

Predictive Asset Analytics

Sales Presentation

March / 2015

Mining, Minerals and Metals



Maintenance costs in the
mining industry

>20%

Total Operational Costs



Up to
15%

of total costs are wasted through the
ineffective use of maintenance*



*Prospect Consulting

Schneider Electric's Solution's Areas



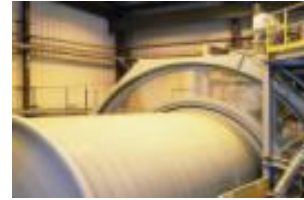
Safety and Security

Improve sustainability by enabling ZERO incident operations



Social license to operate

Obtain and Maintain the license to operate by creating shared value while taking care of the environment



Operation Efficiency

Strengthen people effectiveness, optimize use of assets, increase production performance

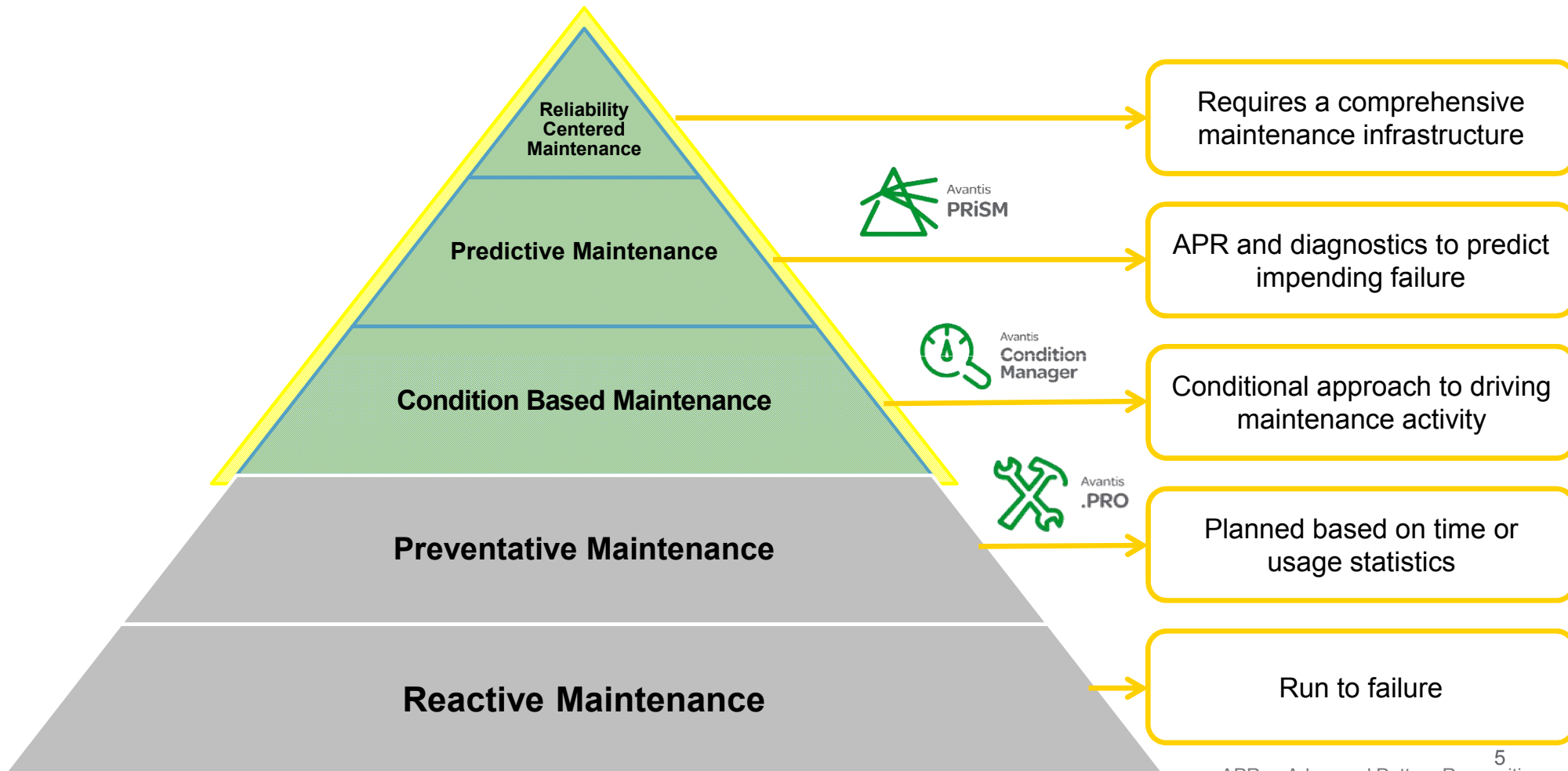


Maximize value creation

Unifying the value chain and business optimization

Grow in a sustainable way
Get the most of your production resources
Increase overall efficiency

