WHITEPAPER

A powerful match: AVEVA™ Predictive Analytics and AVEVA™ PI System™ maximize power plant ROI

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Executive summary:

Power companies face numerous market and plant-level challenges. Overcoming these challenges requires plant personnel to optimize processes and assets, maximize production, and reduce unplanned downtime. These companies are looking for new ways to predict outcomes, increase safety, and perform maintenance at exactly the right time.

When deployed in tandem, the AVEVA™ PI System™ and AVEVA Predictive Analytics create a powerful combination. Forward-looking power producers are increasingly adopting both solutions at once, and companies with an existing AVEVA PI System are adding AVEVA Predictive Analytics to gain faster, better, and deeper insights into assets and processes. Not only can AVEVA Predictive Analytics detect performance anomalies and predict asset failure, its insights and prescriptive recommendations enable operations teams to analyze cost versus risk and devise plans that maximize efficiency and profitability.

Introduction

Amid renewed calls for sustainability, governments have recently enacted more stringent legislation limiting greenhouse gases (GHGs) emissions. This evolving legislation gives power producers ever-stricter mandates when it comes to curbing carbon output. The widespread adoption of renewable generation like solar, wind, and other distributed energy resources (DERs) has decentralized the grid and made it that much more difficult for power companies to balance generation and demand.

By 2023, power generation companies will spend an estimated $50 billion on asset management and grid monitoring technologies. To respond to these evolving fluctuations and challenges in the energy marketplace, power producers must find new ways to increase efficiency and optimize their operations.

For years, power companies have relied on operational data management platforms like AVEVA PI System to ensure efficiency and agility. The onset of new challenges, however, has created the need for new digital solutions. More than ever before, operational efficiency has become paramount.

Given increasingly volatile energy markets, power producers have added more advanced tools, powered by artificial intelligence and machine learning. To improve their operations and gain a competitive edge in the quickly evolving energy marketplace, then, forward-looking companies have added predictive maintenance capabilities to their operational data platforms, like AVEVA Predictive Analytics, which complements AVEVA PI System.

In the journey toward more efficient operations, predictive analytics are essential to any agile business strategy. With integrated predictive analytics capabilities, critical assets do not experience extended periods of downtime resulting from condition- or calendar-based maintenance or, worse yet, unexpected failures. Because companies perform asset maintenance only when it's absolutely essential, operational efficiency can improve drastically; machines are operational longer and engineers only service them when absolutely necessary, thereby saving valuable time and hours-worked, which translate to saving unnecessary costs – a digital solution that quickly pays for itself.

Sparking change: Moving from reactive to proactive maintenance

AVEVA Predictive Analytics allows power generation companies to capitalize on the wealth of data their AVEVA PI Systems hold to maximize return on investment (ROI). By combining contextualized AVEVA PI System information with predictive analytics, maintenance and engineering teams can be more proactive and work together to evaluate assets prior to failure and perform maintenance at exactly the right time. From there, they can use predictive tools to optimize maintenance schedules and ensure the best teams and resources are available to minimize downtime and disruptions.

Take, for example, the case of a 110 MW steam turbine that demonstrated sporadic and isolated bearing vibration issues over the course of a year, followed by an escalating condition that ultimately resulted in the unit's shutdown. Once the maintenance was completed, a similar cycle of sporadic issues began again. When engineering and maintenance personnel started using AVEVA Predictive Analytics along with historical data, they uncovered a chronic issue with the turbine thermal expansion that was causing the bearing vibration failures. Had AVEVA Predictive Analytics been in place prior to asset failure, remedial maintenance could have corrected the thermal expansion problem before it led to bearing vibration issues and the shutdown of the unit.

