CURTISS-WRIGHT

Best Practices in Plant Reliability and Performance

A FAMOS SUCCESS STORY FEATURING SASKPOWER

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SaskPower
Powering the future®

Organization
SaskPower is Saskatchewan, Canada's leading electricity supplier, providing power to over 522,000 customers throughout the province.

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

Solution
Install Curtiss-Wright's FAMOS software to automate plant monitoring and troubleshooting, provide predictive analysis to avoid unexpected outages, and ensure efficient asset management.

Results
A detailed, real-time view into plant equipment that helps SaskPower optimize performance, schedule repairs when necessary, maintain safe conditions, and avert costly unplanned shutdowns.

Over 522,000 customers throughout Saskatchewan, Canada, depend on SaskPower for their electricity. As the province's leading electricity supplier, SaskPower relies on Curtiss-Wright's state-of-the-art Fleet Asset Management and Optimization Solutions (FAMOS) to help maintain peak generation, distribution, and transmission services, helping the plant meet its performance and efficiency goals.

"One of the things that triggered our interest in FAMOS was its ability to do real-time heat-rate calculations," says Dan Hemingway, manager of the performance group within the Generation Asset Management group at SaskPower.

Hemingway and his team sought a solution to collect and monitor heat rate data. Prior to implementing FAMOS, SaskPower's performance engineers had to perform unit heat-rate testing every three years during plant overhauls. Each test required an immense expenditure of effort, including two months of preparation, a week onsite to install instrumentation, a week onsite to collect data, and about two months offsite to analyze the data and produce a report. "It took about six months of effort for each report," Hemingway confirms. "And even then, the data we collected was not always correct, or we couldn't validate it. We wanted to move out of this very time-consuming and labor-intensive testing process."

DIAGNOSTICS FOR SUCCESSFUL ASSET MANAGEMENT

Ensuring safe, reliable, sustainable, and cost-effective power for SaskPower's wide service area, while remaining competitive with other Canadian utilities, demands efficient asset management. SaskPower has a generating capacity of 3,542 megawatts (MW) from 17 generating facilities, including three coal-fired power stations, five natural gas stations, seven hydroelectric stations,

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and two wind power facilities. The utility also buys power from various independent power producers, raising its total available generation capacity to 4,493 MW. The company manages $10 billion in assets and employs more than 3,150 permanent full-time staff in approximately 70 communities.

"Before we acquired FAMOS, we had a reactive approach for resolving issues," says Mohsin Siddiqui, senior performance engineer for SaskPower. "Now FAMOS is our primary solution for performance monitoring and diagnostics, and we can catch issues before they cause equipment to fail. We are more proactive and much more productive because we can analyze how well equipment is performing before problems occur."

IMPLEMENTATION AND INTEGRATION

SaskPower used a competitive process to evaluate and procure a thermal performance monitoring solution that also provided early warning of potential equipment failures. SaskPower selected three modules from the FAMOS software suite: PEPSE, PMAX, and PdP. PEPSE models plant and equipment performance after testing potential offerings, with FAMOS having the added advantage of being an integrated solution. PMAX is a Thermal Performance Monitoring System (TPMS) for monitoring plant operations and maximizing performance. PdP is an advanced pattern recognition (APR) application that utilizes data signals from digital control systems, historians, and other monitoring systems to detect abnormal operating conditions.

SaskPower also uses the OSIsoft PI data historian, which collects data in a time-series database and sends it to FAMOS for analysis. FAMOS records the events and graphs the data values over time, allowing for historic analysis. Since the system recognizes how various parameters interact with each other, it can automatically flag anomalies and send alerts when a parameter deviates from the reference state.