Maintenance Programs



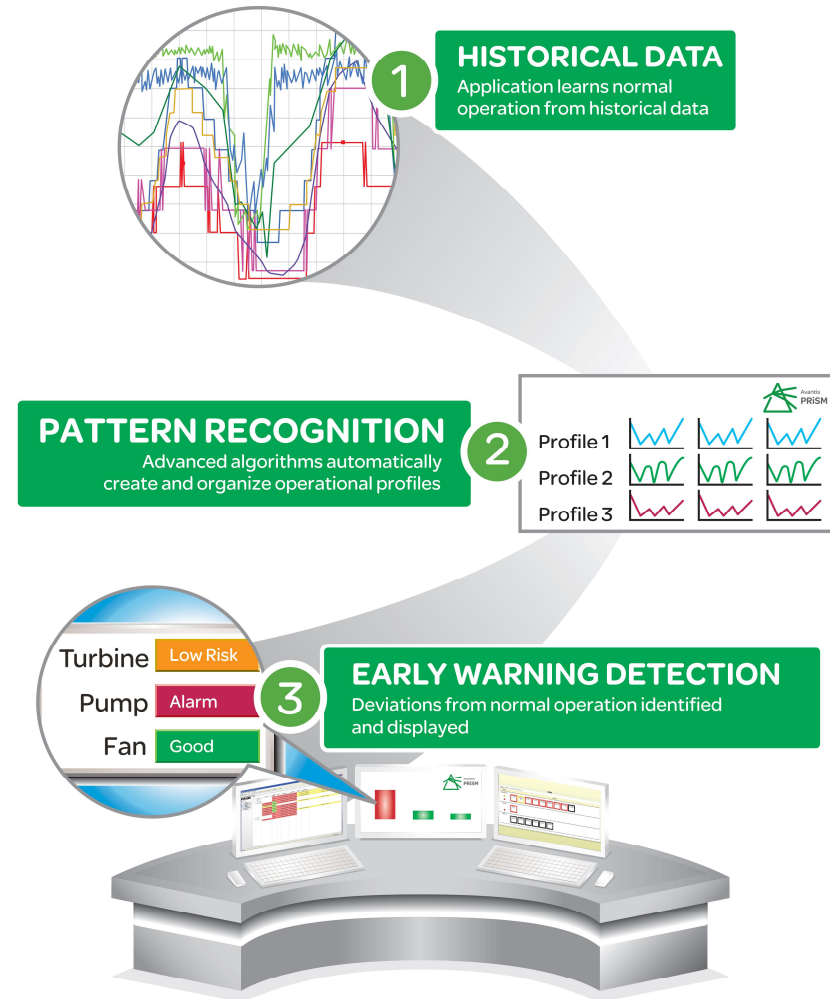


Real-time Predictive Asset Health and Performance Monitoring



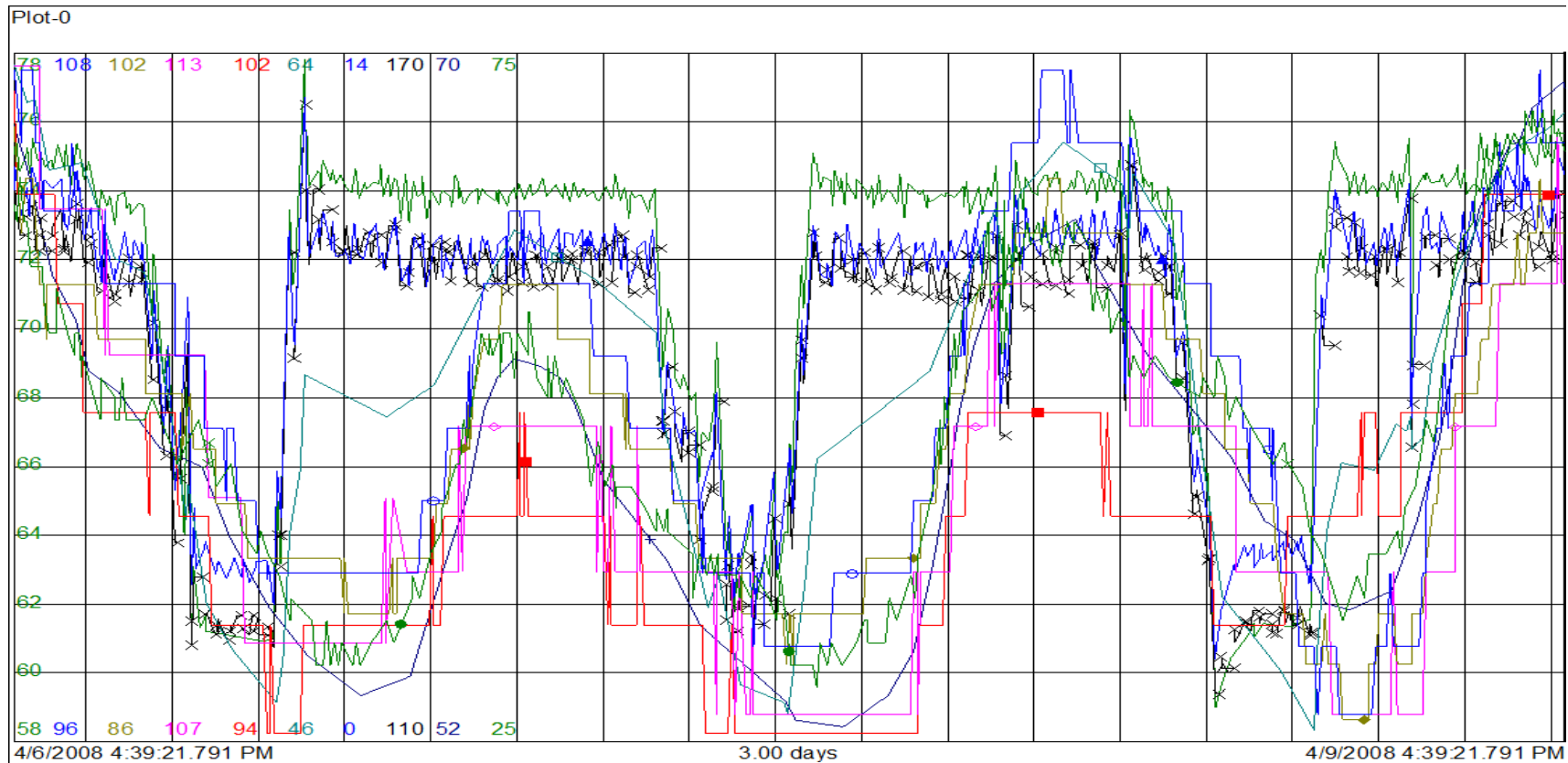
Predictive Asset Analytics

- > Advanced pattern recognition for on-line equipment condition monitoring
- > Utilizes historical data to describe how a piece of equipment operates and builds a model
- > Monitors equipment behavior continuously, in real-time
- > Alerts when current operation deviates from the historical norm
- > Early warning detection of equipment problems
- > Fault diagnostics capabilities



