Enterprise Asset Performance Management

Overview of Software Diagnostic Tools used in Power Industry

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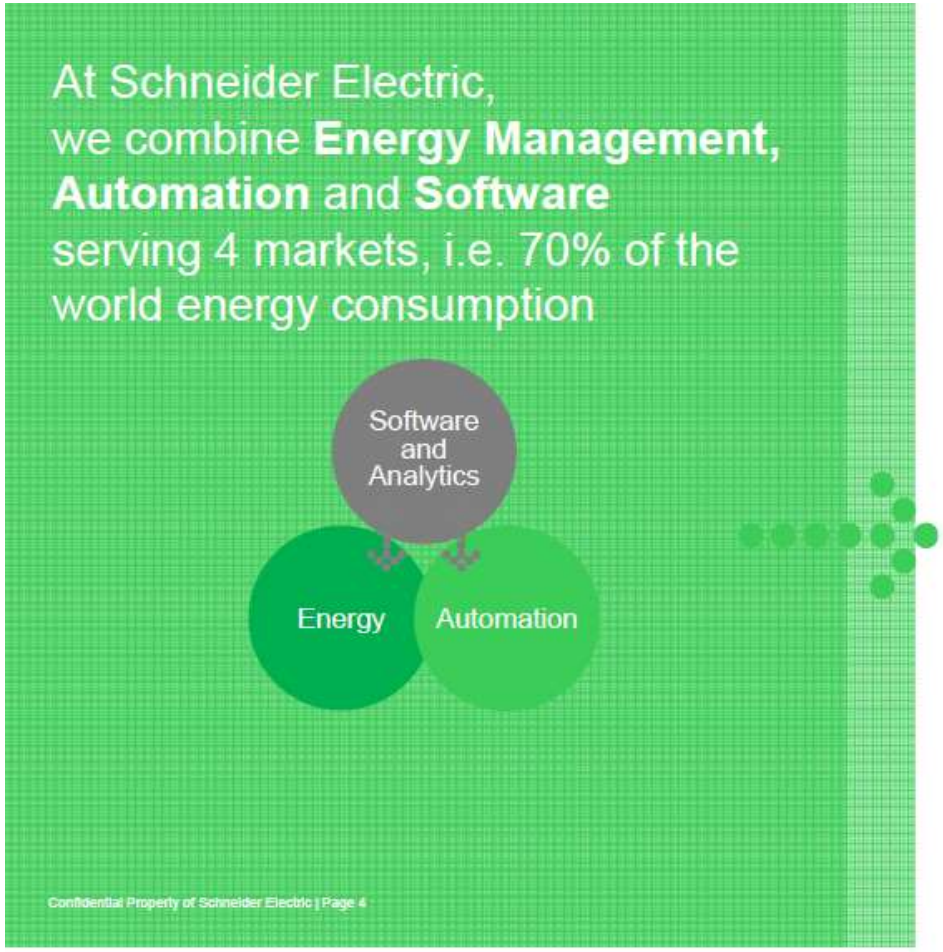
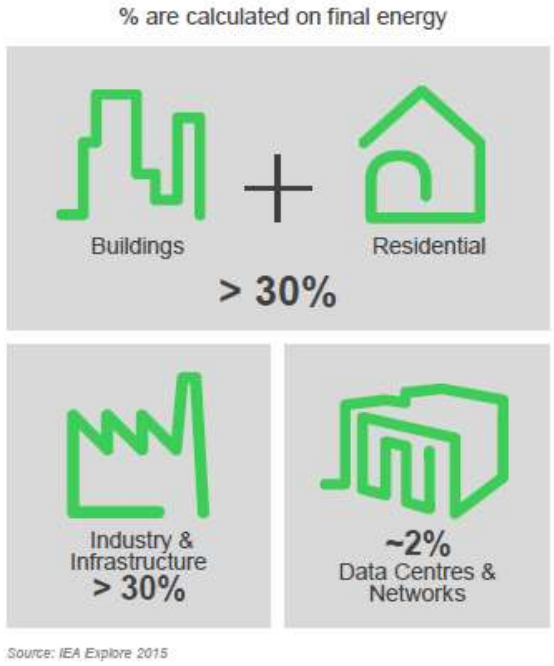
Schneider Electric

Presentation Flow

- Company Overview
- APM Overview
- APM Software: Wonderware e-DNA
- APM Software: Avantis PRiSM
- Case Studies

Company Overview: What do we do?





