AVEVA™ Predictive Analytics for PI System

By combining real-time and historical information from your PI Server with Artificial Intelligence (AI) and machine learning-driven predictions found in AVEVA Predictive Analytics, how much more profitably could you be running your business? How many critical asset failures could you be preventing? How much could you improve the safety, reliability, and sustainability of your operations?

The combination of AVEVA Predictive Analytics with your PI System facilitates advanced notice of potential asset failures before they occur, enabling your personnel to proactively assess equipment and schedule maintenance activities at the most economically advantageous time. AVEVA Predictive Analytics helps you streamline asset performance, increase reliability, and reduce downtime to enable asset and operational excellence.
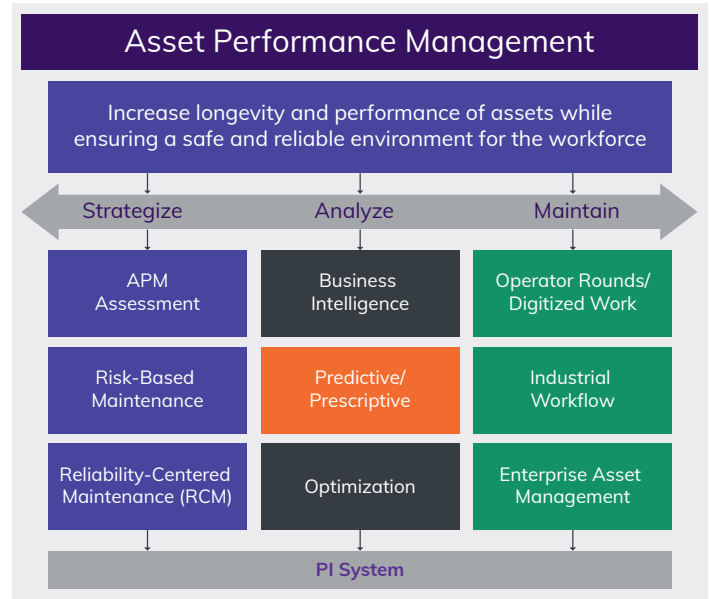
Achieve Asset Excellence

Improving reliability, performance, and safety are among the top priorities of industrial plants and other asset-intensive organizations. Businesses today are focusing their efforts and resources on controlling costs and maximizing value from existing investments. AVEVA Predictive Analytics helps organizations gain the highest return on critical assets by supporting predictive maintenance (PdM) programs with early warning and diagnosis of equipment issues ahead of asset failures and existing operational alarms.

By combining the information stored in your PI Server with AVEVA Predictive Analytics, sensors are communicating ever-increasing amounts of data in real-time, giving you more information than ever before about the health and performance of your equipment. AVEVA Predictive Analytics gives users the ability to quickly transform raw data into actionable insights to prevent equipment failure and make smart decisions that improve operations. Equipment agnostic, the software can be configured to monitor assets regardless of equipment type, vendor, or asset age without the need for OEM-specific asset information.

Sensor data from your rotating equipment, such as turbines and motors, has correlated readings like revolutions per minute (RPM), bearing temperature, vibration, and load readings.

By combining this data stored in your PI Server with AVEVA Predictive Analytics, you can use built-in Artificial Intelligence and machine learning to automatically identify anomalous behavior in the performance of assets months before a failure may occur. All without having to write a single line of software code. This provides you with advanced warning and early notification to proactively inspect the asset and avoid equipment failure that you otherwise might not have identified.

Asset Performance Management functional view

Asset Performance Management

Increase longevity and performance of assets while ensuring a safe and reliable environment for the workforce

| Strategize	Analyze	Maintain
APM Assessment	Business Intelligence	Operator Rounds/ Digitized Work
Risk-Based Maintenance	Predictive/ Prescriptive	Industrial Workflow
Reliability-Centered Maintenance (RCM)	Optimization	Enterprise Asset Management

PI System

AVEVA Predictive Analytics integrates with your existing PI Server, and can be combined with AVEVA's solution for condition-based maintenance to form the industrial analytics toolset for a comprehensive Asset Performance Management program.

AVEVA Predictive Analytics overview

With native integration to your existing PI Server, AVEVA Predictive Analytics allows users to quickly use the data they already have to develop a predictive and prescriptive maintenance practice within their organization – without the need for a data scientist and software development.