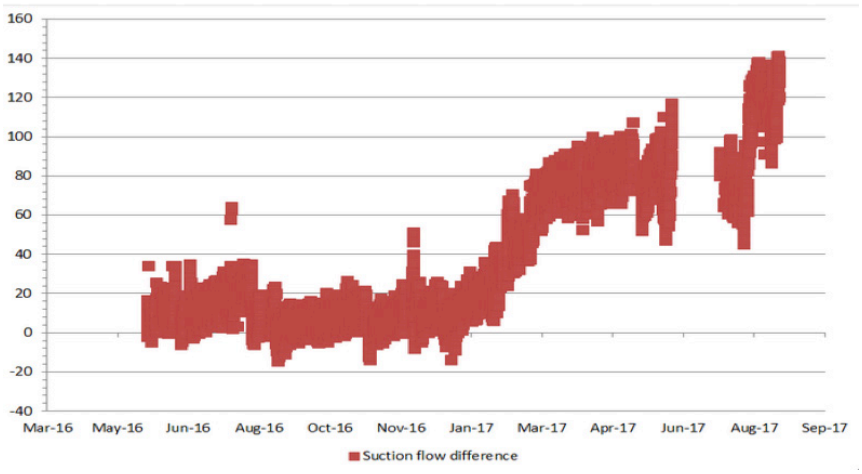
Just as Hemingway and his team had hoped, FAMOS has taken over the heat rate calculations for multiple units. PMAX draws the data automatically from the PI historian, calculates the heat rate, and logs the results back into PI. PMAX lets them view these results on-demand to determine the heat rate at any moment, giving the engineering team continual insight into plant performance.

"We haven't done a unit heat rate test in 10 years or more," says Hemingway. "This has freed up a lot of time for other monitoring and diagnostics activities. We have also replaced much of our onsite performance testing with data analysis from the PI and FAMOS systems."

POWERING 24/7 CONDITION MONITORING

Five engineers in the performance group use PdP on a regular basis, along with about a dozen personnel at the plants. The PI reference file describes the optimal operating conditions of all the 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. Over the course of a two-year period, FAMOS helped diagnose 270 anomalies. The cost-benefit of the seven most significant of these events totaled $691,913, with potential savings of 22,392 MWH.

For example, one anomaly showed a high oxygen reading in a boiler at one of SaskPower's generating facilities. This was impacting the fans and windbox dampers, but a couple of quick adjustments helped them to avoid a derate and restore efficiency. Engineers estimated they avoided 2,160 hours of derate, with a cost impact of $333,720.



PdP clearly displays the pressure differential in the suction strainer.

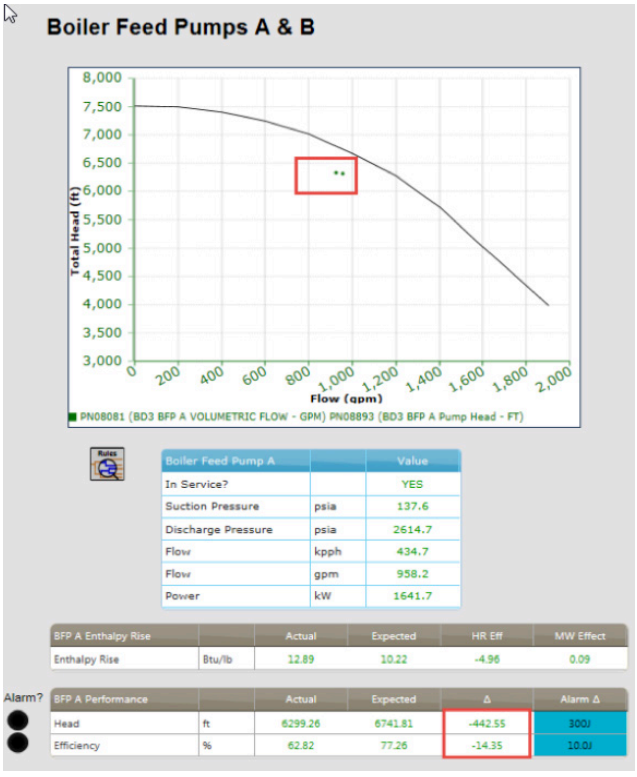
The performance engineering team also used PdP to diagnose an issue with a boiler feed pump at the facility. A review of PdP data revealed that BFP efficiency had dropped 10 percent over a several month period. The boiler feed pump 3A suction flow was running lower than the set standard, and the suction strainer differential pressure and motor current on the 3A pump had also decreased. Meanwhile, the boiler feed pump B suction flow had increased.