Life Is On Schneider Electric

Company Overview: Global specialist in energy management and Automation

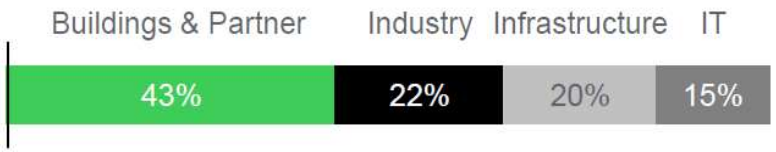
€24.7 billion
FY 2016 revenues

5%
of FY revenues devoted to R&D

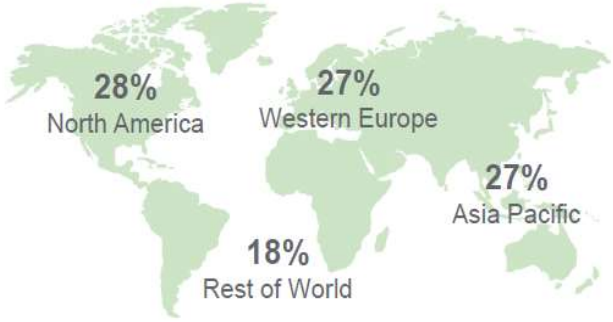
160,000+
people in 100+ countries

Four integrated and synergetic businesses

FY 2016 revenues



Balanced geographies – FY 2016 revenues



Company Overview: Expertise with Vertical Segments

Wide industry coverage

We work with
19 of the top **20** petroleum companies
22 of the top **40** chemical companies
10 of the top **15** mining and minerals companies
25 of the top **50** food and beverage companies

Installed base strength

Over **100,000** sites
Over **2 million** licenses
Over **20 billion** operating parameters monitored
Over **12,000** terabytes of operating data processed annually

Scale

3,000 people
10 R&D centers
24 project centers

Partner ecosystem

4,000 SI partners
160 technology partners

Company Overview: Portfolio Areas and Offerings

	Portfolio areas	Offerings	Primary industries served
How do I **design and commission** my assets at the lowest possible cost?	Process Engineering	• Process Design & Simulation • Training Simulators	Oil & Gas Power Generation Metals & Minerals
How can I **plan production** to maximize profit?	Operations Planning & Scheduling	• Trading, Feedstock Management • Planning & Scheduling	Refining Mining
How can I **produce safely and profitably** and meet **regulatory norms**?	Operations Management	• Manufacturing Execution • Real-time Optimization	Oil & Gas, Power Metals & Minerals F&B, CPG, Water
How do I ensure availability and **reliability of assets**?	Asset Management	• Asset Performance Management • Mobile Workforce Management	Oil & Gas, Power Metals & Minerals F&B, CPG, Water
How can I **enable better decision making**?	Information Management	• Enterprise Historian • Intelligence & Analytics	All manufacturing and infrastructure
How can I **monitor and control operations** better?	Operations Control	• HMI • Supervisory Control	All manufacturing and infrastructure