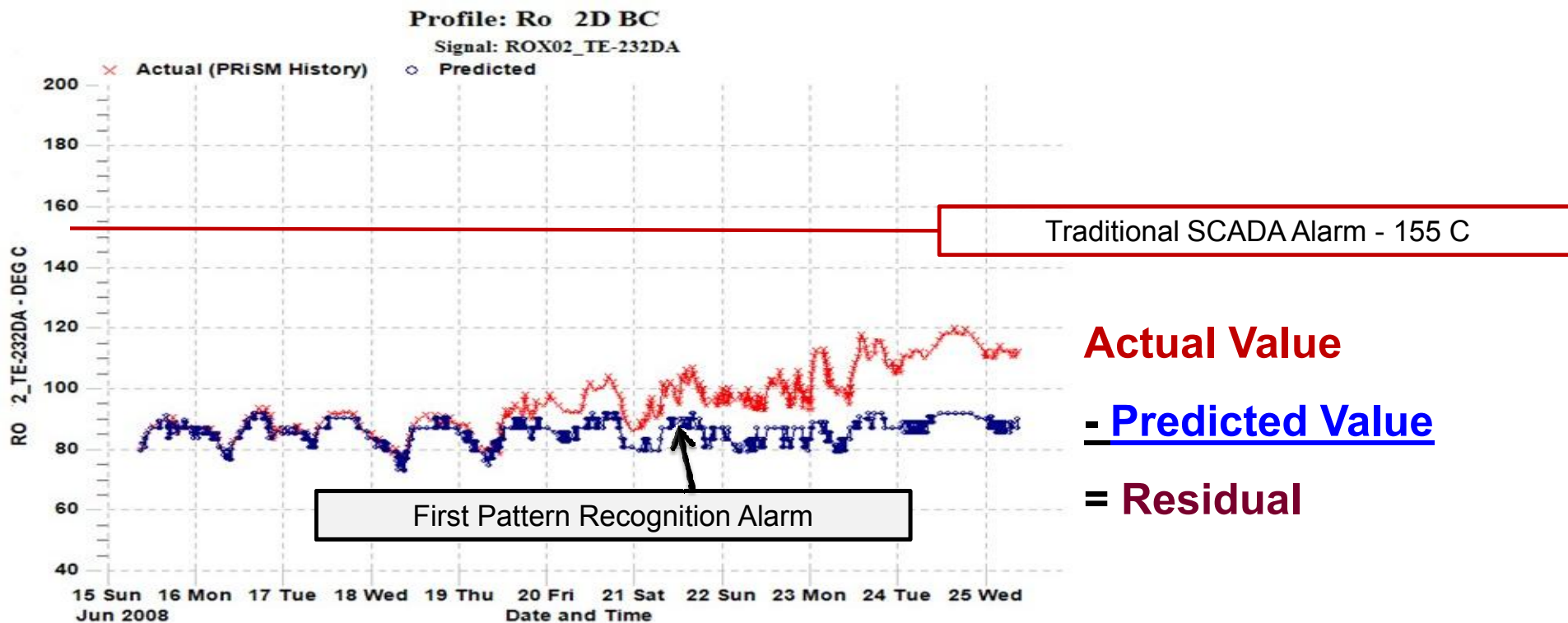
Monitoring without Advanced Analytics

As your fleet continues to expand, how will you manage the additional assets and data streams?

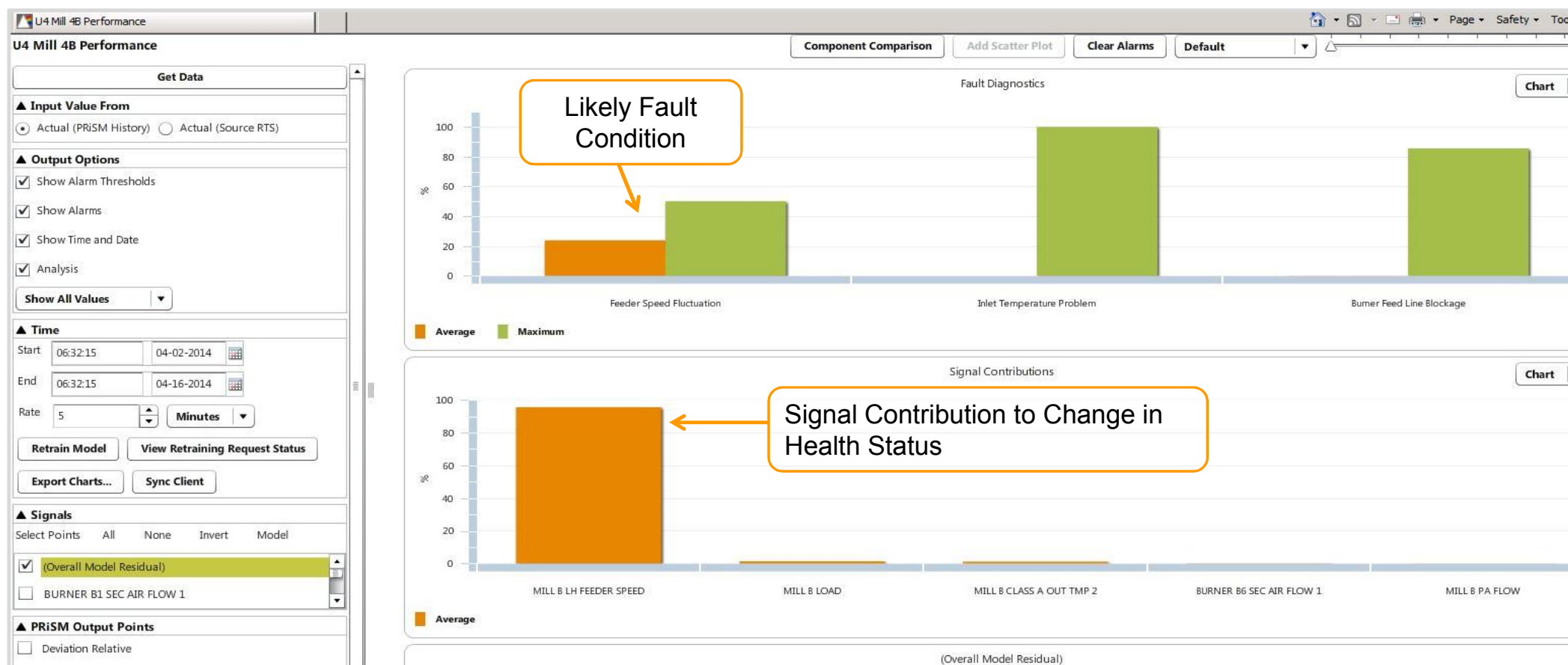


Early Warning Prediction

- ▶ We use automated alarms for PRiSM to alert us when lines separate
- ▶ Set alarms on the residual value, the actual value minus the predicted
- ▶ Alarms are received earlier than typical SCADA alarms