The success of any predictive analytics solution depends not only on the algorithmic approach, but also on its ability to be operationalized within your business at scale. It's the no-code, purpose-built solution approach that enables companies to deploy and sustain a predictive monitoring program across the enterprise. AVEVA Predictive Analytics learns an asset's unique operating profile during all loading, ambient, and operational process conditions.
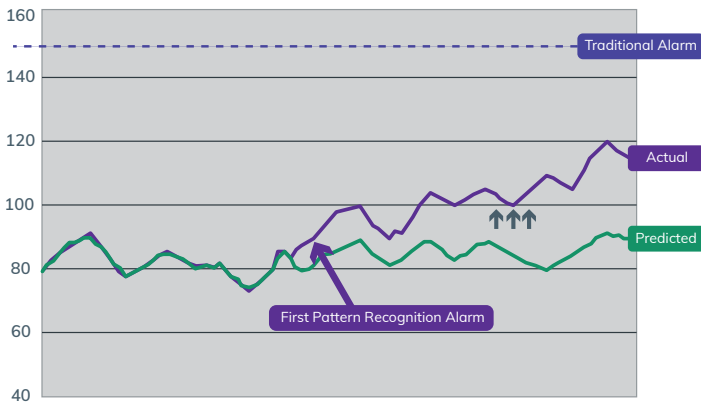
AVEVA Predictive Analytics learns an asset's unique operating profile to clearly identify minor changes in its operation before fixed operational alerts are triggered

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, the software can assist in root cause analysis and fault diagnostics, providing prescriptive actions to remedy the problem as quickly as possible.

AVEVA Predictive Analytics uses patented OPTiCS technology based on AI and machine learning to provide early warning identification and diagnosis of equipment reliability and performance problems. For assets and systems that lack full history for a training data set, a KANN artificial neural network technology helps infer behavior so that the solution can still be applied across a wide spectrum of assets and use cases.

AVEVA Predictive Analytics is part of a comprehensive portfolio of Asset Performance Management solutions that allow you to operationalize improved processes and maintenance strategies.

As your personnel have the opportunity to inspect equipment before failure, they may spot other correlations, like a harsh environment, that are leading to faster equipment degradation.

The combination of early warning detection and fault diagnostics with prescriptive guidance results in optimized maintenance planning and execution, and more profitable operations.