Industry-specific applications

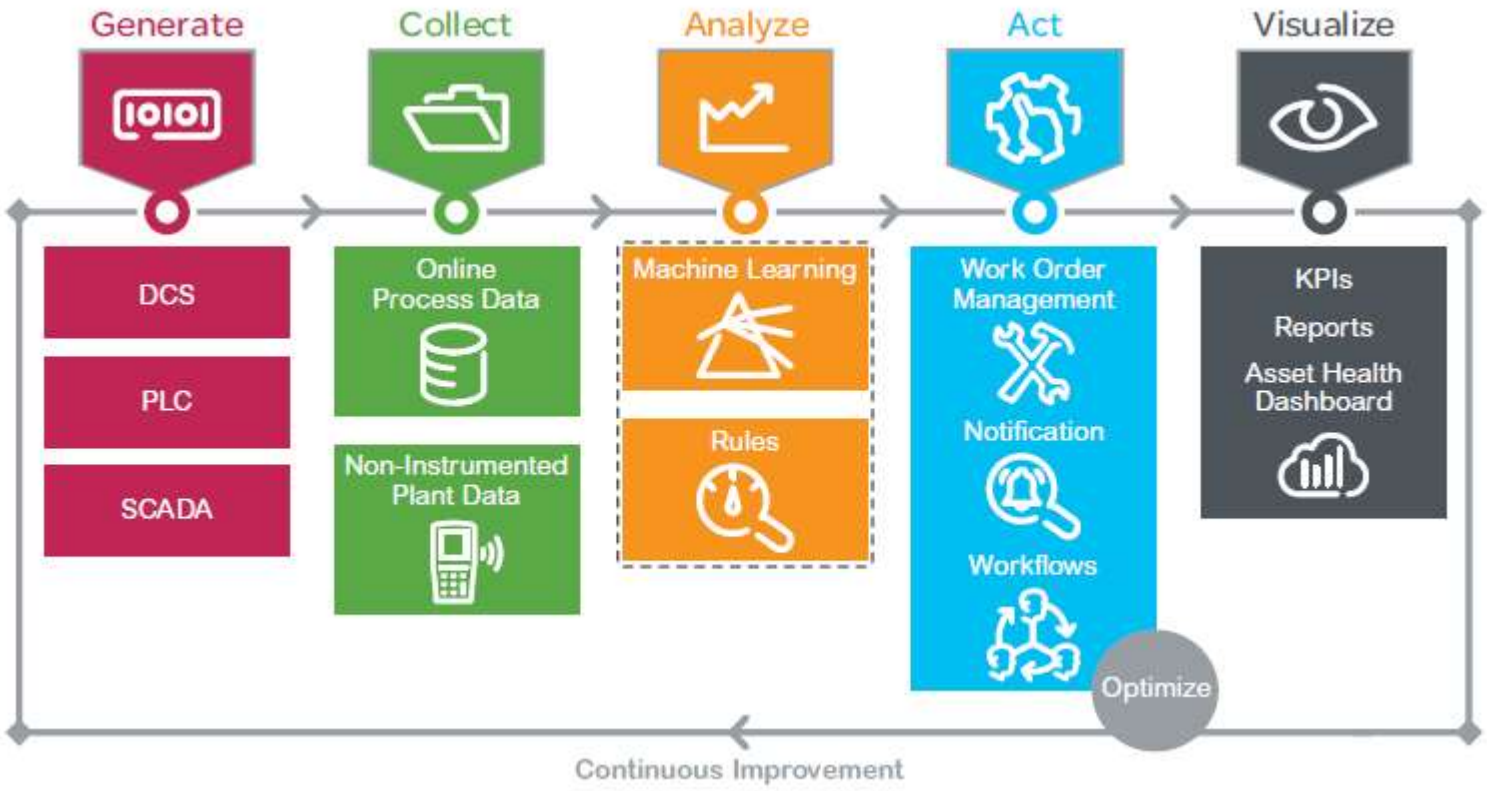
Platforms

Asset Performance Management

Scope: Includes ability of system to capture data and take action in form of Analytics and Visualization

Outcome: Ensures increased economic asset value, availability and reliable operations of assets

APM Overview : Functional View



APM Overview : Data Management and Predictive Analytics Solutions

Enterprise Data Historian

- Collect, store, analyze, display and report on industrial sensor and asset health related data
- Centralized data management
- Integration with existing control and monitoring system and devices
- Lossless data compression
- Advanced client tools (View, Trend, Report Manager & Excel Add-in)
- Web-based application

Predictive Asset Analytics Software

- Online asset health and performance monitoring
- Data-driven models using actual operating conditions
- Advanced Pattern Recognition technology
- Early warning detection of equipment problems
- Advanced analysis capabilities including fault diagnostics
- Reduce failures, increase reliability and improve performance

APM Software: Wonderware® eDNA: Client and Web Applications

- eDNA View
- eDNA Trend
- eDNA Excel Add-in
- eDNA Report Manager
- eDNA Manual Data Logger
- eDNA Web
- Class Hierarchy Database (CHaD)
- eDNA Event Manager
- eDNA Business Connector (EBC)

APM Software: Wonderware® eDNA: Workflow

Collect: Connect with hundreds of control, monitoring, smart devices and other business systems using a variety of standard interfaces.

Store: Compress, store and organize collected information securely in an online, enterprise database.

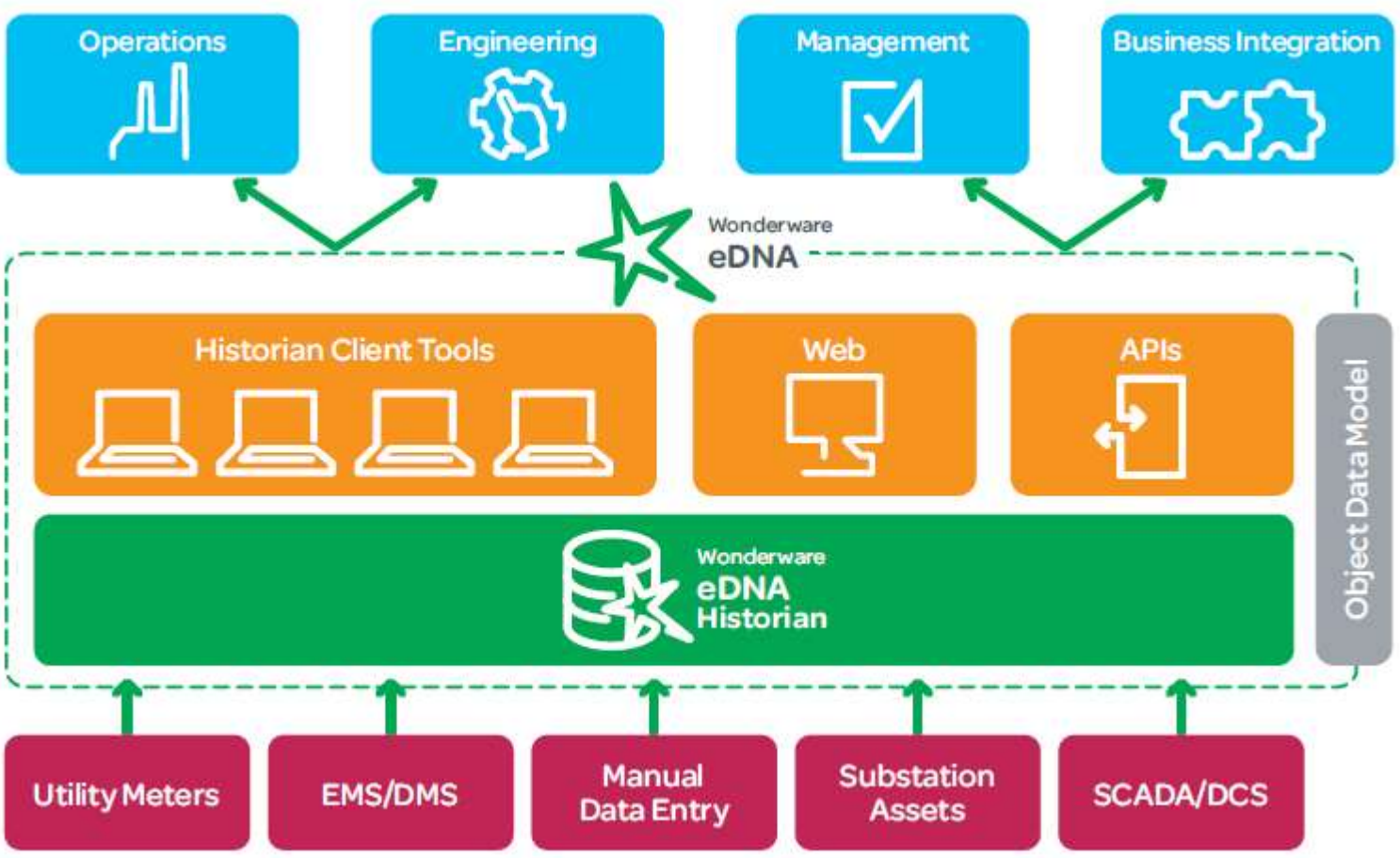
Display: Present real-time and historical data through advanced client tools.

