CASE STUDY

EtaPRO® Remote Monitoring & Diagnostics Center

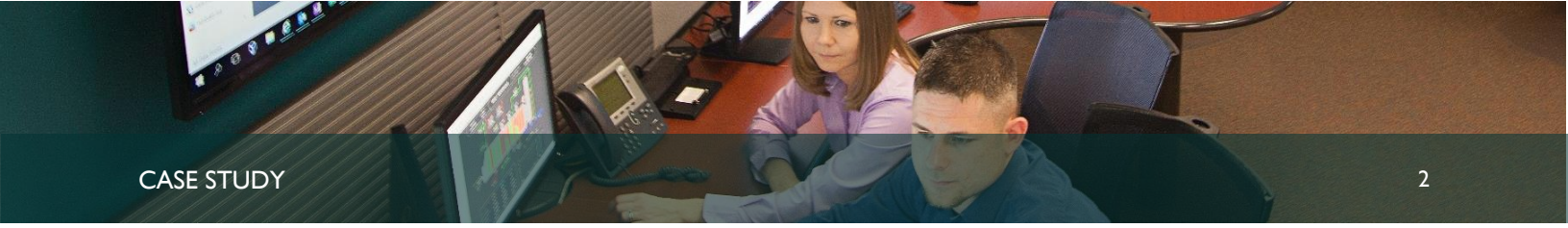
EtaPRO®

The EtaPRO® Remote Monitoring & Diagnostic Center is designed to support power plants, including those without existing performance monitoring capabilities that have a limited engineering staff. In today's lean workforce environment, power plant personnel find themselves continually responding to critical events.

Failing to detect these events before they become mission critical is inversely proportional to the engineering workforce's dedicated time and ability to monitor plant and condition performance.

EtaPRO's FastStart™ service, available for new and existing customers, is designed to get your workforce involved with EtaPRO's monitoring and diagnostic capabilities, so your company maximizes the value EtaPRO provides. Today's power plants integrate complex, interrelated systems operating under restrictive emissions and operating limits. The engineers, operators, and maintenance staff need tools that simplify and prioritize information flow, providing them with actionable knowledge.

EtaPRO™
REMOTE
MONITORING & DIAGNOSTIC CENTER



Examples of EtaPRO Remote Monitoring & Diagnostics Center (M&D Center) Success

Compressor Fouling

Description

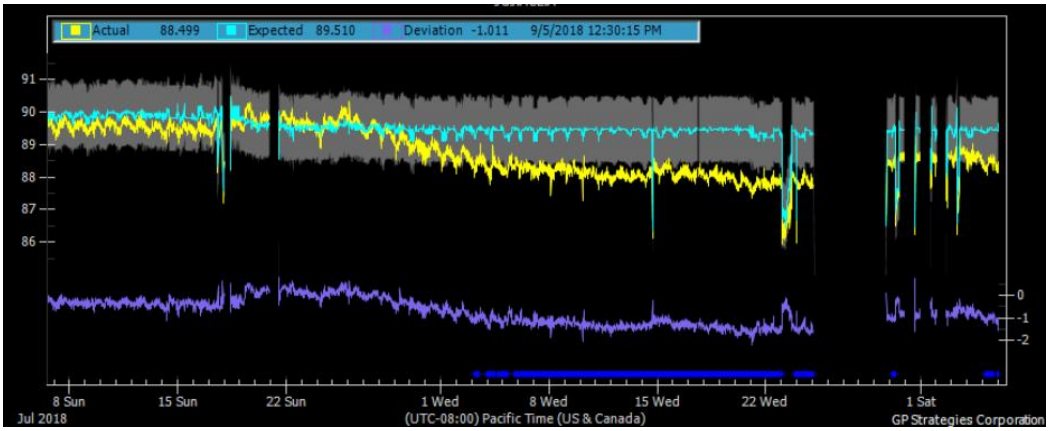
The EtaPRO M&D Center identified a drop in compressor efficiency on two gas turbine at a 2x1 Combined Cycle plant.