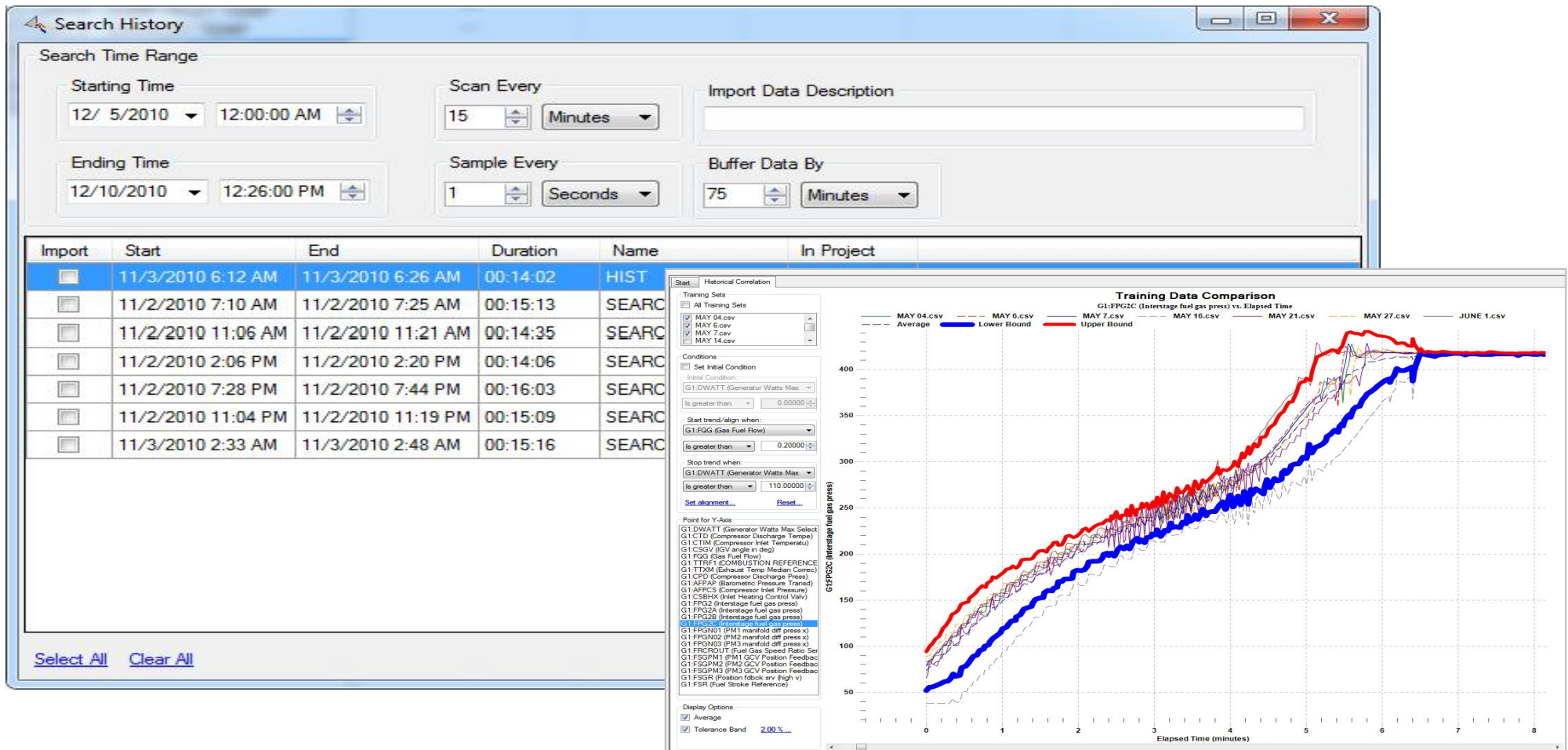
Match Fault Pattern with Known Conditions (Library)



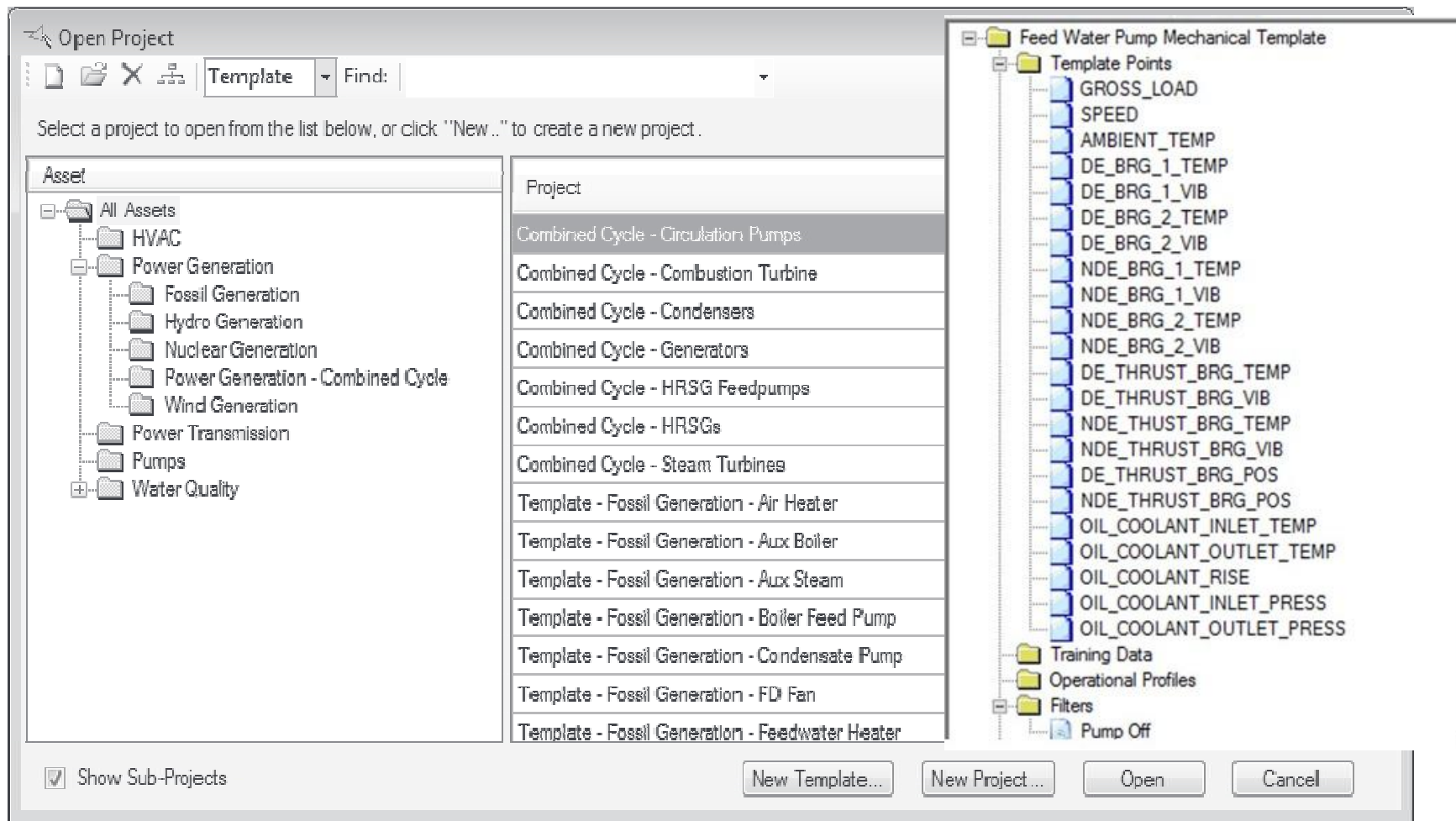
Intelligent Alert List – Situational Awareness Screen

