Suncor: Optimizing advanced predictive power maintenance

Suncor - www.suncor.com
Industry - Oil and Gas

Goals

- Identify potential reliability concerns and equipment failures up to six weeks before they occur

- Increase time to plan for equipment downtime

- Use new equipment condition insights to inform machine maintenance decisions

Challenges

- 20,500 critical assets across 14 sites including oil sands, downstream, exploration and production, and pipelines

- Isolating the changes in KPI from normal, ambient day-to-day fluctuations to indicate degrading machine condition

Solutions

- AVEVA™ Predictive Analytics

- AVEVA™ PI Vision™

- AVEVA™ Process Optimization

Results

- Generated $37 Million CAD in cost savings since implementing APM (RAW) in 2017

- Optimized maintenance strategy gives Suncor control of planned downtime and improves performance of active assets

- Maximized equipment availability and company profitability

AVEVA

Suncor is a global integrated energy company headquartered in Calgary, Alberta, Canada. Its operations involve 20,500 critical assets spread across 14 sites, including oil sands development, production and upgrading; offshore oil and gas; petroleum refining and the national Petro-Canada™ retail distribution network. Monitoring all these different assets—ranging from a single valve to a 200-megawatt gas turbine—would present a challenge for any organization.

To capture data from this diverse set of assets and optimize asset performance, Suncor relies on asset performance management, remote monitoring, advanced analytics, and a collaborative workflow—which it calls APM (RAW)—to enable predictive asset maintenance. This approach empowers Suncor to monitor its assets with dynamic models and detect problems up to six weeks before they occur, maximizing equipment availability and increasing equipment performance.

"Since we got set up in 2017, we've produced $37 million of collaborative value between the sites and us."

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Vance Seeley
Senior Analyst, APM Specialist, Suncor

(RAW) power and efficient maintenance

Suncor's APM (RAW) methodology consists of three processes: remote monitoring, advanced analytics, and collaborative workflow. First, the central monitoring team assembles the data it needs through remote monitoring.

This central station draws on data received from Suncor's site historians as well as from another team that can place wireless sensors on equipment about which data might be lacking.

Next, Suncor runs this data through its AVEVA-powered analytic models. These models—powered by AVEVA Predictive Analytics, AVEVA PI Vision, and AVEVA Process Optimization—include rules-based diagnostics as well as asset performance management, principle performance, and system models. With this information, Suncor's centralized monitoring team—consisting of experts in rotation, cogeneration, process and instrumentation—is now able to identify potential equipment failures weeks before they occur.

The final stage of this workflow is when the monitoring team schedules meetings with each of Suncor's sites to review its findings. With these meetings, the centralized monitoring team ensures that its data and analysis become action, maintaining Suncor's operational excellence. Since Suncor began APM (RAW) in 2017, the company has implemented it across more than 20,500 assets and used it to generate 1,700 health cases on detected anomalies, enabling the early resolution of potential problems. This early resolution has saved Suncor $37 million CAD.

Powering APM (RAW) with AVEVA

To power the advanced analytics at the center of APM (RAW), Suncor has combined a suite of AVEVA products. It uses AVEVA PI Vision, AVEVA Predictive Analytics, and AVEVA Process Optimization to create the models that undergird its proactive response to potential equipment failures and keep its equipment operating at maximum efficiency.

To troubleshoot problems before they appear, Suncor relies on digital twin technology. To create digital twins out of its remote-sensor-generated data tags, Suncor uses AVEVA PI Vision. Along with benefitting from the real-time KPIs that AVEVA PI Vision enables, Suncor also exploits the solutions' data visualization capacities to create dashboards for ad hoc analysis.

In collaboration with these digital twins, Suncor deploys AVEVA Predictive Analytics to benefit from its anomaly detection with machine learning capabilities. It uses this software to catch potential failures in its digital twins before they occur. Suncor credits AVEVA Predictive

Analytics with helping to significantly improve reliability and reduce maintenance costs. With this software, Suncor has achieved some of its highest-value early-detection warnings.

Suncor supplements these other two solutions with AVEVA Process Optimization, which helps to fine-tune the data and analysis from AVEVA PI Vision and AVEVA Predictive Analytics. With AVEVA Process Optimization's process simulation and small, focused optimization, Suncor enables responsive equipment condition monitoring and enhances AVEVA PI Vision. This is also very useful for soft sensors or situations where sensors cannot be deployed. With these solutions, Suncor has a holistic perspective on its operations that maximizes the time its machines are online.

"We have found AVEVA Predictive Analytics to be very, very valuable. We have got some of our highest-value catches using this software."
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Vance Seeley
Senior Analyst, APM Specialist, Suncor

## Optimizing gas turbine maintenance

Suncor's set of AVEVA solutions provides a foundation for it to constantly innovate its predictive asset maintenance. When dealing with gas turbine degradation, it needed a new approach to be able to make risk-based decisions about machine maintenance with accurate knowledge of equipment condition. When AVEVA Predictive Analytics processed historical data, it could not render the degradation of gas turbine performance accurately. Not only did its model tolerance mask small changes in the data, but also the instruments capturing this data were not precise enough.