Issue

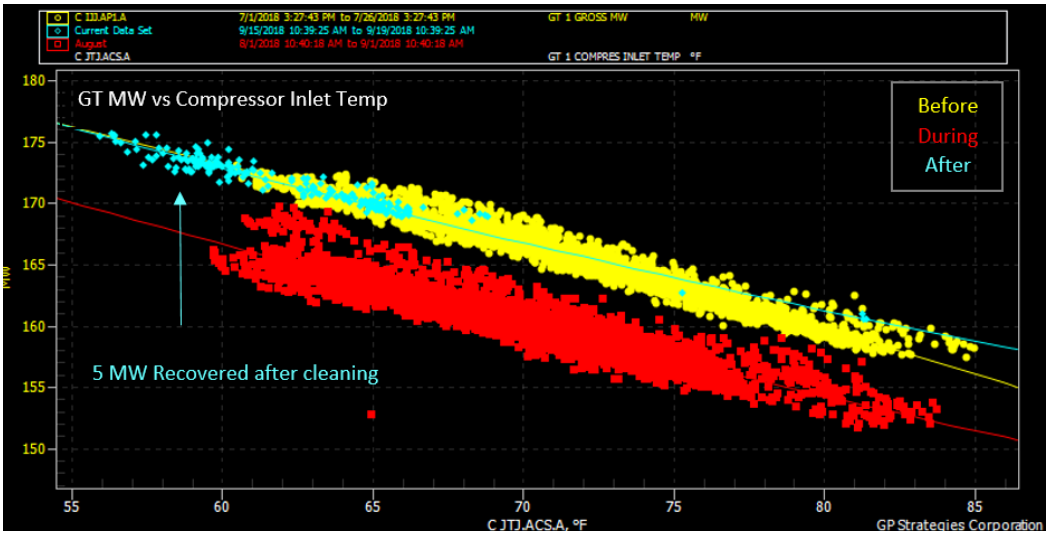
Since the drop compressor efficiency occurred on two separate machines around the same time, the issue was believed to be related to the intake. It was determined that wild fires in the area caused compressor fouling due to particulates in the air.

Value

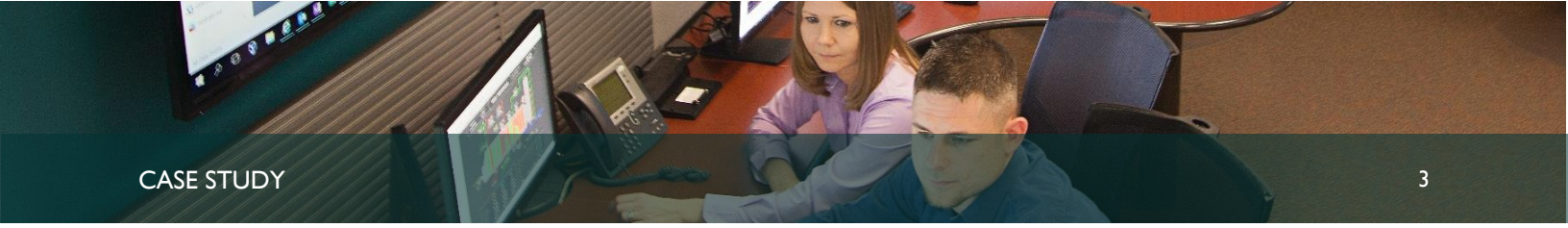
Due to the advanced warning from the EtaPRO M&D Center, the plant was able to schedule compressor cleaning to recover gas turbine performance. An analysis of the gas turbine output and heat rate indicated that the 1.5% reduced compressor efficiency resulted in an additional 200 Btu/kWh heat rate and a capacity loss of 5 MW per gas turbine. Savings from are estimated at **$150,000.**



EtaPRO APR trend of Reduced Compressor Efficiency



EtaPRO Plot indicating Gas Turbine Output vs Compressor Inlet Temperature before, during and after the compressor-fouling event.