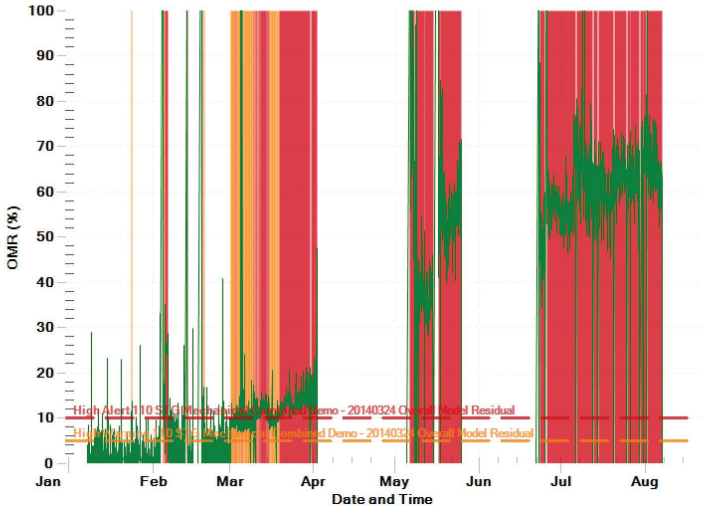


Figure 1: Predictive Analytics software provides clear indication of a turbine problem prior to failure

The result would have been significant savings in maintenance costs, as well as additional generation sales due to increased unit availability. Estimated savings in this case are in the millions of dollars – a result of 35 days fewer days of downtime as well as the associated repair costs.

Predictive analytics uses deep learning tools to forecast the remaining useful life of assets, giving teams critical information and prescriptive insights to analyze cost versus risk and devise plans that maximize efficiency and profitability. Users can define meaningful indicators based on operating data to determine in real time how these indicators will influence asset performance. Even if changes are subtle, as in the case of the steam turbine, the software will predict performance degradation and component failures. Teams gain visibility into each asset, from critical to least vital, and can use this information to manage plans based on urgency, criticality, necessary action, and spare part availability.

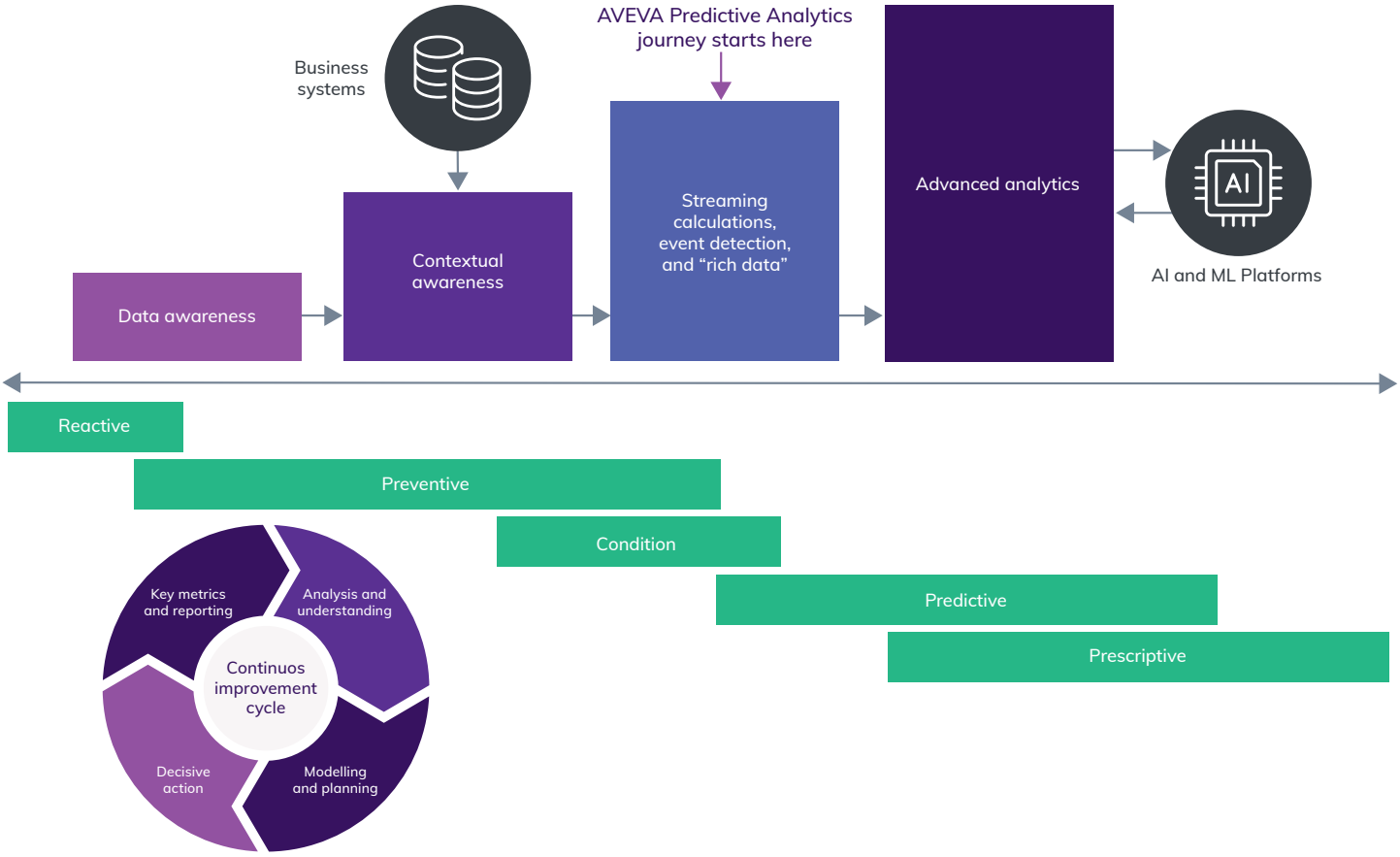
In addition to preventing asset failure, predictive, AI-driven process and asset insights enable companies to optimize energy usage, compare asset performance, and diagnose anomalies. Not only do these predictive insights help power plants stay in regulatory compliance, they allow organizations to meet contractual obligations by enabling better asset and process outcomes.