Analyze: Create user defined calculations and expressions with a predefined library of functions. Integrated clients interpret the data, document results and diagnose events.

Report: Access raw and aggregated information in a specified format or through ad-hoc queries.

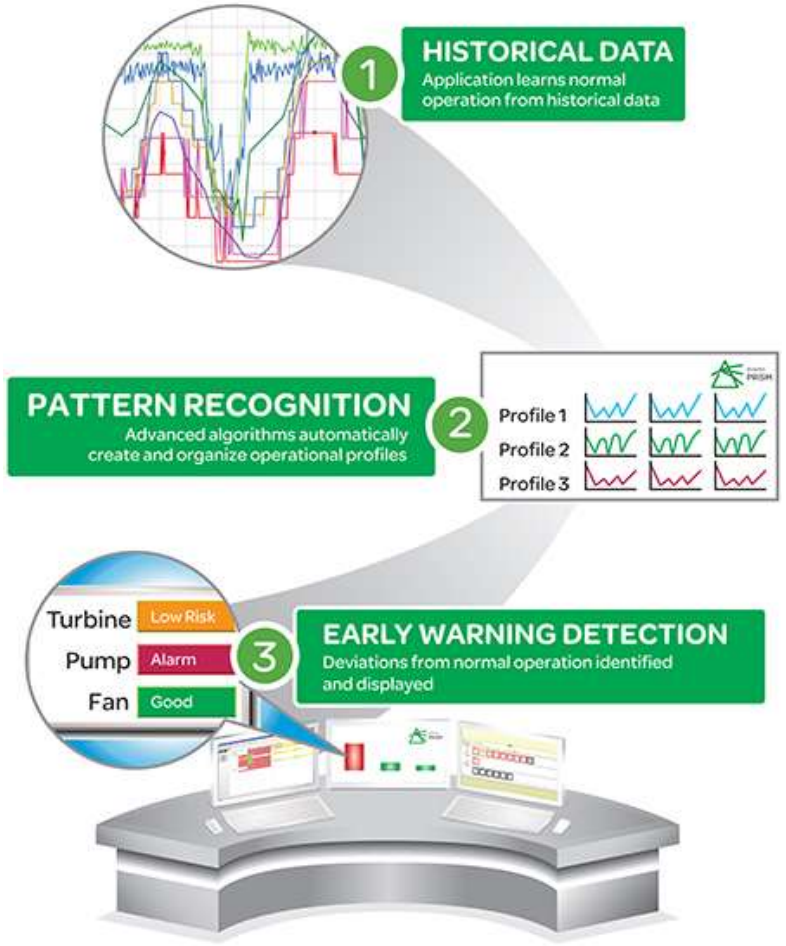
Alert and Notify: Send an email or text message to a computer or mobile device with alarm information. Example: "Unit 1 generator is experiencing high bearing temperature. Inform operator."