To diagnose the anomaly, the team tested suction flows using a portable ultrasonic flowmeter. Vibration data was recorded at regular intervals, recirculation valves in the boiler feed water pumps were checked, and they looked for clogs in the suction strainer. After performing these tests, in conjunction with continuous performance monitoring, they determined that the pump had a mechanical, internal issue; the team also identified a faulty suction valve.These inspections also revealed extensive barrel damage on the attemperator gasket, which required machining and weld repairs, and that the pressure head was over-torqued.

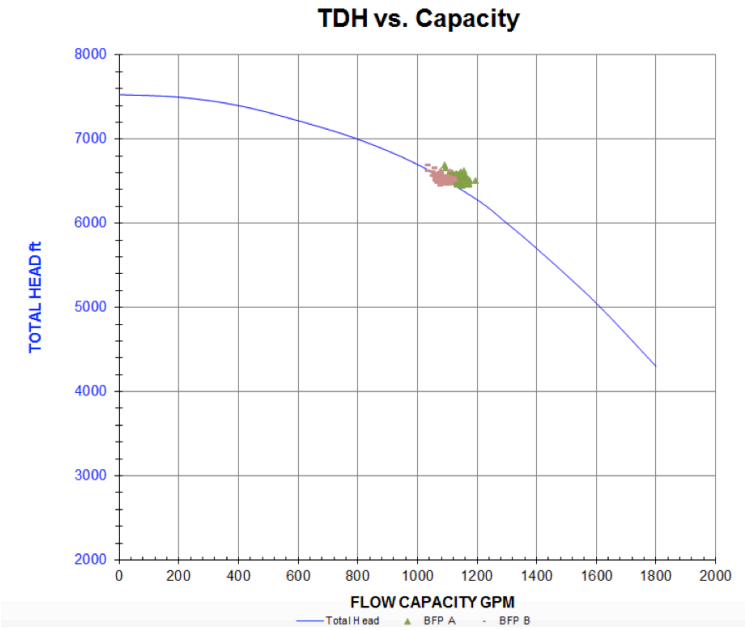
DATA ON-DEMAND

As these examples illustrate, if Hemingway's team wants to perform any test to analyze the performance of a given piece of equipment, information is available in the PI historian database. Because FAMOS is installed as a web client, the results are available to authorized employees throughout the company - users don't have to go to the trouble of requesting access or installing software. This makes it very easy to distribute FAMOS results and insights to people in various departments.

"We used to do routine testing every year or so to keep track of performance and to check if any of the specs were downgrading over time," Siddiqui states. "However, these efforts were not particularly valuable,



PdP shows the drop in Boiler Feed Pump fficiency.



The diminished flow capacity, as displayed by PdP.

because occasionally information would come in and no one would do anything with it." Now engineers perform tests only when someone needs the data, such as in preparation for an overhaul. "We've become more strategic in our performance testing," he adds.

Constant data collection has also enabled a decisive shift from reactive to proactive performance management. FAMOS continually examines the data signals available from the historian. When it recognizes any deviation from the reference state, it flags the issue and sends an alert to the team. Data is graphed in real time, which makes it easy for them to notice when anything is amiss. Having this type of detailed, real-time glimpse into plant equipment helps SaskPower optimize performance, schedule repairs when necessary, avert costly unplanned shutdowns, and maintain safe operating conditions.

"FAMOS helps SaskPower reach its performance goals for safe, efficient unit operation and high reliability," Hemingway concludes. "With proactive monitoring, we are quickly made aware of any performance issues and can resolve the problems."

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