AVEVA Predictive Analytics helps asset-intensive organizations reduce equipment downtime, increase reliability, and improve performance while reducing operations and maintenance expenditures.
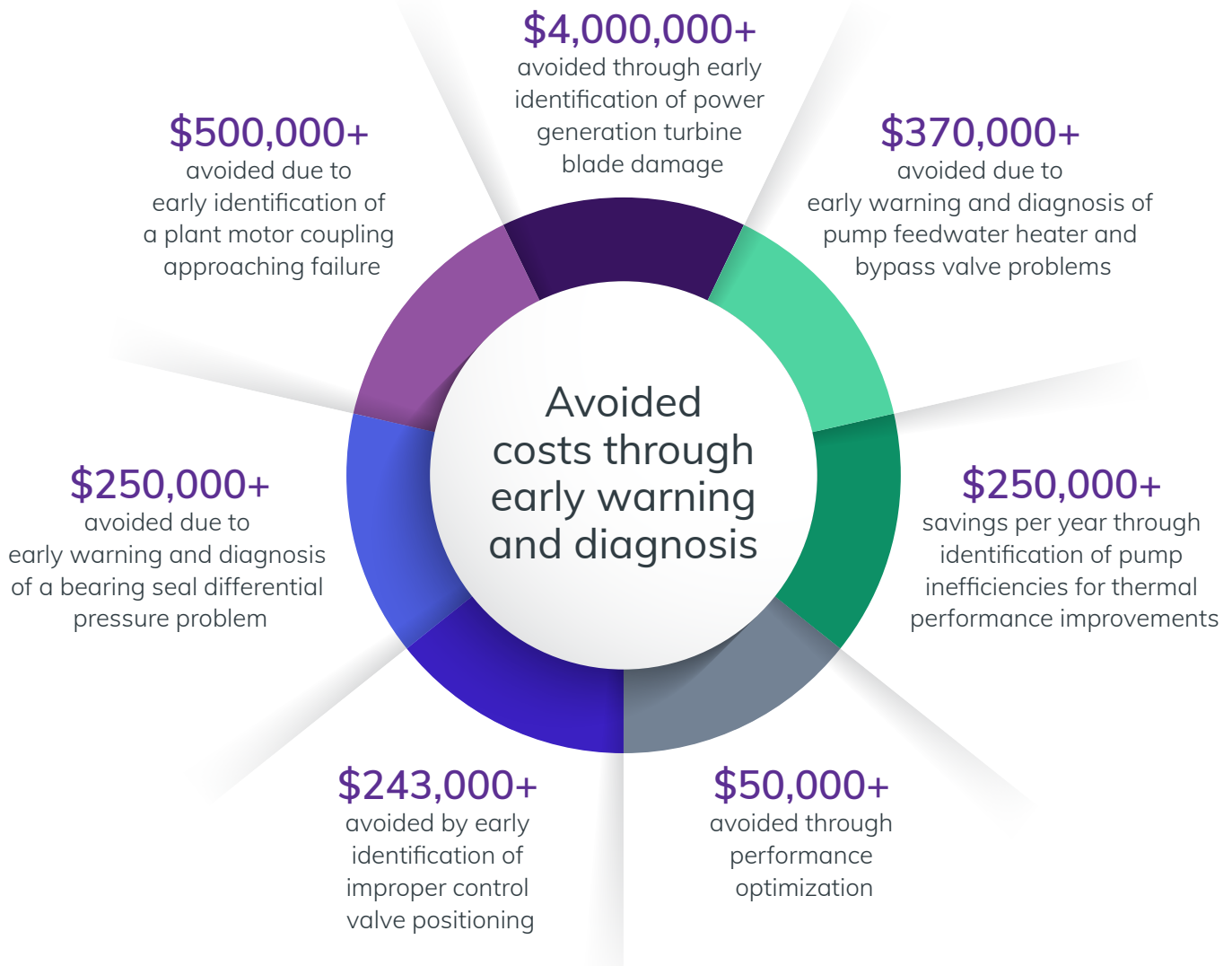
With predictive analytics, personnel know and understand the actual and expected performance for an asset's current operational state. They know where inefficiencies are and their impact on financial performance, and can use this information to understand the impact of performance deficiencies on current and future operations. This information also helps assess the risk and potential consequences associated with each monitored asset and can be used to better prioritize capital and operational expenditures.

Another increasingly important benefit is the capability for knowledge capture and transfer. AVEVA Predictive Analytics ensures that maintenance decisions and processes are repeatable even when organizations are faced with transitioning workforces.

The AVEVA Predictive Analytics advantage

1. Reduce unscheduled downtime
2. Prevent equipment failures
3. Reduce maintenance costs
4. Increase asset utilization
5. Extend equipment life
6. Identify underperforming assets
7. Improve safety
8. Optimize maintenance planning and execution

Reduce OPEX by 10-20%

Avoided costs through early warning and diagnosis

$4,000,000+ avoided through early identification of power generation turbine blade damage

$370,000+ avoided due to early warning and diagnosis of pump feedwater heater and bypass valve problems

$500,000+ avoided due to early identification of a plant motor coupling approaching failure

$250,000+ savings per year through identification of pump inefficiencies for thermal performance improvements

$250,000+ avoided due to early warning and diagnosis of a bearing seal differential pressure problem

$50,000+ avoided through performance optimization

$243,000+ avoided by early identification of improper control valve positioning

Software features

AVEVA Predictive Analytics offers native integration to your existing PI Server. The software can be deployed on-premises or in the cloud. The system is highly scalable and can be used to monitor a single asset, a specific plant, or thousands of remote assets across many sites.

Results from the AVEVA Predictive Analytics models can be easily integrated with other business systems using industry-standard integration approaches.

Prescriptive actions

AVEVA Predictive Analytics includes the ability to provide users with prescriptive actions to mitigate a potential failure. When an alert is triggered, prescriptive actions are included in the alert to mitigate the potential failure. Prescriptive actions empower the workforce to execute predefined guidance when addressing asset maintenance and performance issues, resulting in improved decision-making and consistency in how issues are investigated, managed, and resolved.