APM Software: Wonderware® eDNA: Architecture

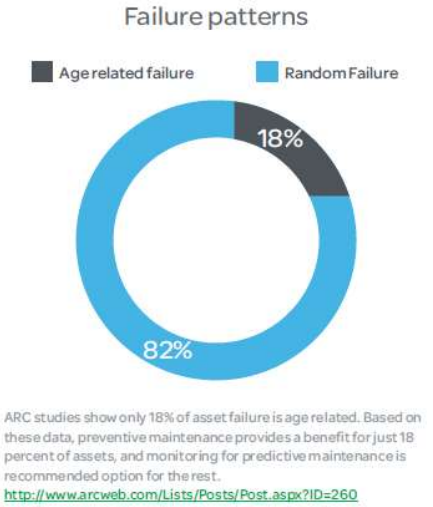


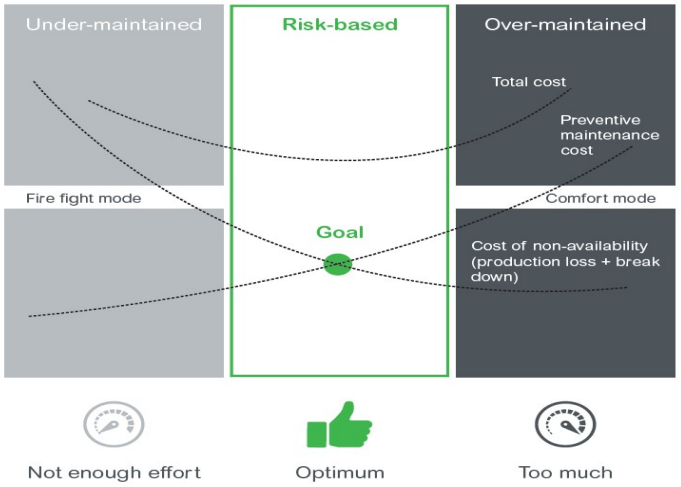
APM Software: Avantis PRiSM (**PR**ocess **i**nformation **S**ignal **M**onitor)

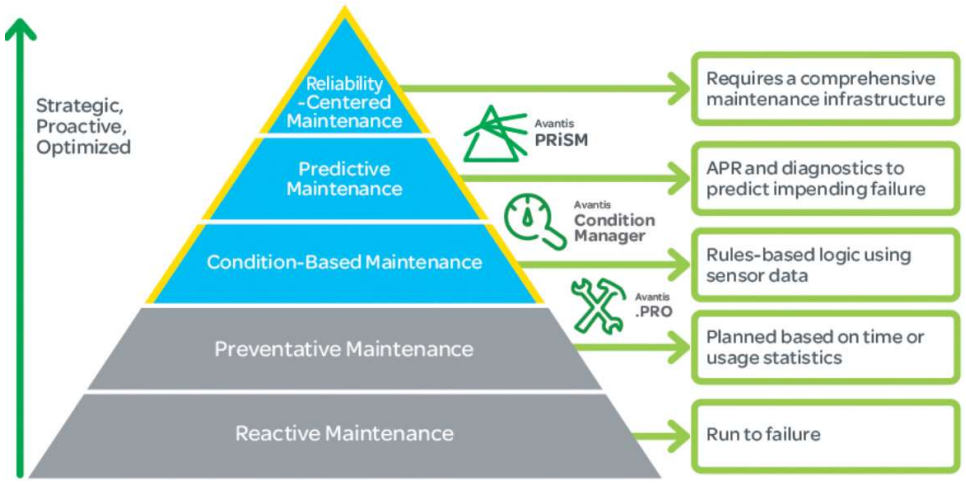
- Predictive Asset Analytics Software
- Software based modeling of equipment using advanced pattern recognition
- Uses historical data to describe how a piece of equipment normally operates and build a model
- Continuously monitors behavior in real-time
- Alerts when the operation differs from the historical norm
- Early warning detection of equipment problems
- Advanced analysis capabilities including problem identification and root cause analysis

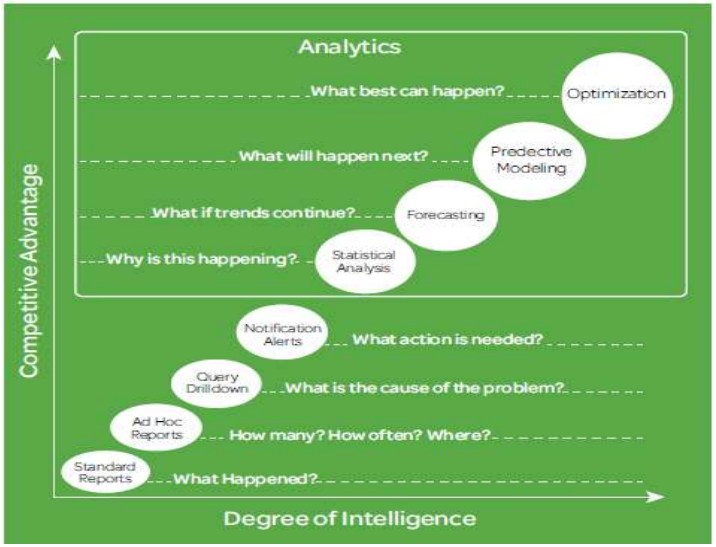


APM Software: Avantis PRiSM Methodology and Benefits









APM Software: Avantis PRiSM Software Offerings

- Server
- Desktop Client
- Web Access
- Alerts and Notifications
- Data Analysis
- Transient Module
- Calculation Engine
- Security
- Monitoring and Diagnostic Services

Case Studies: Tata Power

Tata Power improves operational efficiencies and moves to proactive maintenance

A leading integrated power company in India, with an over **10,000 MW** generating capacity, driving technology-led improvements at its new 4000 MW Supercritical Ultra Mega Power Plant.

