studies to test potential efficiency improvements.

"The FAMOS tools have become part of our risk prevention and early-detection strategy," Levings states. "The software continually examines the data signals available from the historian. It recognizes how these different parameters interact with each other, flags anomalies, and sends alerts when a parameter deviates from the reference state. It's a solid product, and the pricing was also attractive to us."

THE VALUE OF PERFORMANCE MONITORING WITH PDP

As part of the PdP setup process, the staff created a reference file that describes the optimal operating conditions of all equipment. PdP compares these baseline values to the actual values to help performance engineers monitor many different facets of plant operations based on real-time sensor readings of temperatures, pressures, vibration, and other parameters.

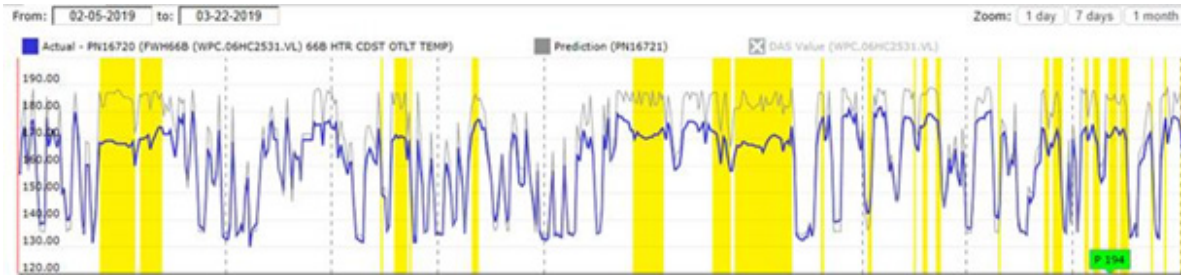
PdP also makes predictions about signals that may indicate an abnormal operating condition - data is graphed in real time, making it easy for plant personnel to notice when anything is amiss. Having this type of detailed, real-time glimpse into plant equipment helps NRG Parish optimize performance, schedule repairs when necessary, and avert costly unplanned shutdowns.

For example, on one occasion after a maintenance outage, PdP data showed that a fan bearing was running at a higher temperature than it had been before the outage. The performance engineers flagged this to the operators, who discovered that oil with a different viscosity had been used on that bearing and was causing the bearing to run hotter. Changing the oil brought the temperature back into normal range. "That variance from normal was very subtle," Levings states. "It was something that an operator wouldn't necessarily have been aware of, but PdP pointed out the variance immediately, helping us circumvent a larger problem. If that fan had failed, we would have faced a derate since we would not have been able to run at full capacity."

In another incident, PdP detected a temperature anomaly in a feedwater heater on a wall-fired coal-burning boiler. "At first it seemed to simply be a defective temperature sensor," Levings says, "but a closer look at the PdP data indicated that it was not only the extraction line temperature but a low temperature rise across the heater."

The Unit 6 graph indicates that the plant wasn't getting normal heat transfer from the 6B feedwater heater. - the blue line is the actual temperature; the gray line is the reference standard, established in the historian. The green P194 flag indicates there is a note about the condensate outlet temperature parameter in the PdP Tracker, which allows operators to capture, review, and update issues to manage findings from identification to resolution.

"We could see that the condensate outlet temperature was running



Unit 6 6B Feedwater Heater (PdP Tracker #194)

approximately 30 degrees lower than usual," Levings recalls. "Combined with the stage 20 extraction steam temperature being very low and a low drain temperature, it appeared that stage 20 wasn't sending extraction steam to the heater."

Since that heater is located in the condenser neck, if the extraction line is breached, rather than heating the feed water, steam is released into the condenser, which raises the condenser pressure. "The result is inefficient cooling that makes the unit run less efficiently," explains Levings. "This is the kind of subtlety an operator might miss if PdP hadn't pointed out the anomaly. It identified a piece of equipment that needed our attention, preventing an unexpected issue that could cause a much greater problem at some later date."