Home Asset Status Alarms Annunciator Panel Explorer ▼												
Rating 1 2 3 4 5 ☒ Auto Refr												
Name	Rating	Criticality	Current Status	Tech Exam Date	Tech Exam Status	Earliest Event	Latest Event	Alarms	Warnings	14 Day Event History (days)		
U1 Steam Turbine Mech	4	0				03-17-2014 20:20:18	04-16-2014 06:05:18	170	224			
U6 Mill 6B Performance	5	0				03-17-2014 15:55:18	04-16-2014 06:20:18	25	18			
U4 Mill 4B Performance	5	0				04-08-2014 07:25:18	04-15-2014 02:05:18		12			
U5 Mill 5C Performance	5	0				03-17-2014 16:50:18	04-16-2014 06:15:18	14	29			
U5 Mill 5A Performance	5	0				03-28-2014 13:10:18	04-16-2014 06:15:18	10	25			
U6 Mill 6A Performance	5	0				03-16-2014 08:35:18	04-16-2014 02:40:18	22	66			
U6 Mill 6ETemp	5	0				04-15-2014 03:55:18	04-15-2014 21:45:18	2	7			
U1 Mill 1D Performance	5	0				03-19-2014 21:15:18	04-15-2014 04:05:18	4	6			
U1 Mill 1E Performance	5	0				03-19-2014 05:05:18	04-09-2014 21:40:18	2	12			
U1 Mill 1D Temp	5	0				04-09-2014 19:35:18	04-09-2014 20:55:18		2			
U2 Mill 2A Performance	5	0				03-18-2014 07:30:18	04-07-2014 22:15:18	32	35			
U1 Mill 1F Performance	5	0				03-19-2014 05:25:18	04-15-2014 06:20:18	24	40			
U1 Mill 1C Performance	5	0				03-24-2014 18:35:18	03-24-2014 18:45:18		1			
U2 Mill 2B Temp	5	0				03-26-2014 10:55:18	04-16-2014 06:10:18		4			
U1 Steam Turbine Performance	5	0				03-18-2014 10:40:18	04-15-2014 08:40:18	21	104			
U2 Mill 2A Temp	5	0				03-28-2014 00:30:18	04-07-2014 22:05:18		2			
U2 Mill 2D Performance	5	0				03-18-2014 15:35:18	04-11-2014 19:55:18	102	115			

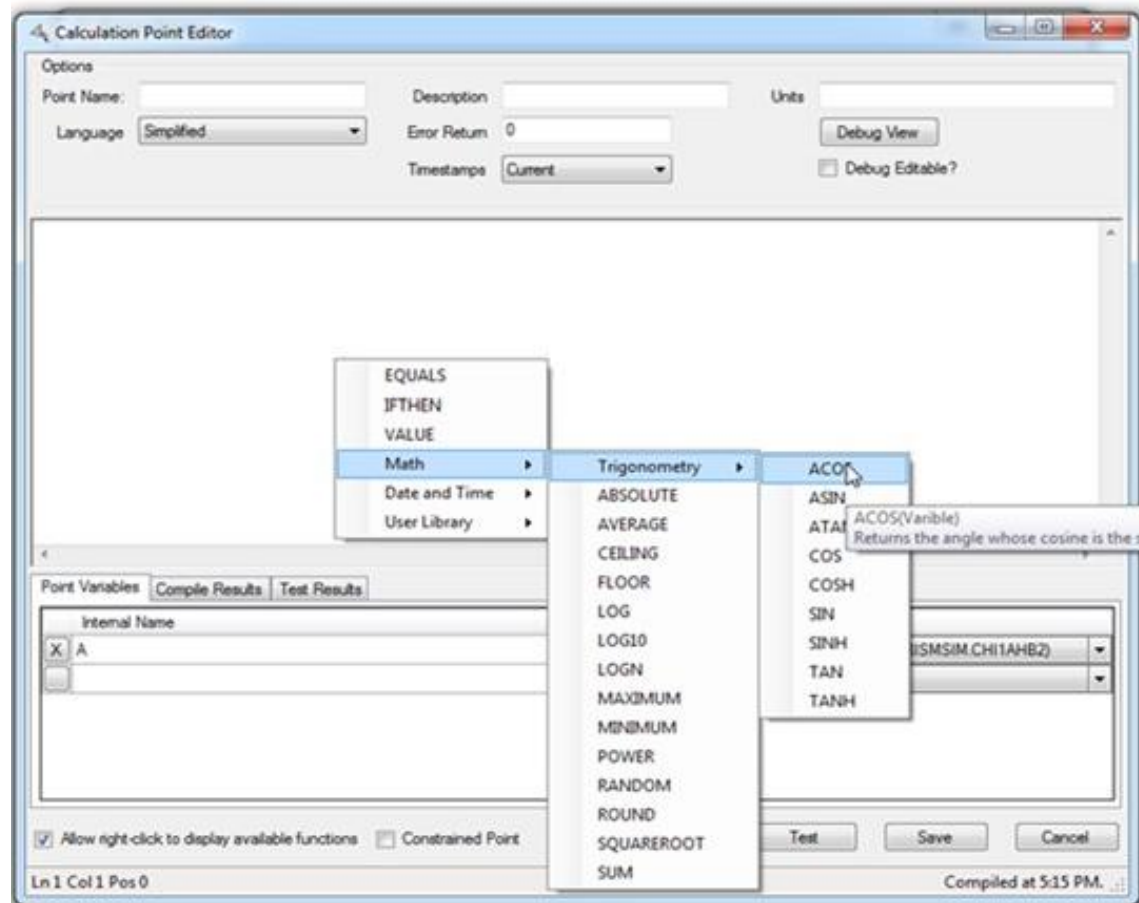
Transient Analysis – Event Capture



Model templates



Calculation Engine



Predictive Analytics – Transformative Technology

>Centralized, Continuous, Real-time Monitoring

- > For more informed business decisions

>Reduce Reactive Maintenance

- > Move from unplanned to planned maintenance
- > Provides situational awareness

>Extend Maintenance Intervals

- > Support of Condition-Based Maintenance
- > Avoid over servicing

>Knowledge Capture

- > Events do not repeat themselves
- > Train younger engineers

>Prioritize Maintenance

- > Risk assessment of abnormal conditions – can we stay online?

Studies show that only 18 percent of asset failure patterns are age related. (Most require a predictive component to detect).