Challenges

- Enable quick and trouble-free commissioning of the control system for plant startup
- Move from reactive to proactive maintenance in the operating unit
- Quickly analyze large amounts of asset data for accurate equipment condition assessments
- Provide the right information to the right people at the right time

Solution

SimSci Operator Training Simulator integrated with the **Foxboro DCS** enabled rapid commissioning and startup. The **Avantis PRiSM** predictive analytics coupled with value-added services for model building and training enabled Tata Power to address their key operational challenges.

Source: TechValidate

50%
reduction
in commissioning time

Early warning and detection, months before failure

$ 0.25M
savings per 'catch'

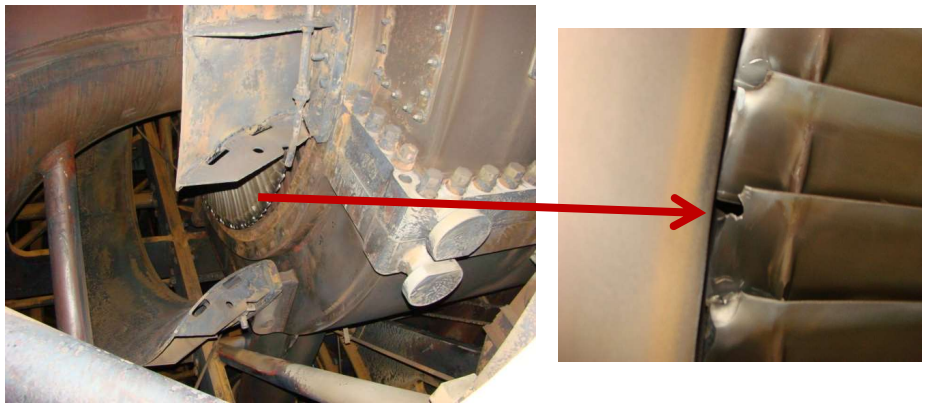
Closing the loop to help Tata Power:

- Safely eliminate the need for field programming and all the accompanying errors
- Cut system commissioning time in half
- Reduce training time from months to weeks, saving an average of four weeks
- Implement native diagnostics and monitoring capabilities for two generating units of their ultra mega power project
- Predictive failure notifications and closed-loop maintenance actions on critical power equipment

Case Studies: Observations – Turbine Vibration

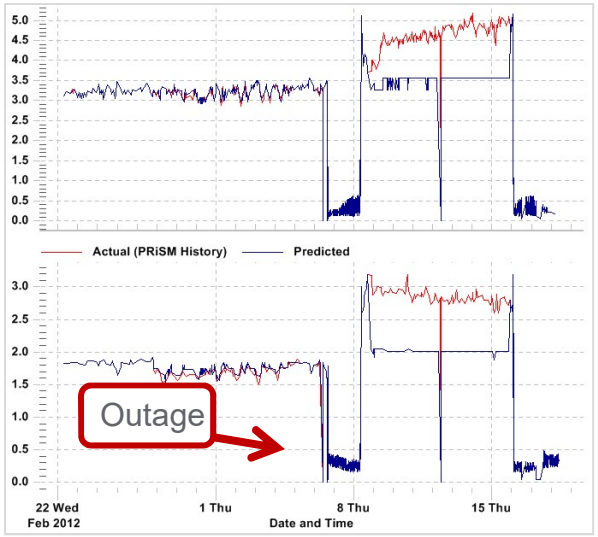
Observation:

- Unit started after an outage
- Vibration step change on a LP turbine
- Notified Engineering & Plant
- Vibration data was collected & unit was retired for inspection
- Bolts on lower half of flow sleeve broke & flow sleeve contacted L-0 blades