Suncor confronted the challenge of configuring models which could measure performance degradation through changes in KPIs head on. Rather than use this historical data, Suncor focused on OEM performance curves and the original performance baseline data. It used these curves to produce a surrogate training data set based on the original baseline performance. It then adjusted that performance for the complete operational envelope of ambient temperature, pressure, humidity, and other fluctuating variables.

Training AVEVA Predictive Analytics with this rated performance, Suncor could then generate an ideal, expected set of values and performance range and use it as a benchmark against the machine's actual performance as a way of understanding the machine's performance degradation. Where the traditional anomaly detection method could not provide insights into performance degradation, the rated performance analysis was able to provide values that Suncor could use to keep risk low and optimize its maintenance plan for maximized efficiency. With Suncor's models, it could even immediately quantify the change in performance and increased megawatt production as a result of maintenance.

PAO high dynamic range model: Rated performance approach
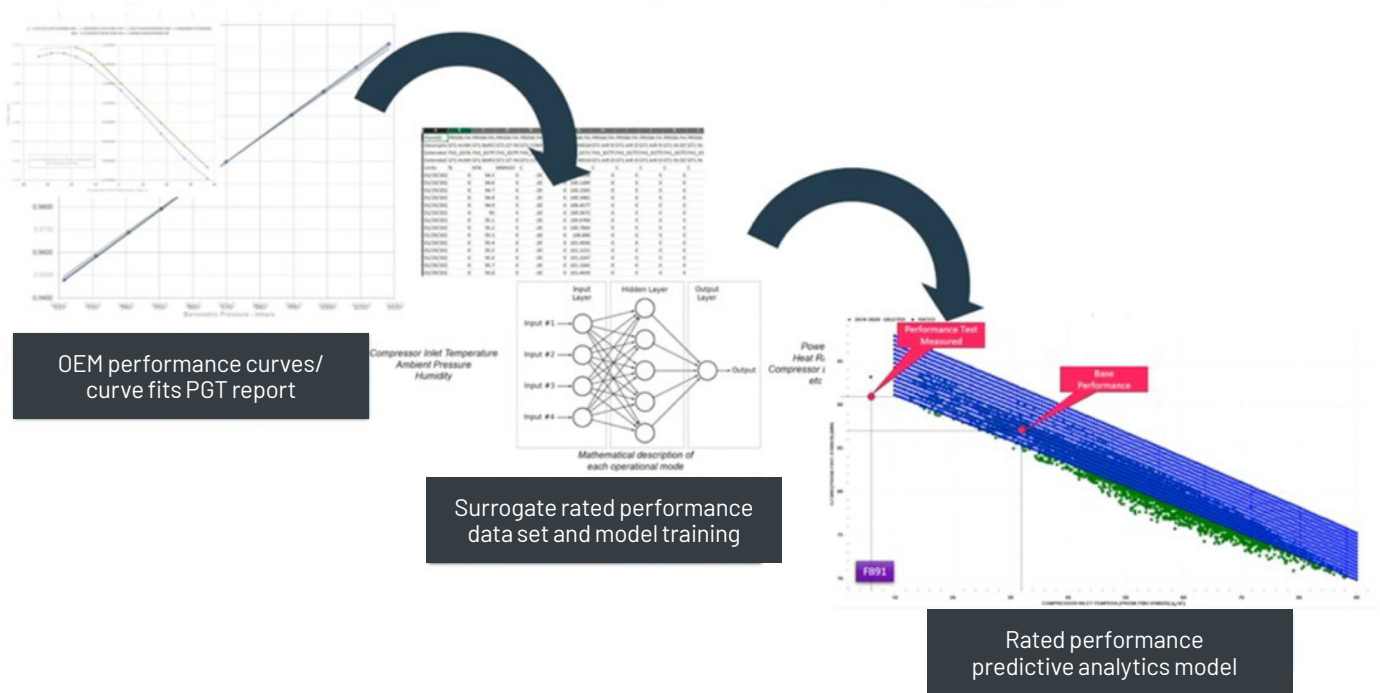
Suncor used AVEVA Process Optimization machine learning capabilities to analyze OEM performance curves and develop a rated model that could provide an accurate benchmark for gas turbine performance degradation

"Immediately, we can evaluate what was the actual benefit of doing that maintenance and turn this into a risk-based maintenance approach where we can assign value that we generate from the maintenance versus the value of the degradation that is occurring."
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Dr. David Smith
Senior Analytical Solutions Engineer,
AI Center for Excellence, United Kingdom

Suncor's use of APW (RAW) underpins its operation of co-generation assets. By building on its foundation of AVEVA Predictive Analytics, AVEVA PI Vision, and AVEVA Process Optimization, Suncor has refined and optimized its approach to maintenance. Integrating into its operations the simulation, machine learning, and data visualization capabilities that these AVEVA solutions enable, Suncor is lowering risk across its operations and, at the same time, maximizing equipment availability as well as overall profitability. .

For more information
watch the full presentation here.