AVEVA Predictive Analytics is simple and easy to deploy on top of AVEVA PI System. IT experts perform setup, users define the variables, and the model automatically finds relationships in the data. After training, operations personnel have access to a self-service, no-code tool that doesn't require data scientist expertise. Not only does this ensure rapid ROI, user-defined variables and standard operating procedures enable knowledge capture should experienced personnel leave.

Predictive analytics unlock unlimited potential for power companies. With access to real-time predictive insights in a user-friendly interface, operations teams can easily understand how inefficiencies affect financial performance, gauge future consequences, assess risk, avoid disruption, and even increase customer satisfaction. Together, AVEVA Predictive Analytics and AVEVA PI System enable power companies to operate reliably and efficiently.

AVEVA PI System curve: Is your organization ready for predictive analytics?

AVEVA PI System is an incredibly flexible data management platform. From historian to contextualized, single source of truth, every plant is on its own AVEVA PI System journey. Depending on how you're using AVEVA PI System, your company may be ready to reap the benefits of AVEVA Predictive Analytics.



Real-time data and AVEVA PI System facilitate the transition from reactive modes to preventative and condition-based maintenance (CBM). Contextualization ultimately supports CBM, enabling visualization, event detection and notifications, and streaming analytics to trigger events and measure performance. For example, AVEVA PI System can send run-time information to a computerized maintenance management system (CMMS) for its preventive maintenance (PM) module to consume.

Once power companies have enabled these capabilities in AVEVA PI System, the foundation is there to deploy AVEVA Predictive Analytics. Real-time data and event frames from AVEVA PI System can be integrated into advanced tools and results from predictive models can often be returned to AVEVA PI System for use and visualization. From there, power companies can embark on a continuous improvement cycle of using predictive analytics in conjunction with AVEVA PI System capabilities to predict maintenance and optimize their processes.

Case study

Duke Energy moves to preventative maintenance

In 2010 Duke Energy, a power generation company with 90 plants in seven states, suffered a catastrophic transformer fire that caused $60 million in losses. The company found that it lacked the data to have prevented it. Duke Energy had used AVEVA Predictive Analytics for some limited applications since 2007. However, the company recognized that it needed a deeper integration and broader implementation of the technology to preempt future problems and optimize its operations across its diverse plants.