Elevated Atomizer Vibration

Description

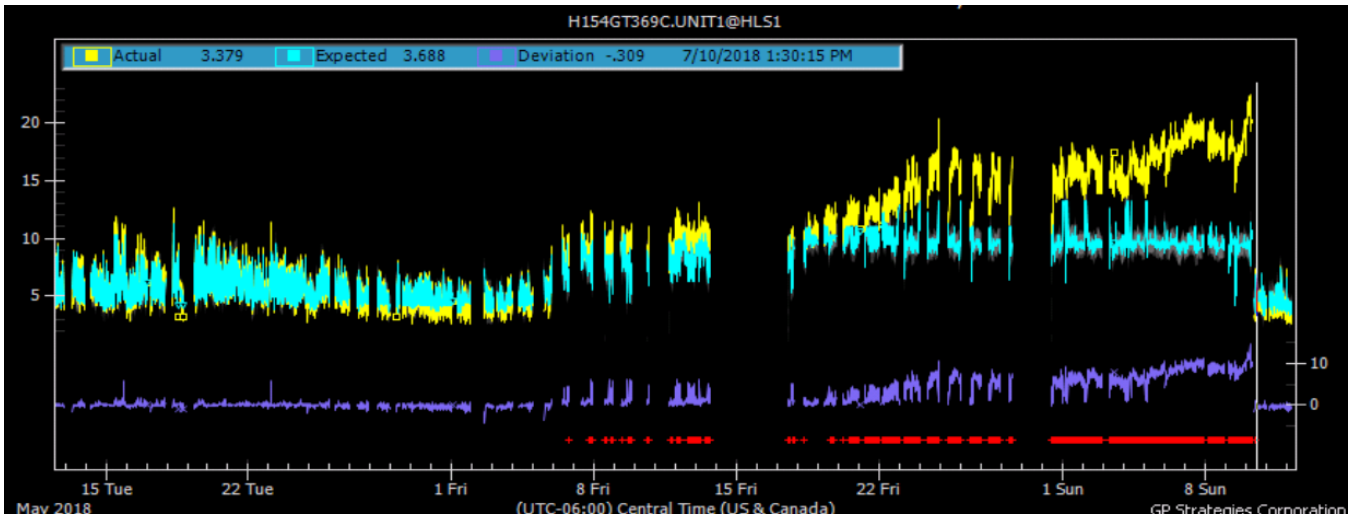
The EtaPRO M&D Center identified high vibrations on a SDA atomizer spindle vibration.

Issue

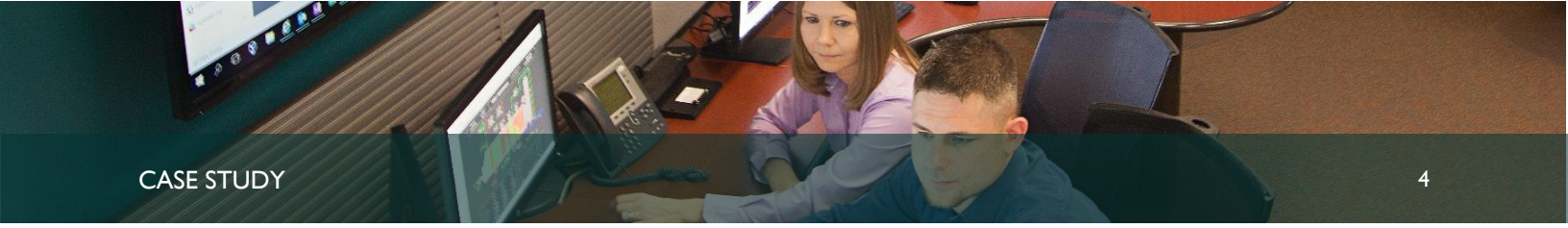
The atomizer was believed to have been plugging up resulting in elevated vibrations (a common issue with SDA atomizers). The initial APR warning came in three weeks before reached the DCS alarm limit.

Value

Due to the advanced warning from EtaPRO APR, the plant was able to prepare the spare atomizer for replacement two weeks in advance of the DCS warning. Once the new atomizer was put in place, the M&D team was able to confirm vibration levels have returned to normal. Savings from are estimated at $5,000.



EtaPRO APR trend of Elevated SDA Atomizer Spindle Vibration and Return to Normal



Low Flow to Condensate Conductivity Analyzer

Description

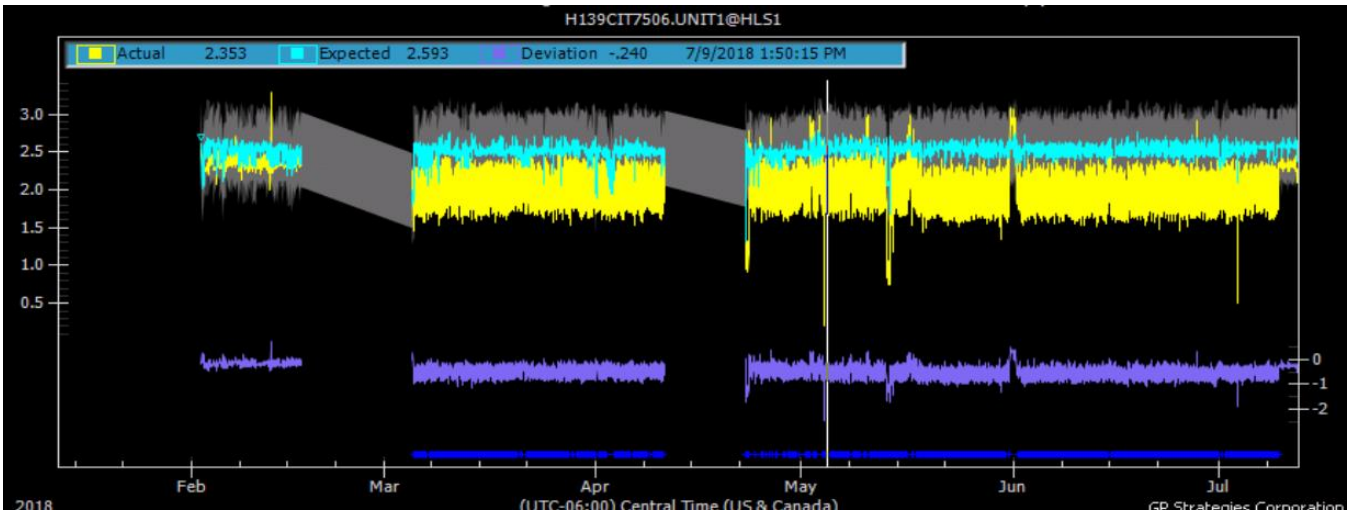
The EtaPRO M&D Center identified abnormal variations on a condensate conductivity reading.

