CUSTOMER CASE STUDY

# Tata Power uses AVEVA™ Predictive Analytics software

**Company Name - Tata Power**
**Industry - Power**

## Goals

- Avoid asset failures and reduce equipment downtime
- Identify subtle changes in system and equipment behavior
- Gain advanced warning of emerging equipment issues
- Monitor the health and performance of critical assets fleet-wide in real time
- Improve maintenance planning
- Enable knowledge capture to optimize information sharing between plant personnels

## Story

- Reduce unscheduled maintenance
- Move from reactive to proactive maintenance
- Quickly analyze large amounts of asset data for accurate equipment condition assessments
- Information sharing between groups to get the right information to the right people at the right time
- Complexities in the process and technology of Tata Power fleets

## AVEVA Solution

- AVEVA Predictive Analytics

## Results

- Early warning identification of equipment problems, days weeks or months before failure
- Dynamic insights and deep-dive diagnostics for equipment behavior changes
- Improved equipment reliability and performance
- Better maintenance planning and cost control
- Knowledge capture of equipment failure modes

**Mumbai, Maharashtra, India** – Established in 1915, Tata Power is one of the largest integrated power companies in India with a significant international presence. The company has an installed generation capacity of 8,750 MW in India, with another 9,100 MW under development. Tata Power has a presence in all segments of the power sector including generation (thermal, hydro, solar and wind), transmission, distribution and trading.

In 2014, the utility created a plan to implement a fleet-wide monitoring and diagnostics program to continuously monitor the health and performance of critical power plant assets across all Tata Power plants. Tata Power was seeking a solution that would transform their data into real-time insights to be used for proactive maintenance and more efficient operations. They wanted to achieve early warning of equipment problems to avoid unplanned downtime and forced outages.

After evaluating several options, Tata Power selected AVEVA Predictive Analytics software as the key tool for their remote monitoring and diagnostics center. Tata Power has completed the first phase of a three phase deployment of AVEVA Predictive Analytics for two units of their Supercritical Ultra Mega Power Project (CGPL – MUMPP). Phase 1 utilized Schneider Electric's Maintenance Diagnostics and Services Center (MDSC) for model building, tuning and training. Phase 2 currently in progress, envisages to cover another three units at Mundra and two units at Trombay, while Phase 3 covering the rest of the Tata Power units is scheduled for early 2016. Phases 2 and 3 are being deployed by Tata Power resources.

## Solution

Tata Power uses AVEVA Predictive Analytics to continuously monitor the health and performance of critical assets while providing early warning notification of equipment that is performing poorly or is likely to fail. AVEVA Predictive Analytics is based on an algorithm called OPTiCS, which uses Advanced Pattern Recognition (APR) and machine learning technology to learns an asset's unique operating profile during all loading, ambient and operational process conditions.

Existing machinery sensor data is input into the software's advanced modeling process and compared to real-time operating data to determine and alert upon subtle deviations from expected equipment behavior. Once an issue has been identified, AVEVA Predictive Analytics can assist in root cause analysis and provide fault diagnostics to help the user understand the cause and significance of the problem.

Phase 1 of the fleet-wide monitoring project at Tata Power was for two 800 MW power generation plants at the Mundra Power Station. Tata Power identified which assets and components to monitor based on their strategic importance to the business: boilers, steam turbines, CW pumps, coal pulverizes, fans, boiler feed pumps, generators and transformers.

Tata Power worked closely with AVEVA to determine which sensors would best correlate with the chosen asset's operational characteristics and then collaborated together on the model-building process. The models were trained with one year of historical operational data and fine-tuned according to the equipment history. Thresholds were set for early warning and alert notifications based on each asset's individual operational profile.

The utility uses the AVEVA Predictive Analytics Web application to manage alerts, quickly retrain models and analyze and trend model results. AVEVA Predictive Analytics Web organizes alert information in a hierarchical structure allowing users to identify systems that are in an abnormal state and then view the individual components of the alert for further analysis.

Tata Power built a remote monitoring & diagnostics center (they named it ADoRE- Advanced center for Diagnostics & Reliability Enhancement) where they are using AVEVA Predictive Analytics software. The ADoRE team can alert and dispatch plant personnel almost immediately after an emerging problem is identified by AVEVA Predictive Analytics. ADoRE also facilitates increased knowledge sharing between the team and enables collaboration for timely problem solving. Additionally, the team encourages consistent procedures across the fleet for operations and maintenance problem identification and resolution while increasing opportunities for knowledge capture and understanding of equipment failure modes.