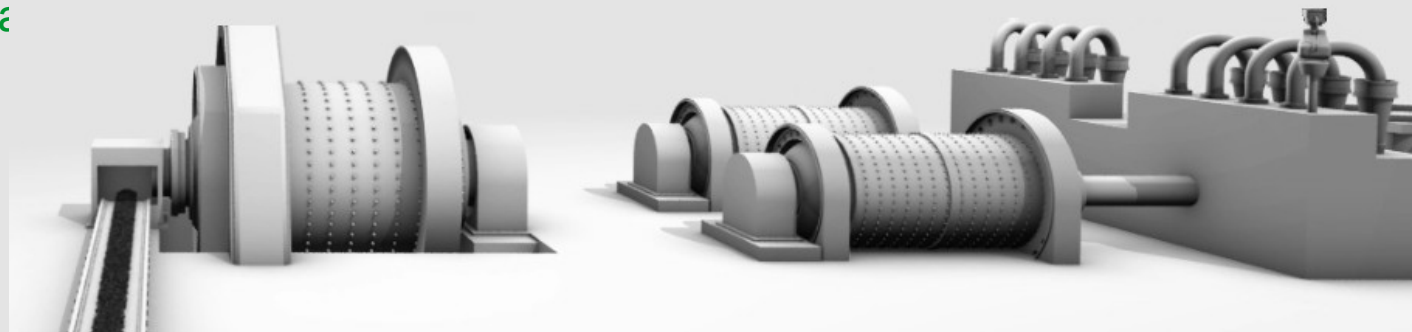
- ARC Advisory Group

Case Studies



Equipment Types

- > Turbine
- > Compressor
- > Electric Generator
- > Pumps – Centrifugal, Integral
- > VFD's
- > Fans, blowers
- > Heat Exchanger, Boiler, Oven, Kiln
- > Air Heaters
- > Water Heaters
- > Pulverizer, Crusher
- > Condenser
- > Transformers, Breakers, Capacitors
- > Agitators, blender, Mixer
- > Gearbox
- > Chillers
- > Seal systems



Case Study

> User profile

- 40,000 MW
- 63 coal-fired units (Supercritical, Large & Small Drum)
- 10 combined cycle units (2 on 1)
- 2 cogen units (Steam generators)
- 1 fluidized bed unit
- 2,700 models

> Savings in 2014

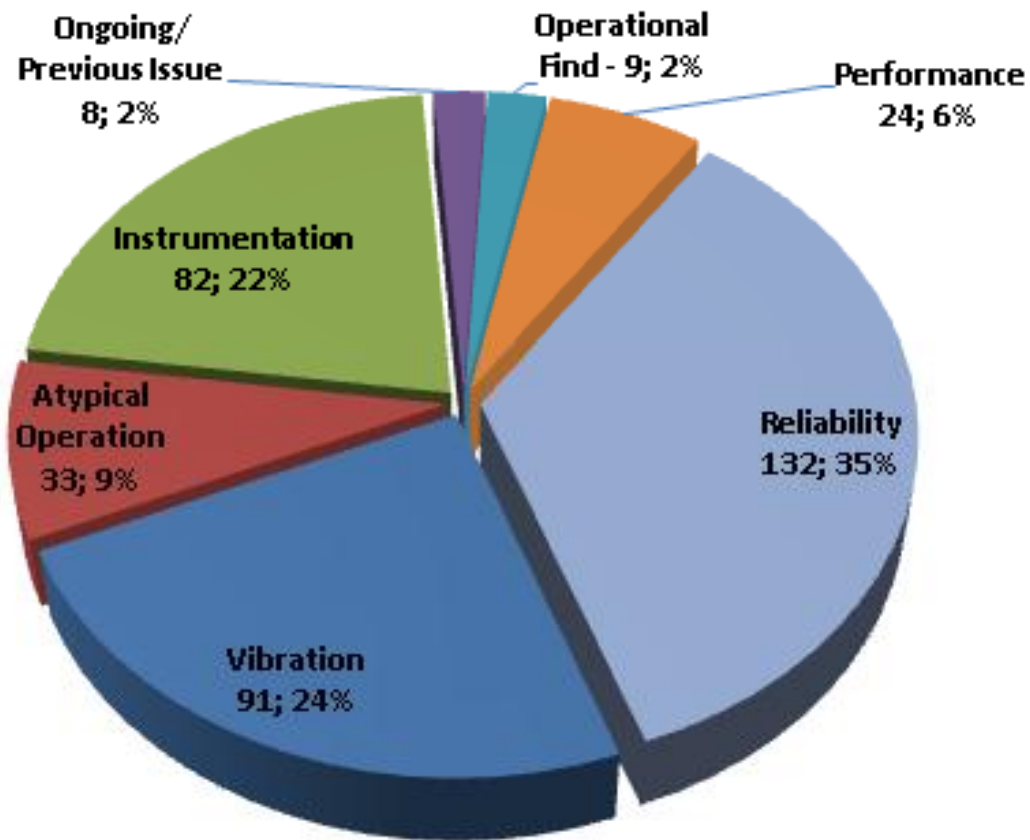
- \$4M avoided cost

> Real Savings

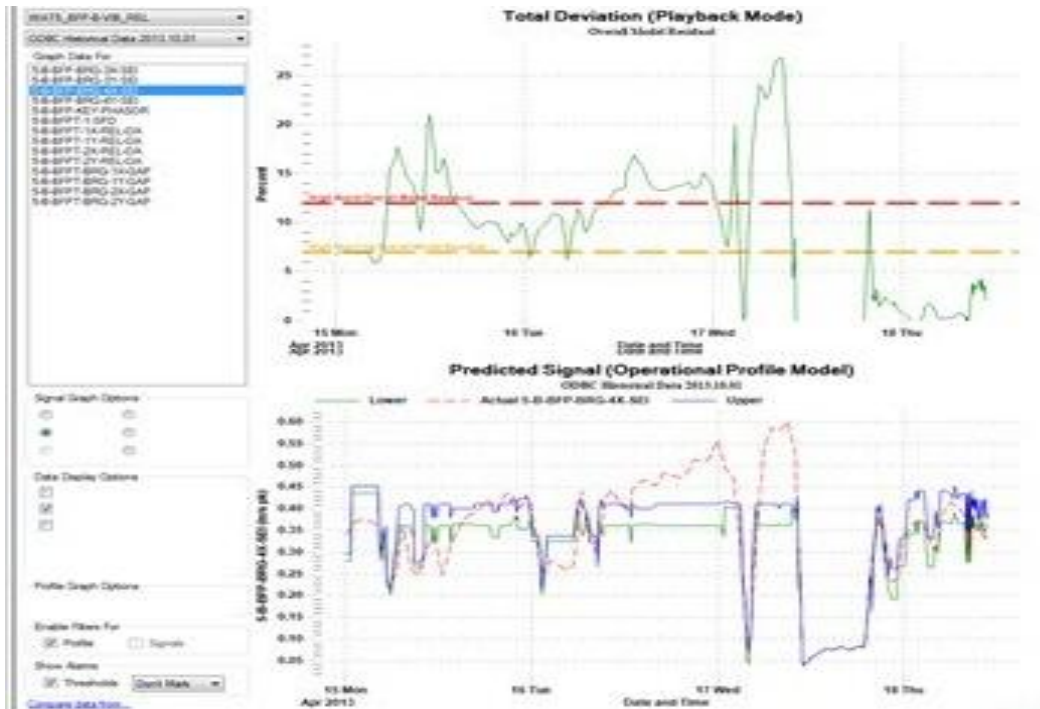
- User estimates that the real savings is closer to \$40M when considering savings from AGC, repair costs and labor costs