Issue

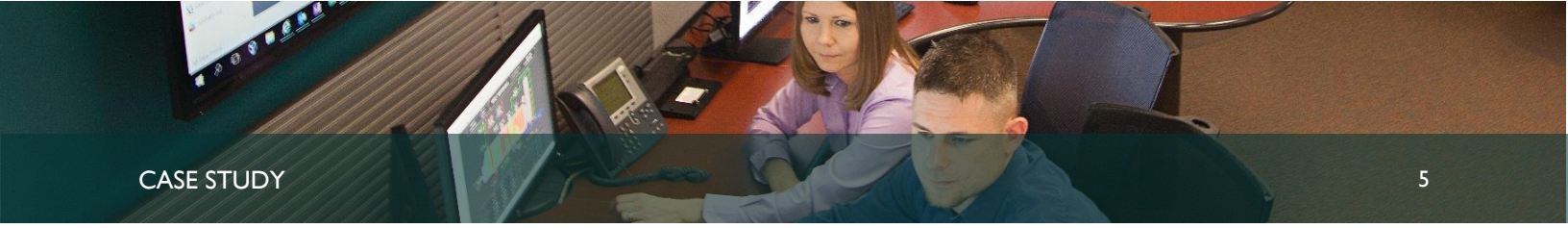
After a few weeks of troubleshooting, the issue was found to be related to low flow to the conductivity analyzer. The flow was increased and the readings returned to normal.

Value

The conductivity variation would have been difficult to identify without the pattern recognition models in place, as the indication did not produce any other alarms on local systems. If a chemistry issue did occur, the inaccurate reading may have masked poor water chemistry resulting in avoidable damages. Savings from are estimated at **$5,000.**