DRILLING INTO THE DETAIL DATA

The PdP graphs made it easy to see small variances in plant equipment. The yellow bars and solid yellow background point out that something is outside of the expected range, alerting operators to focus on those timestamps. "Rather than having to go into the historian to build a plot, it's already built for them in PdP," Levings says.

The following graph indicates the actual temperature versus predicted temperature for the steam extraction process. This wide variance alerted the staff to take corrective measures.

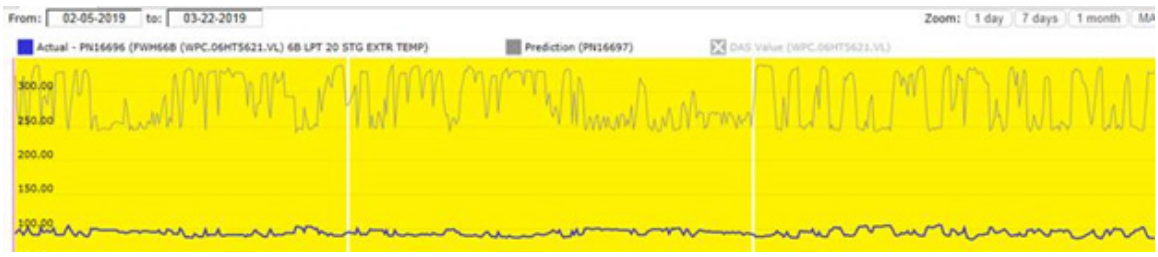
The low drain temperature on the above graph indicates that extraction steam is not reaching the heater.

"The low-energy heater fitting in the condenser neck wasn't impacting plant performance in an obvious way," Levings points out. "No alarms were going off, so it had gone unnoticed, and that's the situation we want to avoid. With PdP, it's all about early detection and prevention," he adds.

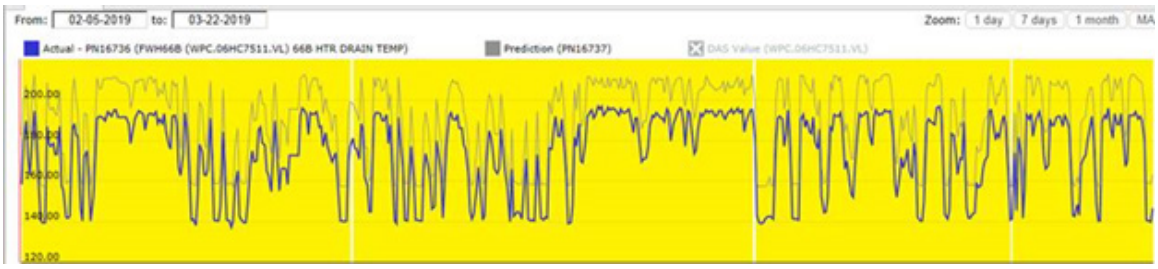
ONGOING SUPPORT FROM CURTISS-WRIGHT

By addressing maintenance and repair problems early, PdP helps identify equipment problems and possibly resolve those problems before the equipment goes into alarm—reducing issues and enhancing plant productivity. It simplifies plant management, since the staff proactively schedules repairs, reducing the likelihood of forced shutdowns caused by equipment failure.

Curtiss-Wright also provides monitoring and diagnostics (M&D) support for the station. Experts constantly review PdP activity, collaboratively track performance and equipment anomalies, and communicate their findings to the WA Parish staff using the FAMOS Tracker feature. "Tracker is closely



Actual tempurature versus predicted tempurature for the steam extraction process.



A low drain tempurature indicating that extraction steam is not reaching the heater.

integrated with PdP to enable a holistic view of the entire facility," Levings explains. "It documents issues from detection through resolution, allows people to add comments, and it keeps a record of the issue should it recur. Curtiss-Wright's M&D team provides an extra set of eyes on the trending data."

The PdP display makes it easy to monitor issues for each model and the associated sensors. Simply clicking on an issue number opens the issue in FAMOS for review and editing.

"FAMOS is a well-integrated and robust solution for our plant," Levings concludes. "Every application in the suite is relatively easy to use. It enables proactive monitoring so we can quickly locate performance issues. It allows us to predict problems and avoid generation loss."

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