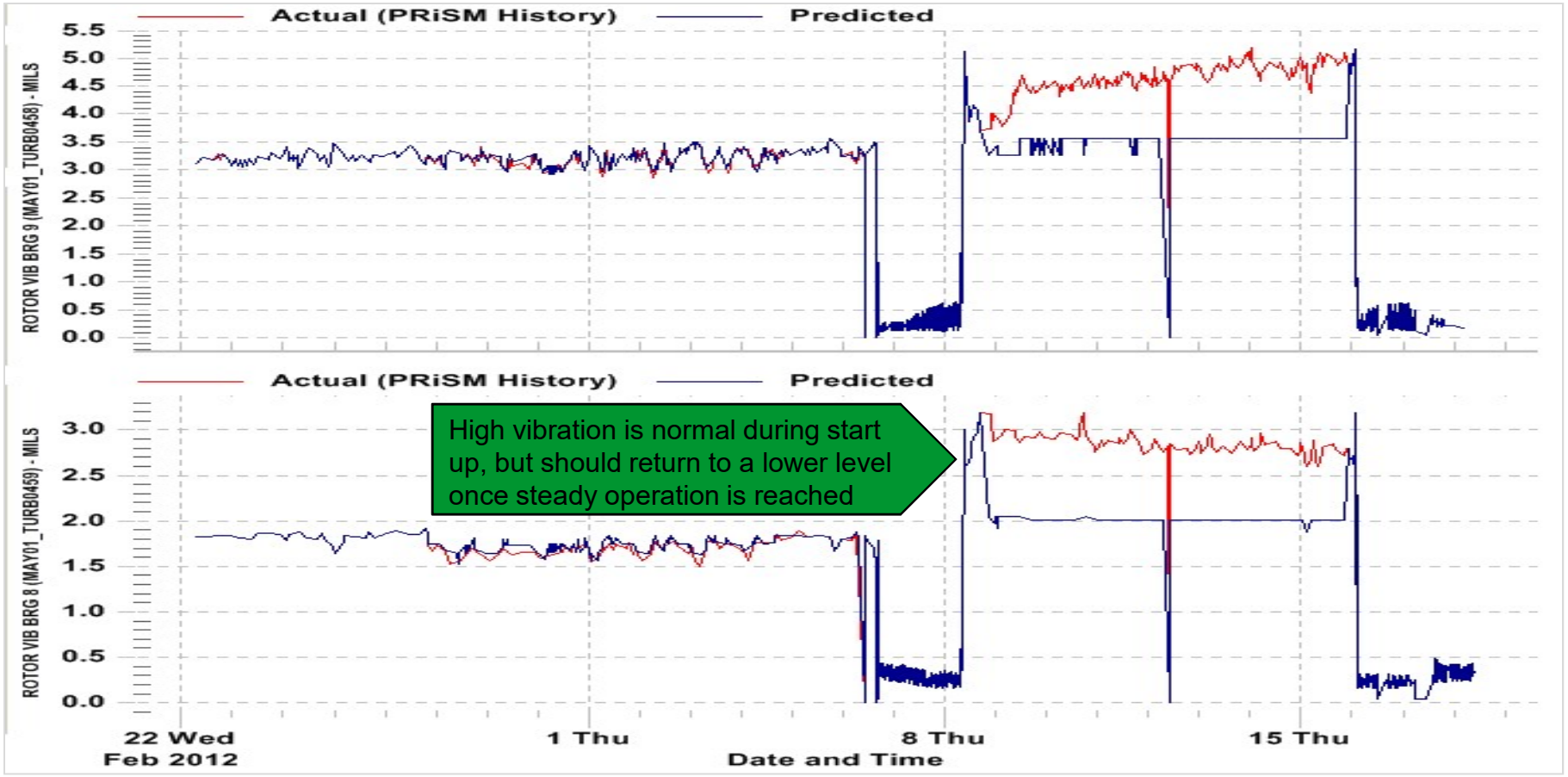


Result:

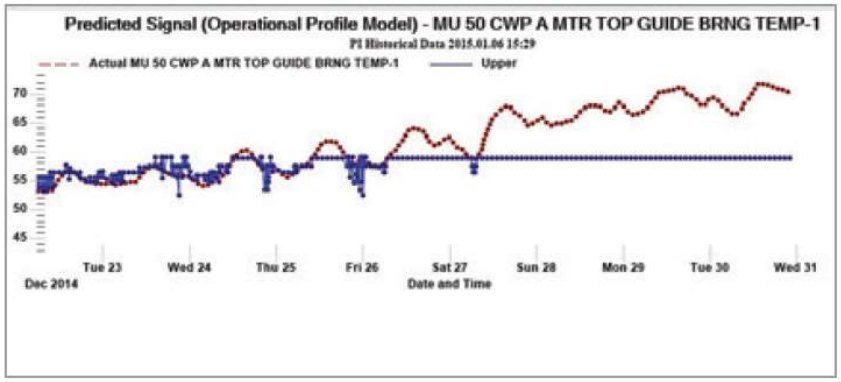
- Upper half of flow sleeve was no longer supported by lower half
- Avoided damaging multiple stages of blades, packing and diaphragms
- **Est. Cost Avoided: $4.1 million**