EtaPRO APR trend of Condensate Conductivity Measurements



Failed Expansion Joint - Gas Path

Description

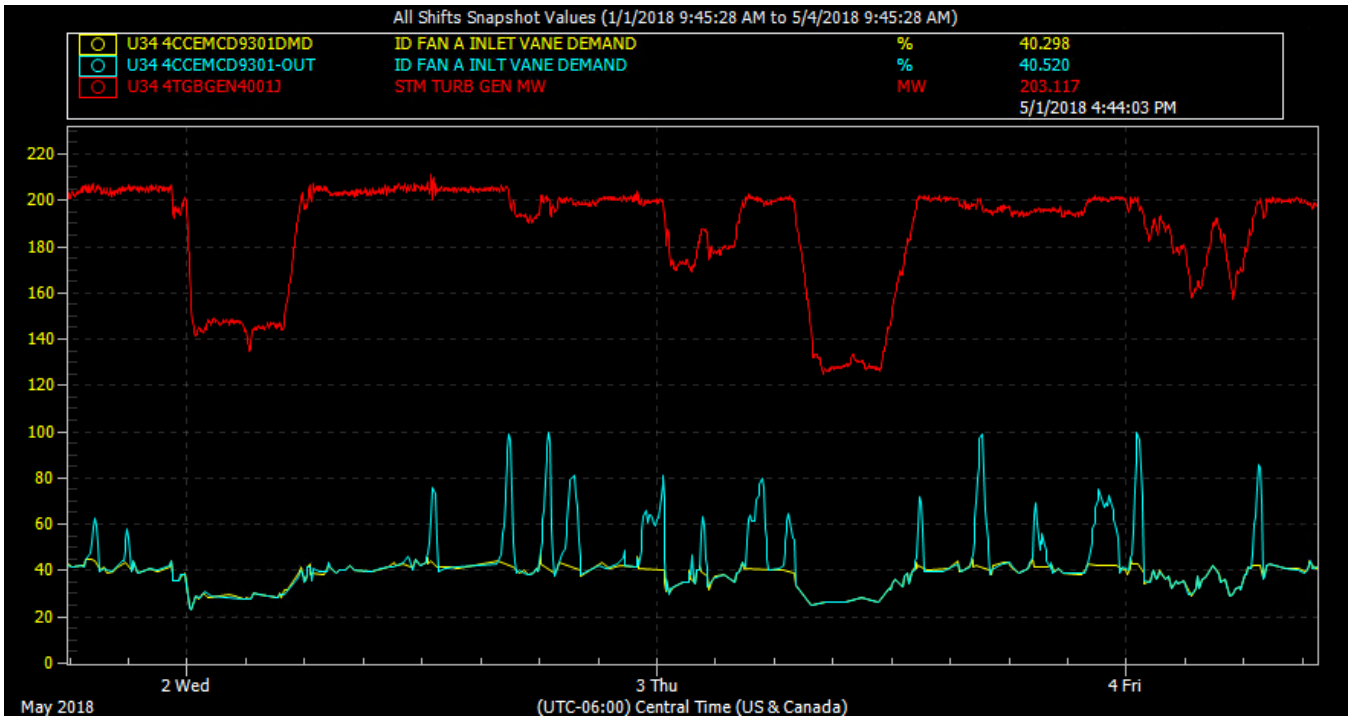
The EtaPRO M&D Center identified high valve demand and large fluctuations on ID fan inlet vane signals.

Issue

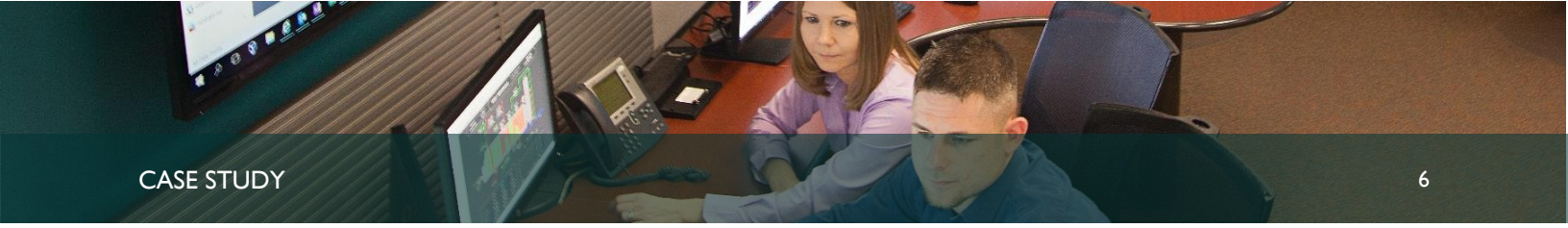
After inspection, the plant found a failed expansion joint near the inlet to the ID fans.

Value

The plant was able to quickly identify the issue and plan for repair. Leakage into the gas path results in additional power consumption on the ID fans. In addition, excessive motion can lead to early failure of inlet vanes on the fan. Savings from are estimated at **$12,000.**



EtaPRO trend of high valve demand.



Steam Turbine Bearing Damage

Description

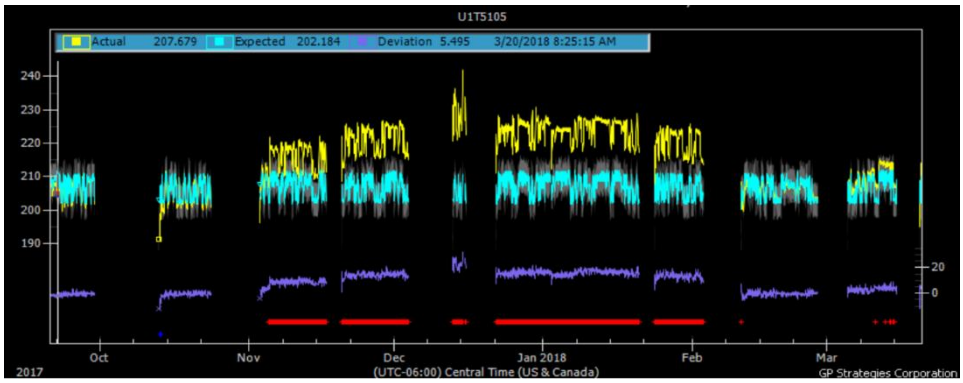
The EtaPRO M&D Center identified an elevated bearing metal temperature which had indicated a 10°F temperature increase following a one week outage.

