Predictive analysis and real-time data is the key to safeguard the health of a power plant

By Praveen Chorghade

A key component in a power supply company is the practice of having a consistent monitoring system in place, essential from the point of view of maintaining its power stations and plants. The key advantage is to minimise operational risks, schedule interruptions and have an increased level of maintenance practices.

Now, more than ever before, technological advancements have made it possible for power companies to set a reliable monitoring system. Coupled with data collection and predictive analytics process, organisations can gather intelligence that is vital for supervising daily operations, maintaining equipment, and efficiently managing emergencies or discrepancies, if any. In the power sector this has been instrumental in avoiding forced power outages across the country.

A global phenomenon

Fleet-wide monitoring involving the predictive analytic software has already been implemented in various utilities in USA. Various utilities in the US and Europe are carrying out such diagnostics at tier-2 Remote Diagnostics/Monitoring Centres. Such centres are located within the geographic supply territories or even outside to the extent even in other countries. One such centre monitoring over 50-60 thermal power plants in the US is created in Pune as well. Even Tata Power Noida has set up ADvanced-center for Diagnostics and Reliability Enhancement (ADoRE) for the fleet, a 24x7 centre that has an extended reach and observability on the company's thermal units at Mundra, Trombay and Maithon. An asset health monitoring system often comprises fixed alarm limits defined within control systems, smart devices, SCADA, or historians. Additionally, fixed end-of-life and equipment run-time calculation are used to determine an asset's health.

The concept has gained a lot of significance due to potential benefits of warning of impending failures, economics of centralised monitoring as compared to individual locations, comparative monitoring of similar units and equipment across the fleet, knowledge capture and collaborative exchange for enhanced plant reliability and predictive maintenance actions. The global implementation inference drawn from such diagnostics centre is towards achieving proactive analytics at the back /remote end and making an expert pooled knowledge available for actions through SMEs to operations/maintenance personnel on-site.

Power of predictive analysis

With the help of predictive analytic software plant, engineers are equipped to take predictive, proactive, risk-informed, and timely decisions. The solution delivers dynamic insight and deep-dive diagnostics for behaviour change of the equipment. In several cases across the energy sector, the solution has successfully identified various plant anomalies at an incipient stage and helped plant engineers take timely mitigating actions, thus evading a catastrophic failure or loss of production. This has resulted in significant savings and availability improvements, while increasing equipment health visibility and optimising logistics of maintenance. Using state-of the art analytics, algorithms, pattern-recognition, and decision making tools, together with performance assessment tools, gap analysis and cause-effect scenarios help in diagnostics and reliability enhancement.

Continuous monitoring of health and performance of critical power plant equipment helps to:

- Minimise operational risks of unacceptable schedule interruptions or increased maintenance
- Early identification and advance warnings of incipient failure modes and impending equipment problems to avoid forced outages and catastrophic failure.
- Identify subtle changes in system and

equipment behaviour based on real-time data, present trends, and historical data

- Provide expert advice to generating stations on equipment performance and operating regime changes towards optimal asset lifecycle management.

Enhancing plant reliability

Armed with data generated from tech-enabled monitoring systems, plant engineers and subject matter experts carry out an in-depth analysis to classify potential findings. These personnel then validate the findings, seek and analyse relevant operational data, maintenance data (SAP-PM Historian), equipment history/Tests data (like vibration, motor current signature, previous test results, off-line diagnostic test etc.) before notifying corrective and preventive maintenance actions to respective units or station.

Data also helps to analyse potential savings that have accrued due to early warning and proactive maintenance actions. This is done by working out a pragmatic scenario building criteria, examined through hypothetical questions such as what would have happened if the monitoring system was either not identified or acted upon in various stages of severity? What would have been the costs incurred and the probability of each of the scenarios? These are then tabulated in order to reduce probabilities to rationally estimate the weighted sum of costs that has been potentially saved.

Advance notifications from a diagnostic centre can prevent possible trouble and trip-outs for plant and equipment much before the actual alarm is generated in the site control room. Even a single plant trip thus averted, manifests itself in a huge potential cost-saving for the power company. Furthermore, the reduced forced outages show favourable plant operational KPIs, thus enhancing its reliability by providing enough time to plan maintenance tasks that can avert impending failures.

Going forward, recognising the multidimensional benefits of a healthy monitoring system, power companies must adopt the practice to enable better functioning and cost effectiveness of its plants and stations.

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