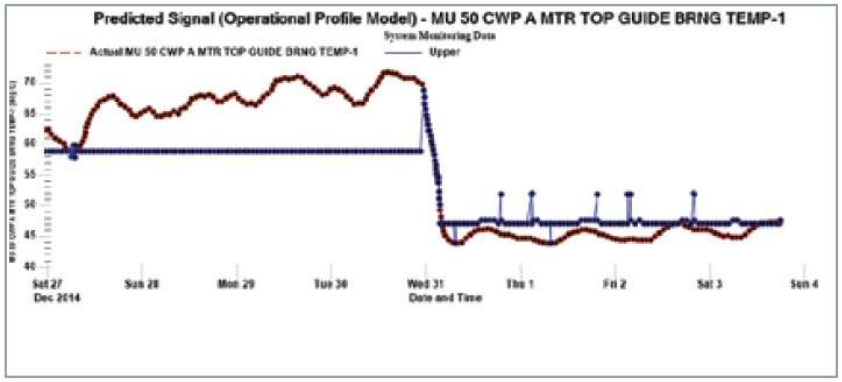


Case Studies: Observations – Turbine Vibration (Contd.)

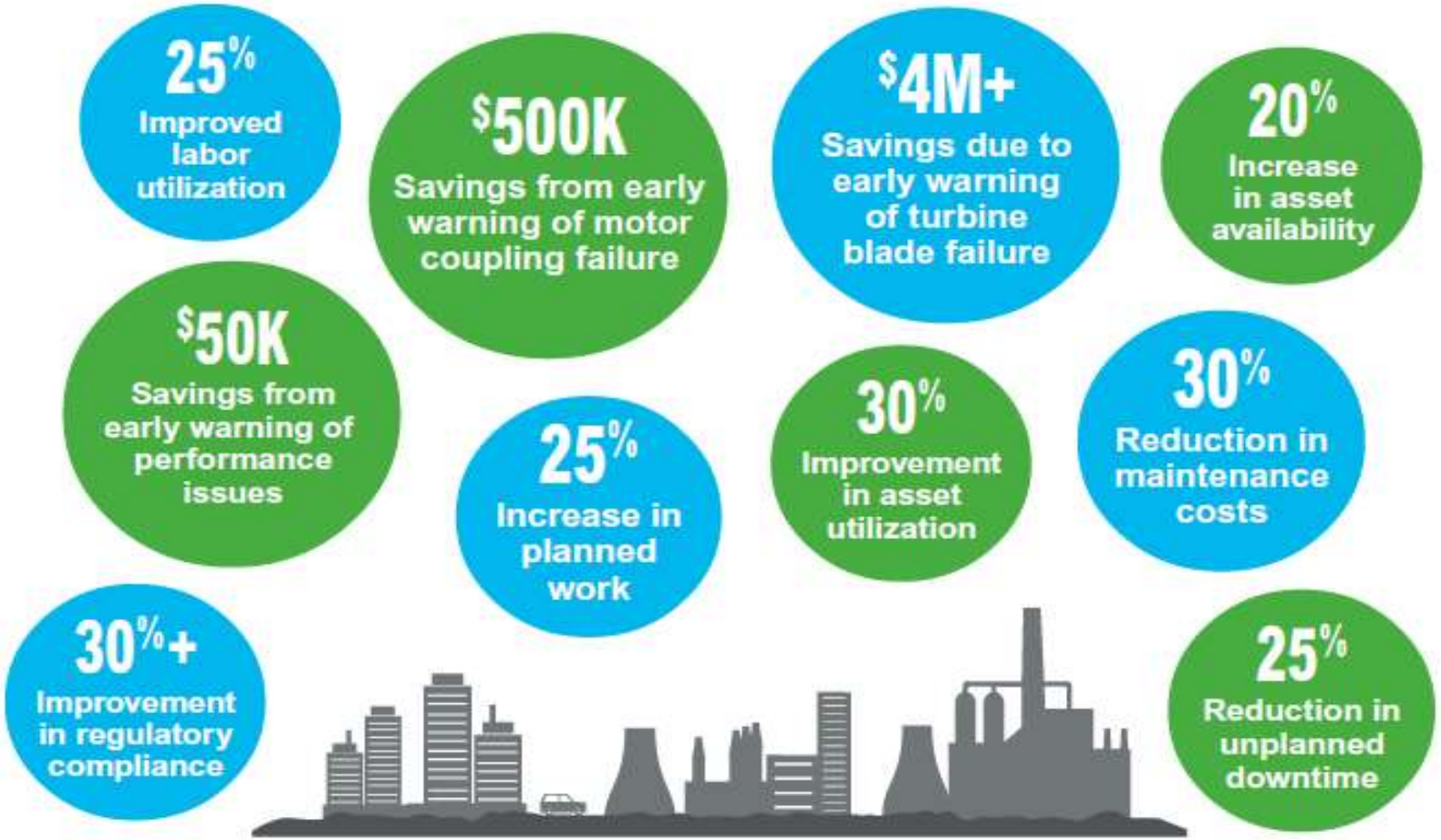


Case Studies: Observations: Cooling Water Pump Bearings: Vibration Trends





APM: Benefits of Asset Performance Management Tools



Thank You

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