



EtaPRO®

CASE STUDY

EtaPRO APR Improves Early Warning of Equipment Failure with Anomaly Detection and Advanced Fault Notifications

EtaPRO®

ABOUT

This US power station, has historically been an early adopter of many technologies, including data validation, asset condition monitoring, and digital performance monitoring. Plant staff have leveraged many of the EtaPRO technologies to improve the reliability, availability, and capacity of the plant's multiple large scale, coal-fired, supercritical units.

Choosing the EtaPRO APR System

The customer evaluated EtaPRO APR after having used various equipment condition monitoring systems for several years. However, they were interested in a single platform that could provide both thermal performance and equipment condition monitoring with broad distribution of critical information to operations, maintenance, engineering, and corporate personnel.

Early Warnings from EtaPRO APR

EtaPRO APR is one of the core technologies within the EtaPRO Performance and Condition Monitoring system. It utilizes a local modeling, advanced pattern recognition (APR) technology to provide early warning of equipment degeneration and/or failure, while minimizing false alarms.

Empirical models of critical plant equipment are developed using carefully filtered, historical operating data covering the full range of equipment operation. These models predict an expected value for each monitored input on a real-time basis.

Differences between the actual and expected values are evaluated and compared to alarm thresholds. EtaPRO APR alerts plant personnel to differences exceeding user-defined limits, considering both magnitude and time. The fidelity of this modeling technology allows for narrow alarm setpoints without triggering false alarms.

Localized Modeling

Among the many unique attributes of EtaPRO APR is its localized modeling approach. An empirical model designed to cover the full range of equipment operation [ramping, steady-state, full load, part load, etc.], including environmental influences [ambient temperature, pressure, relative humidity, etc.] requires an extensive amount of data.

EtaPRO APR selects a unique subset of the historical data that most closely represents the current equipment operating mode and builds a unique model based on that data subset. This localized modeling eliminates the influence of irrelevant historical records, provides improved accuracy with fewer false alarms, and eliminates the need to develop different models to address each unique mode of operation.

EtaPRO APR Detects Problems When Others Don't

During their evaluation period, the plant implemented EtaPRO APR on ten critical pieces of equipment that were also being monitored by their legacy system to ensure that no critical plant issues might be missed. The models for both systems were developed utilizing the same historical data sets.

Shortly after installation, EtaPRO APR initiated an alarm involving the generator hydrogen temperature coming from one of the gas coolers. Review of the same data in the plant's legacy system indicated that the predicted temperature was tracking fairly closely with a modeled value. Therefore, no alarm was initiated by the legacy system. While a 32°C temperature will be experienced during start-up on a cold day, continued operation at that temperature would cause the generator hydrogen seals to shrink and potentially become brittle, ultimately resulting in possible gas leakage and a unit shutdown for repair. The staff investigated the alarm and found a control system fault that was keeping a hydrogen cooler bypass valve from fully closing.

Having the predicted value track a measured value through an equipment or instrument fault is fairly common with many statistical systems. It occurs when a single data value overly influences its own prediction [auto correlation], and possibly the predicted values of many other signals. This results in missing critical equipment issues and/or initiates false alarms on other plant data.

The Result

Had this problem continued undetected and resulted in seal damage, repair or replacement of the seals would have required the plant to shut down to complete the work. EtaPRO APR helped the customer identify and address the issue and avoid a potential outage.