"We found AVEVA Predictive Analytics to be an effective tool in the predictive diagnostics space for detecting functional deviations and impending failures at an early stage for initiating suitable prioritized maintenance actions for enhanced reliability of critical power plant equipment."

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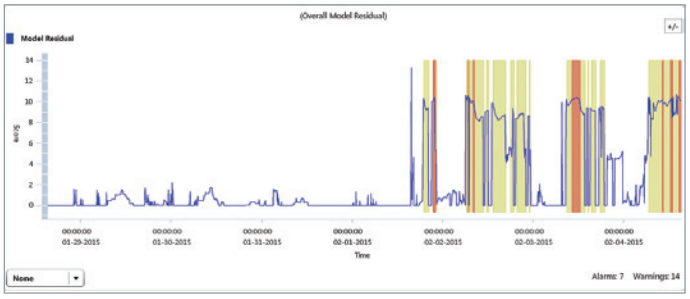
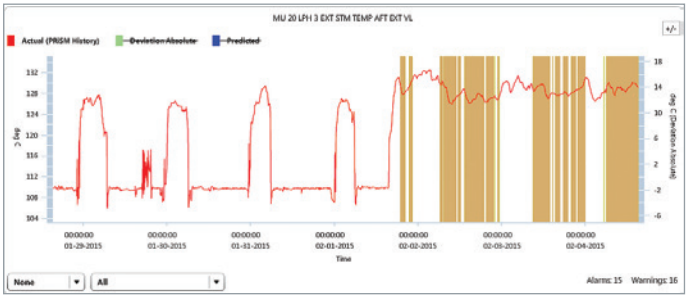
**Praveen Chorghade,**
Chief - Core Technology and Diagnostics,
Tata Power




Overall model residual




Lp heater extraction temperature trend

Coastal Gujarat Power Limited (CGPL), Tata Power's wholly-owned subsidiary, has implemented the 4,000 MW (800 x 5 units) UMPP near the port city of Mundra in the state of Gujarat in India. This UMPP is India's first 800 MW unit thermal power plant using supercritical technology.

## Fault catching

Tata Power has more than 300 models deployed in Phase 1 and they provide regular monitoring and diagnostics for mechanical failures, performance deviations and transients. Because AVEVA Predictive Analytics provides early warning of equipment degradations, one measurement for success is based on the amount and significance of avoided equipment failures and degradations, which they call a "catch." During the Phase 1 deployment a few significant catches were identified, which provided management with confidence in the program and the tool. In one catch, operations and maintenance personnel determined that one of the bypass valves of a low pressure heater was partially open when it should have been completely closed. This was causing condensate flow to bypass through the heater and resulting in a higher extraction temperature, meaning the plant was operating inefficiently.

In another find, top thrust and guide bearing temperatures of circulation water pumps were rising well above expected levels. Each unit is provided with two pumps for handling a full load of 800 MW. Circulation water pump bearings are supplied by the external sealing and cooling arrangement of clarified water. Thrust and guide bearing temperatures are monitored by redundant three RTDs and having trip/alarm values at 195°F/185°F respectively on 2 out of 3 protection. AVEVA Predictive Analytics trends showed the rise to be 50-65°F above predicted values. During a low demand period, the pump was taken for a brief outage to inspect and clear the suspected clogging in the bearing cooling water line. After clearing the block, the bearing temperature normalized and generation potential was normalized.

Identifying and investigating these issues before they caused serious equipment damage resulted in substantial savings, as well as performance and reliability improvements. Estimated cost savings on this catch are $270,000 USD.

## Summary of benefits using AVEVA Predictive Analytics software

After validating the usefulness of AVEVA Predictive Analytics software in Phase 1, Tata Power is continuing with fleet-wide implementation. The utility has already experienced a number of initial operational and maintenance improvements and has been able to manage risk, mitigate damage and identify and correct asset performance problems continuously and in real time.

ADoRE phase 1 is being monitored regularly and Phase 2 is under implementation. Tata Power expects the fleet-wide monitoring approach with AVEVA Predictive Analyticswill lead to improved maintenance planning. The predictive analytics software has enabled personnel to spend less time manually collecting and analyzing data, allowing engineers and specialists to perform higher value tasks and creating more time to be proactive.

AVEVA Predictive Analytics has been configured so that alerts and relevant reports are sent to the right people at the right time, enabling information sharing between various stakeholders before a decision is made.

AVEVA Predictive Analytics has also equipped Tata Power with knowledge capture capabilities, which can be a challenge for utilities faced with transitional workforces. This helps in timely detection of operations and maintenance problems and standardization of detection and resolution procedures.

To learn more about the AVEVA suite of solutions, including AVEVA Predictive Analytics, please visit: **aveva.com**