Since the fire, Duke Energy has transitioned from manual to digital data collection as well as from reactive to preventative maintenance procedures. In 2012, it expanded its use of sensor data, installing over 33,000 sensors, and incorporated AVEVA Predictive Analytics more broadly to integrate 500,000 data points.

Now, Duke Energy draws on over 14,000 models through AVEVA Predictive Analytics. Its system offers early warning to its analysts and enables its engineers to carry out predictive maintenance. In 2016, for example, Duke Energy's analysts, using AVEVA Predictive Analytics, identified a steam turbine blade issue that saved the company $34 million.

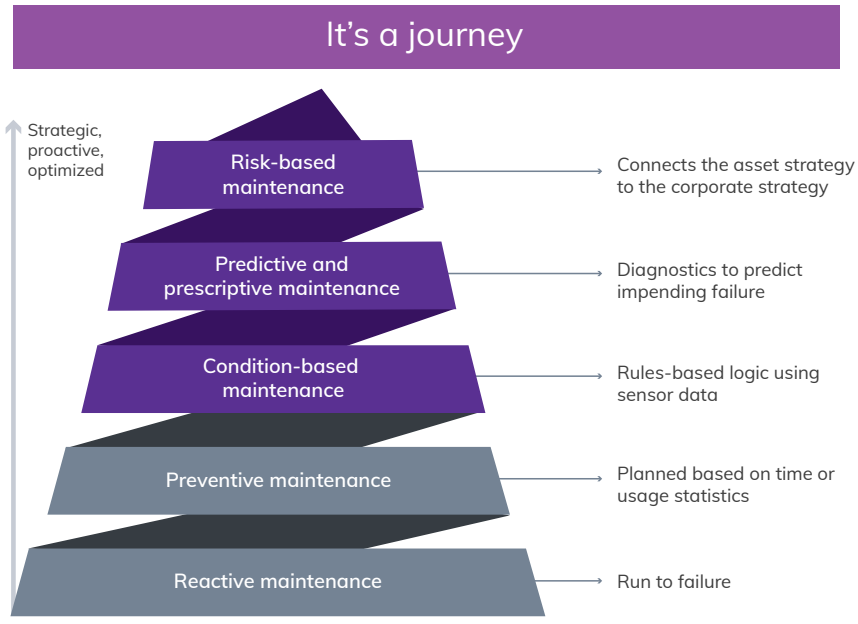
By having personnel on hand to read the models that AVEVA Predictive Analytics produced, Duke Energy resolved the problem before it incurred damage to the unit. AVEVA Predictive Analytics has enabled Duke Energy to have a holistic grasp of its operations and move from a reactive to preventative maintenance.

Large Canadian generating company drives green power production with AVEVA

One of the largest clean power producers in the Province of Ontario has installed AVEVA PI System and AVEVA Predictive Analytics across its renewable and nuclear fleet, thereby enabling AI-infused condition-based maintenance.

The maintenance journey

Moving to predictive or prescriptive maintenance strategies doesn't happen overnight. The right data foundation must be laid and change management strategies enacted to ensure optimal outcomes.



Conclusion: Less analysis, more action

By combining AVEVA Predictive Analytics with existing AVEVA PI System infrastructure, power generation companies can take advantage of real-time and historical operations data to access deeper, faster, and better insights to achieve business objectives and better implement their overall business strategy. Because engineers, controllers, and other plant personnel are equipped with these insights, users can spend less time looking for potential problems and more time acting to maximize the return on every single asset, thereby improving the bottom line. This enables power companies to find the balance between risk-based and reliability-centered maintenance, improve performance, and avoid potential equipment failure. AVEVA Predictive Analytics and AVEVA PI System enable power companies to move towards operational excellence while delivering a 10%-20% reduction in OPEX.

About the author

Douglas Nunez is the Power Industry Global Marketing Manager at AVEVA. With over 20 years in the Power and Utility area, Douglas has a deep understanding of power market dynamics, including key issues, policies, and trends affecting renewable energy development.

Watch the video to learn more