

CASE STUDY

Reducing False Failure Alerts with Physics-Based Prognostics

Our customer, an industrial machinery operator, collects large volumes of sensor and control data from connected equipment to monitor operating conditions, investigate potential issues and predict machinery failures. The data includes a mixture of numerical measurements, text values and error codes, which engineers need to interpret to assess machine performance and identify potential failures. To make effective use of this information, the operator required a way to process large datasets consistently and apply engineering analysis to support both diagnostics and failure prediction.



Challenge

Analysing large volumes of machinery data was difficult due to inconsistent data quality, mixed data formats and fragmented analytical tools that lacked the engineering capabilities needed for reliable failure prediction.

Solution

Advantage Insights by nCode enabled native machine data processing, engineering diagnostics and physics-based prognostics in a shared environment incorporating Python libraries and engineering algorithms.

Result

The physics-based approach reduced false positives by 30%, while enabling engineers and data scientists to collaborate using a common platform for machine diagnostics and failure prediction.

Managing Complex Machine Data for Reliable Failure Prediction

Industrial machinery generates vast quantities of sensor and control data during operation. While this information can provide valuable insights into equipment condition and potential failures, processing it consistently presents significant challenges. For this operator, the collected data contained a mixture of numerical measurements, text values, error codes and inconsistencies, making it difficult for traditional engineering software to analyse effectively.

Existing workflows relied on bespoke Python-based scripts and different analytical approaches. However, these did not fully meet the organisation's requirements for performance, consistency of results, standardisation of analytical processes and data quality. A further limitation was the lack of physics-based engineering features needed to support machinery life prediction.

The operator needed a more effective way to:

- **Process complex machine data:** Handle large volumes of sensor and control data, including mixed data formats and inconsistent measurements.
- **Diagnose operating issues:** Investigate equipment error codes and abnormal sensor values.
- **Predict potential failures:** Use thresholds and fatigue damage calculations to assess machinery condition and anticipate failures.
- **Standardise analysis:** Provide a consistent environment for engineering and data science teams to analyse equipment performance.

Addressing these challenges would enable the organisation to make better use of its machine data and improve the reliability of its failure predictions.

Combining Engineering Diagnostics and Physics-Based Prognostics

To address these challenges, the operator used **Advantage Insights** to process and analyse data from connected industrial machinery. Advantage Insights could be configured to natively read bus data from loggers connected to the machines, handling both the quality and quantity of data collected during operation.

The platform brought together data visualisation, engineering analysis and prognostic capabilities within a single environment, enabling engineers and data scientists to work with a common set of tools.

This approach enabled teams to:

- **Process and visualise machine data:** Read, explore and analyse large quantities of sensor and control measurements.
- **Perform diagnostics:** Investigate error codes and abnormal sensor values to identify potential operating issues.
- **Apply engineering analyses:** Conduct assessments such as rotating machinery vibration analysis.
- **Predict machinery failures:** Use thresholds, fatigue damage and physics-based engineering algorithms to support prognostics.
- **Estimate remaining useful life:** Analyse machine condition to support remaining useful life (RUL) predictions.
- **Collaborate in one environment:** Combine Python libraries and engineering algorithms in a common tool accessible to both data scientists and engineering teams.

By integrating diagnostic and prognostic capabilities, Advantage Insights enabled the operator to investigate multiple operating scenarios and apply consistent engineering analyses to large datasets.

Fewer False Positives and More Effective Failure Prediction

Using Advantage Insights, the operator improved its ability to analyse machinery data and generate reliable engineering insights to support diagnostics and prognostics. Key results include:

- **30% fewer false positives - Improved failure prediction:** The physics-based approach to prognostics reduced the number of false positives by 30%, improving the reliability of failure alerts.
- **One shared platform - Engineering and data science collaboration:** Engineers and data scientists could work within a common environment that combined Python libraries with engineering algorithms, supporting more consistent analysis and easier collaboration.
- **More efficient analysis - Up-to-date trends and predictions:** High-performance data processing enabled teams to investigate multiple operating scenarios and analyse large volumes of machine data to obtain up-to-date trends and predictions.

Supporting More Reliable Machinery Prognostics

By combining engineering diagnostics with physics-based prognostics, the operator could more effectively investigate equipment behaviour and identify potential failures. The ability to analyse abnormal sensor values, investigate error codes and estimate remaining useful life provided a more comprehensive approach to understanding machine condition.

Bringing these capabilities together in one environment also helped engineering and data science teams collaborate more effectively and apply consistent analytical methods.



Advantage Insights is really made for the engineer who needs to predict machinery

failures. Finally a tool that can cope with our sort of data and that contains all the necessary engineering features for us to do our job.

Engineer, Heat Exchanger Fleet Reliability

Enabling More Reliable Predictive Maintenance

By using Advantage Insights by nCode, the industrial machinery operator improved its ability to process complex machine data and apply engineering analysis to diagnostics and failure prediction.

The integration of Python libraries, engineering algorithms and physics-based prognostics in a single environment enabled closer collaboration between engineers and data scientists while supporting consistent analysis of machinery operating conditions.

With a **30% reduction in false positives**, the operator demonstrated the value of combining high-performance data processing with physics-based engineering methods to generate more reliable predictions and support informed machinery maintenance decisions.