Issue Categorization (Fleet Wide Monitoring)



BFP Coupling Shim Pack



Observation:

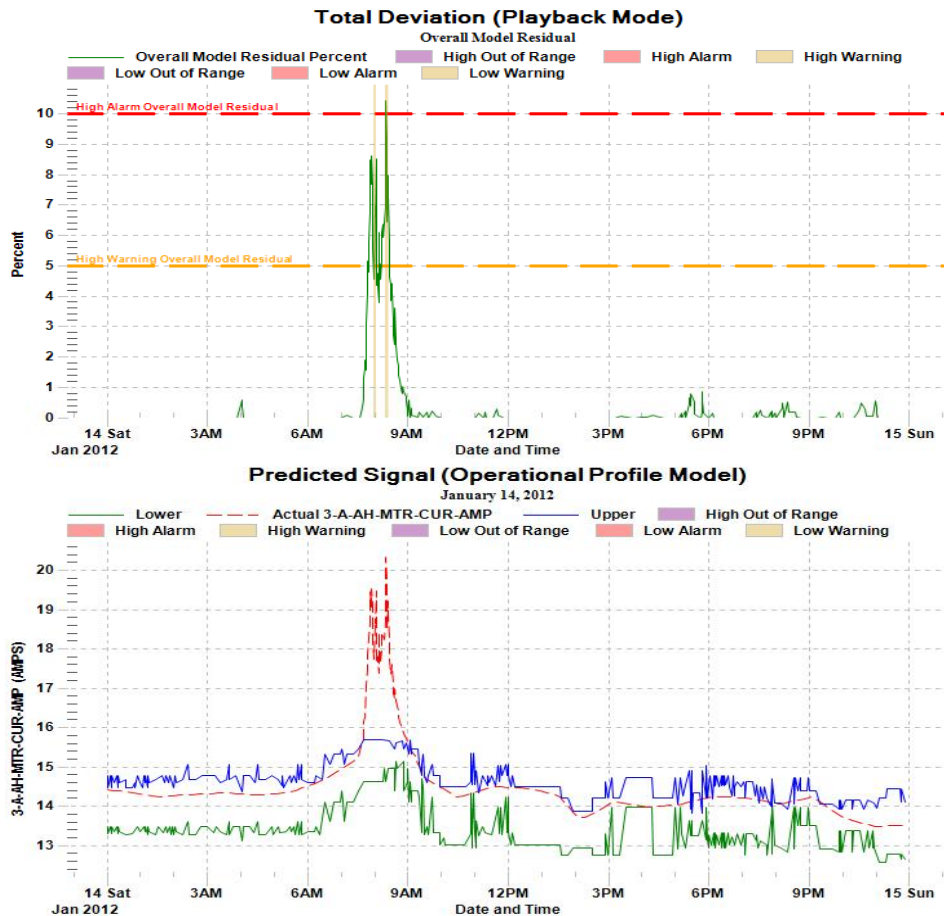
- > Model is indicating an increase in vibration on multiple bearings

Result:

- > A BFP coupling shim pack that was on the verge of failure

**Estimated \$260,000
Savings**

Case Study: Air Heater



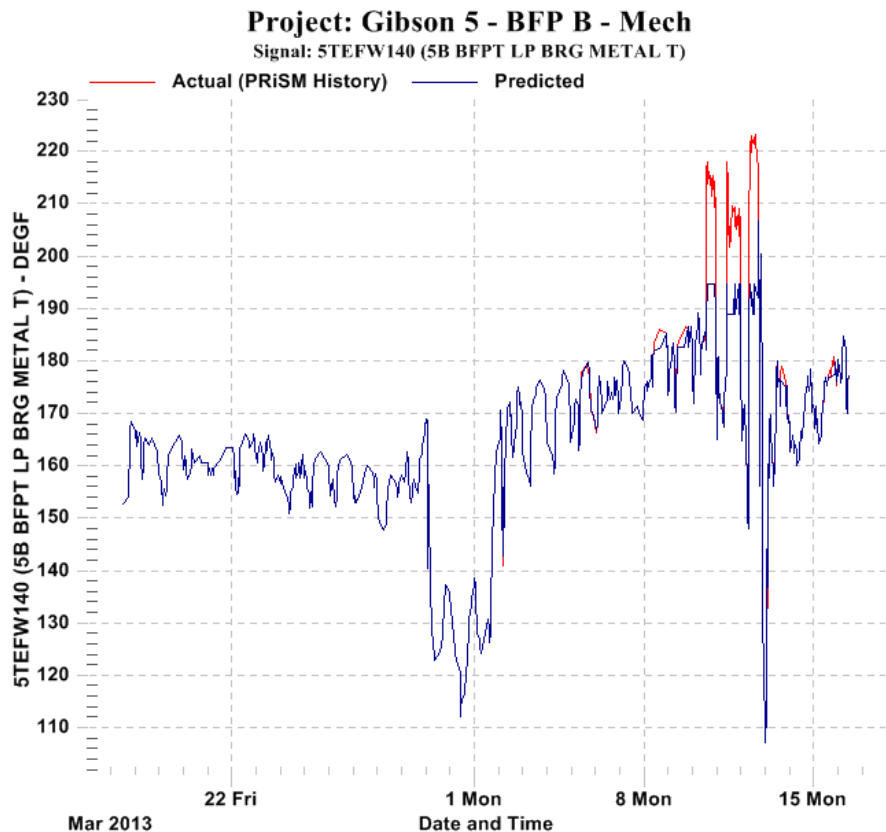
Observation:

- > Air heater amps spiked from 14 amps to 18 amps

Result:

- > Plant found a leak on the hydrovactor on the floor above that saturated the AH insulation, causing expansion issues with the shroud