Issue

After inspection, the plant identified the damage to the upper bearing housing.

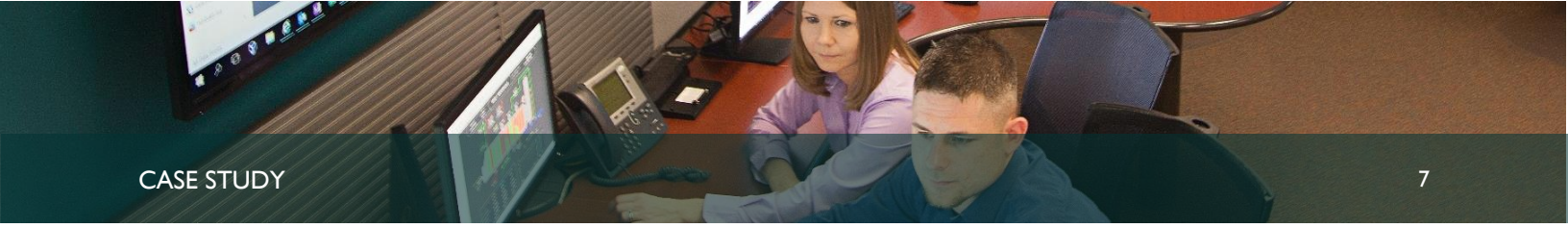
Value

The plant was able to prepare and replace the journal bearing before any major damage occurred to the shaft or other components. This was able to be completed on a planned rather than an emergency shutdown or plant trip. The estimated savings from potential damage that was avoided is $150,000.



APR trend of elevated steam bearing temperature.

Damage found on steam turbine journal bearing. Conditions indicate rub occurred.



Condenser Air In-Leakage (failed piping)

Description

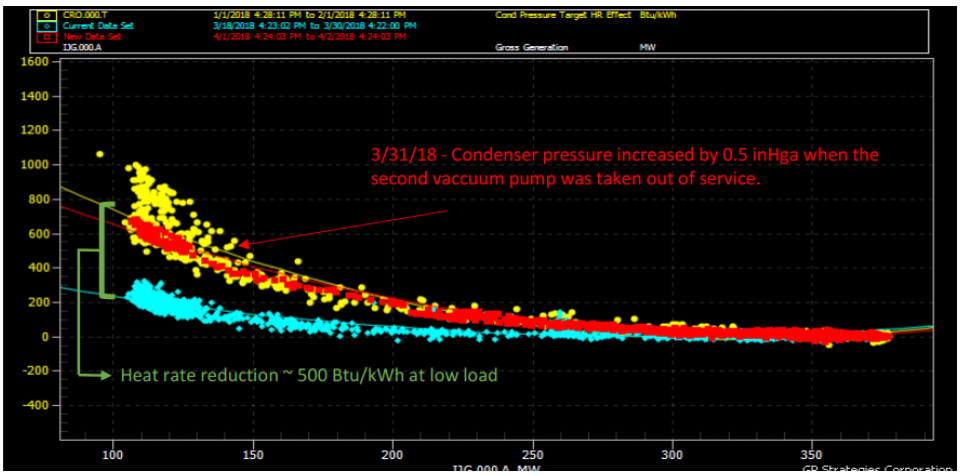
The EtaPRO M&D Center identified high condenser pressure readings following an overhaul outage at this plants station. High condenser pressures mainly occurred at low load operation. The M&D Center's team evaluated the condenser and determined the cause was due to excessive air in-leakage.