Case Study: Turbine Bearings



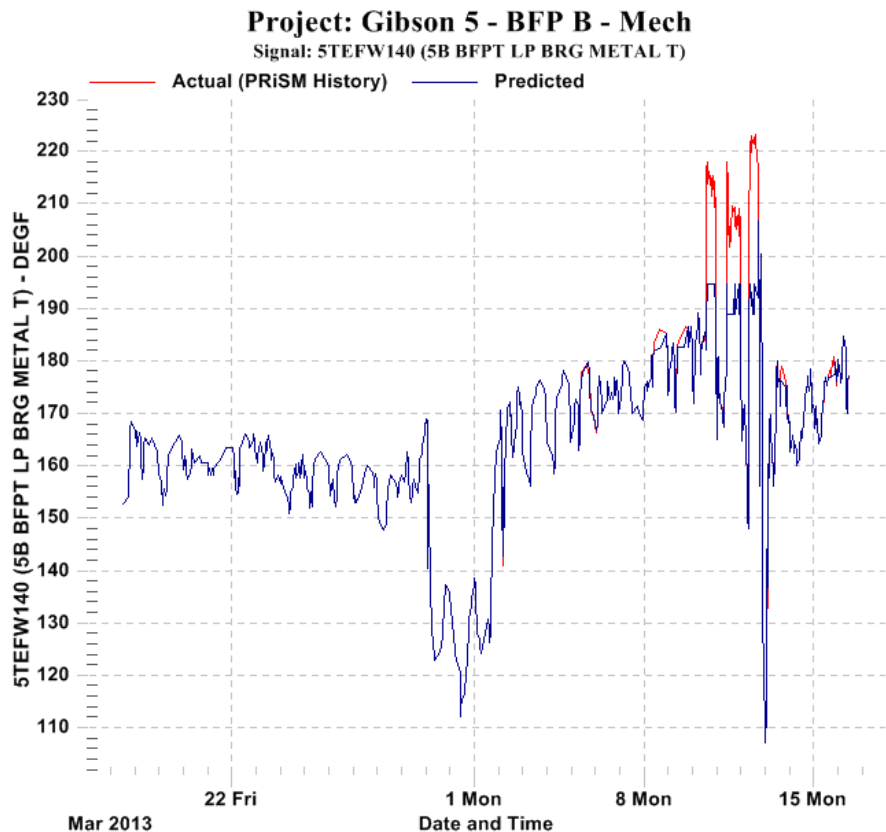
Observation:

- > Bearing metal temperature spikes seen on low pressure turbine bearings

Result:

- > Site investigation found oil reservoir filled with half water and half oil
- > Experience from site determined intricate valveing was supplying too much pressure to the seals resulting in water flowing to the bearings

Case Study: Turbine Bearings



Observation:

- > Bearing metal temperature spikes seen on low pressure turbine bearings

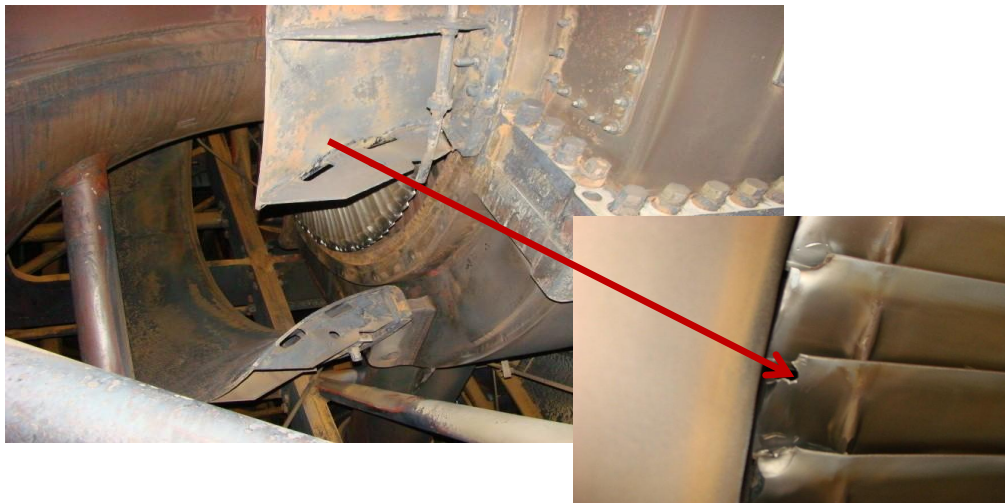
Result:

- > Site investigation found oil reservoir filled with half water and half oil
- > Experience from site determined intricate valveing was supplying too much pressure to the seals resulting in water flowing to the bearings

Case Study: Turbine Vibration

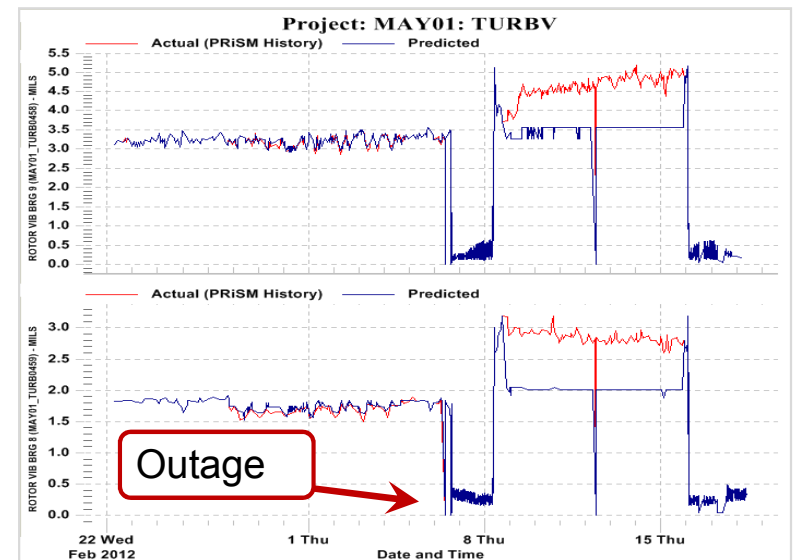
Observation:

- Unit started after an outage, & there was a vibration step change on a LP turbine (well below alarm level)
- Engineering & the plant were notified
- Vibration data was collected & unit was retired for inspection
- Bolts on lower half of flow sleeve had broke & flow sleeve contacted L-0 blades

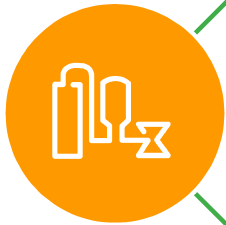


Result:

- Upper half of flow sleeve was no longer supported by lower half
- Minor damage to the LP blades, but avoided damaging multiple stages of blades, packing, and diaphragms if there was a severe blade liberation
- **Estimated Cost Avoided: \$4.1 million**



Benefits



Strategic

(increased asset utilization, improved performance and better maintenance planning)



Financial

(reduced operational and maintenance costs)



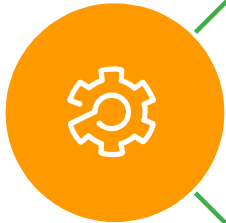
Operational

(reduce downtime, asset utilization, improved quality, production performance)



Safety

(reduced risk, early warning of impending catastrophic equipment failures)



Engineering

(decision support, less-time analyzing and more time acting, mobile solutions)



IT

(data quality, utilization, improved models, real-time and predictive insights)

Thank you!

©2014 Schneider Electric. All Rights Reserved.

All trademarks are owned by Schneider Electric Industries SAS or its affiliated companies or their respective owners.