Issue

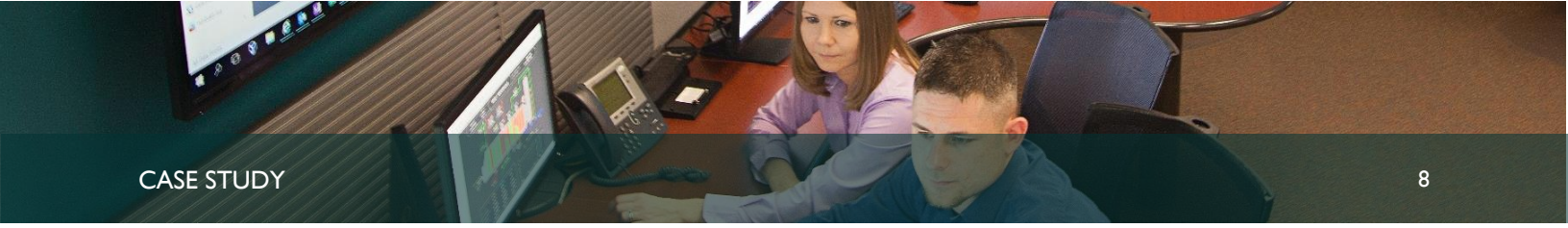
The plant confirmed excessive air in-leakage due to air removal rates on the condenser vacuum pumps. An internal inspection was done and a piping failure was identified in one on the low pressure heaters located in the neck of the condenser. The piping was repaired and condenser improved dramatically.

Value

The plant was immediately alerted to the high condenser pressure following the unit returning to service. Using the EtaPRO and VirtualPlant performance package, the M&D Center was able to run a simulation to quantify the cycle effect of the high condenser pressure, with estimated heat rate penalty near 500 Btu/kWh at lower loads and capacity impacts near 2 MW. The estimated saving is $100,000 per month.



EtaPRO trends indicated shifts in condenser pressure after repair.



Cooling Water Inlet Valve Failure

Description

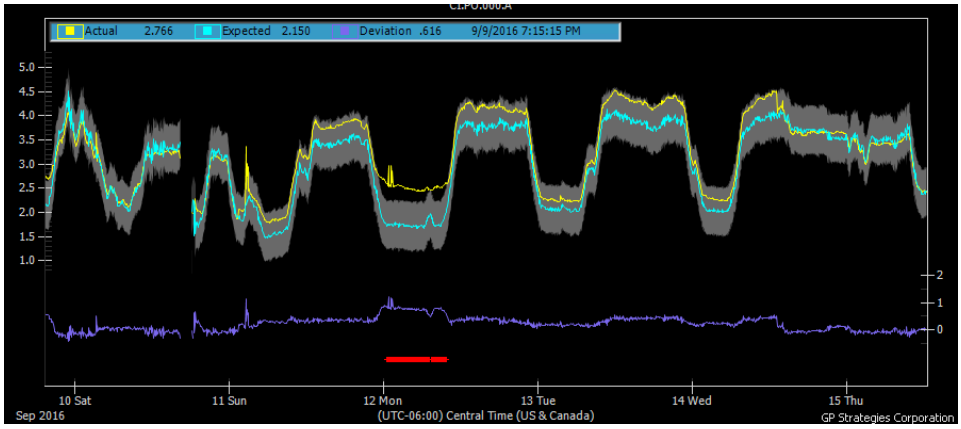
Early in the morning, the condenser cooling water outlet temperature CW-1 indicated a 10°F temperature shift. At the same time, the CW pump discharge pressure indicated a pressure increase of 5 psig. The condenser pressure did not show much movement at the time, but did rise early in the morning the following day and he remained 0.2-0.5 in Hga higher across the load range. The EtaPRO M&D Center made the recommendation to check the cooling water side for any obstructions.

Issue

After an inspection, the plant identified an issue with the cooling water inlet valve. The keyway was slipping off the shaft and not allowing the valve to open all the way. The issue was resolved within 36 hours of the initial alert from APR.

Value

The elevated condenser pressure was resulting in a higher heat rate and reduced capacity. Losses were estimated at $38,000 per month.



Hydrogen Temperature Increase

Description

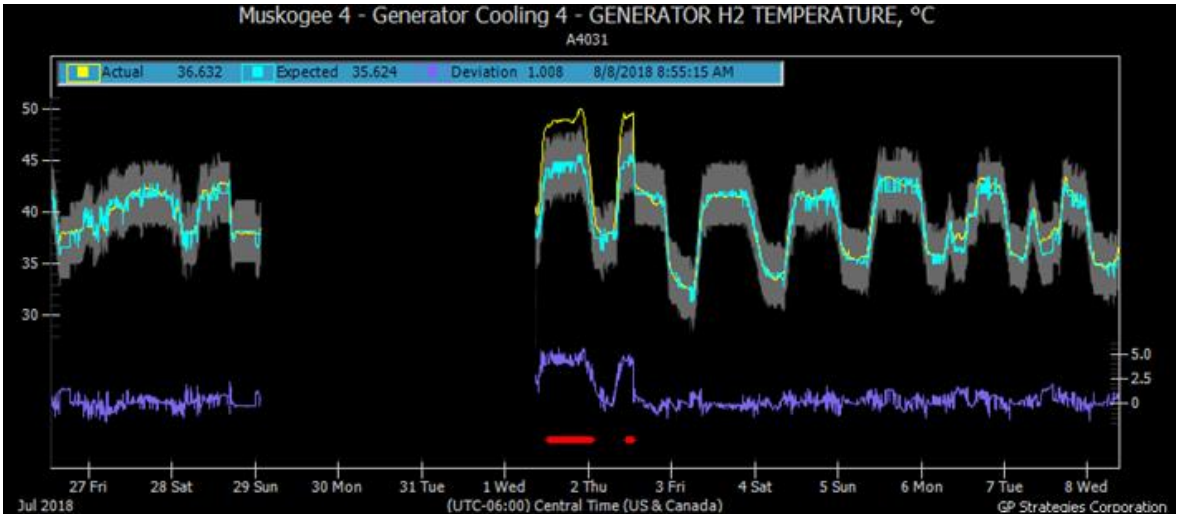
The EtaPRO M&D Center team identified a hydrogen temperature increase of 5°C on a steam turbine generator. A similar increase was also found on multiple generator stator slot temperatures.

Issue

After inspection, the hydrogen cooler was determined to be air bound. The plant burped the hydrogen cooler to remove air in the system and the temperatures returned to normal.

Value

The issue was identified, diagnosed and resolved in less than 24 hours before temperature elevated to an alarming range. This prevented additional wear from elevated temperatures and potentially avoiding a unit trip had the issue gone unnoticed.


Muskogee 4 - Generator Cooling 4 - GENERATOR H2 TEMPERATURE, °C
A4031
Actual 36.632
Expected 35.624
Deviation 1.008
8/8/2018 8:55:15 AM
50
45
40
35
30
5.0
2.5
0
27 Fri
28 Sat
29 Sun
30 Mon
31 Tue
1 Wed
2 Thu
3 Fri
4 Sat
5 Sun
6 Mon
7 Tue
8 Wed
Jul 2018
(UTC-06:00) Central Time (US & Canada)
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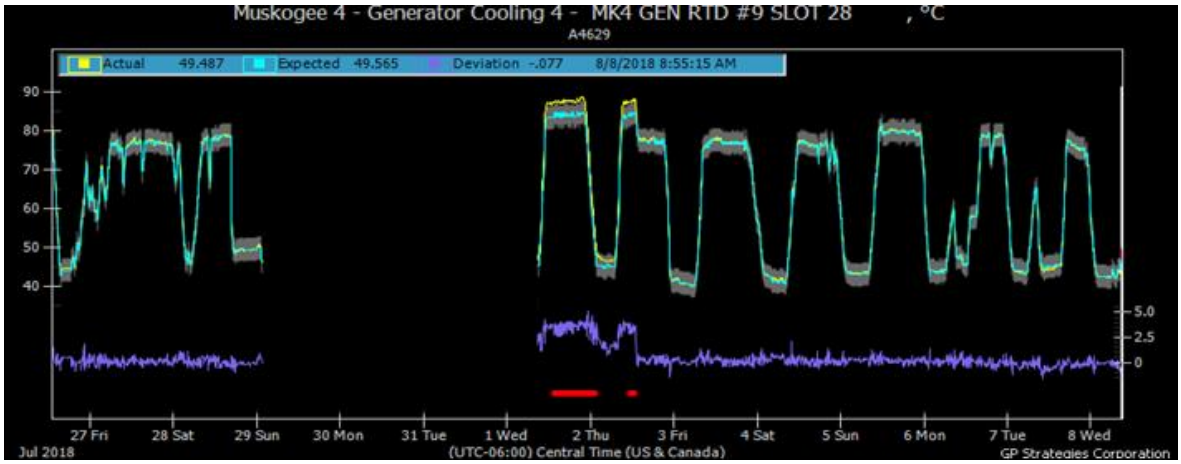
Muskogee 4 - Generator Cooling 4 - MK4 GEN RTD #9 SLOT 28 , °C
A4629
Actual 49.487
Expected 49.565
Deviation -.077
8/8/2018 8:55:15 AM
90
80
70
60
50
40
5.0
2.5
0
27 Fri
28 Sat
29 Sun
30 Mon
31 Tue
1 Wed
2 Thu
3 Fri
4 Sat
5 Sun
6 Mon
7 Tue
8 Wed
Jul 2018
(UTC-06:00) Central Time (US & Canada)
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