Asset remaining useful life

AVEVA Predictive Analytics uses deep learning to forecast the remaining useful life of assets, providing actionable insight into operations and maintenance risk. Operations and maintenance teams can use this information to determine whether it is possible to operate the asset until the next planned maintenance outage or if an urgent shutdown is required. This enables plant personnel to be more effective in scheduling maintenance and assessing risk to maximize safety and profitability.

Native PI Server integration

AVEVA Predictive Analytics leverages native integration with PI Server's Data Archive utilizing native tag search and real-time and historical data retrieval. You can write predictive values back to the PI Server for use in PI Server calculations – specifically Asset Analytics, Event Frames, and Notifications.

Intuitive model building

With AVEVA Predictive Analytics, you don't have to be a data scientist or software developer to develop, validate, and deploy predictive models. The software uses a no-code, intuitive user interface to develop predictive models for your existing assets. Model templates provide fast deployment and simplified maintenance of predictive models for common assets at a site or across the enterprise. Playback provides the ability to fully validate and optimize predictive models before they are operationally deployed.

Alerts and notifications

Alerts are configured to provide early warning indication when an asset's current operation is deviating from its learned asset signature. The alerts provide clear indication of the assets that require further investigation and remediation, and enable the user to quickly link to diagnostic and prognostic information about the asset. Notifications can be configured to proactively notify users of alert conditions.

AVEVA Predictive Analytics is used to monitor 30,000+ assets globally.

Sample assets monitored:

- Gas turbines
- Steam turbines
- Wind turbines
- Hydraulic turbines
- Generators
- HRSGs
- Boilers
- Pumps
- Fans
- Motors
- Gearboxes
- Cooling towers
- Heat exchangers
- Condensers
- Air heaters
- Inverters
- Transformers

Data analysis

AVEVA Predictive Analytics includes advanced statistical and model-based comparison applications and business intelligence tools that enable users to spend less time searching for potential problems. Users have the ability to view the raw training data, results of the model, compare the performance of similar assets of the same type, and view the effects of alerts. The statistical applications interpret the data using visual representations so that data scientists and equipment experts are not required to interpret the results.

Fault diagnostics

AVEVA Predictive Analytics fault diagnostics provides clear indication of how well the current condition of the asset matches common failure modes for the asset type being monitored. This enables timely, consistent analysis of alert conditions so that problems can be rapidly diagnosed and acted upon, reducing the likelihood that an engineer will attribute an abnormal operating condition to the wrong cause.

Transient module

AVEVA Predictive Analytics transient module provides the ability for online monitoring of abnormal conditions during a transient event such as turbine startups and shutdowns. AVEVA Predictive Analytics is also able to automatically identify previous transient events from historical data, which is useful for comparisons.

Calculation engine

The software includes an advanced calculation engine that provides the ability to develop simple and complex calculations to create pseudo or "virtual" points. The results of these calculations can be used in AVEVA Predictive Analytics models, allowing for greater system flexibility. The calculations can automatically back-calculate, making historical data available for the monitoring period before the current calculation was created.

Cybersecurity

The safety and security of your data is our top priority. As an established leader with more than 50 years' experience delivering industrial software solutions, we recognize that your data demands a stringent cybersecurity posture and the highest operational standards.

AVEVA Predictive Analytics software integrates with existing enterprise security systems. The system supports single sign-on authentication, and administrators have the ability to limit user access rights and editing privileges at a granular level.

Case management

AVEVA Predictive Analytics provides an integrated case management solution to actively manage and track predictive machine alerts from inception until resolution for the entire life cycle of the asset. Cases can be assigned to the responsible team member and compared with previous cases for the same or similar assets to aid in root cause analysis and remediation. The case management solution enables knowledge transfer through the structured capture of problem analysis and resolution by your most experienced team members, so that it is available to accelerate knowledge transition to the next-generation workforce.

Operational scale

Operationalizing and scaling Artificial Intelligence and machine learning projects can be the difference between success and failure of a monitoring and diagnostic center. AVEVA Predictive Analytics has all the built-in and ready-to-deploy features that accelerate your time to value, including:

- Model templates and validation
- Alert management
- Fault diagnostics
- Prescriptive analytics
- Known failure modes and remediation steps
- Asset comparison and reporting
- Remaining useful life
- Integrated alert workflow

Additional products

AVEVA offers a comprehensive portfolio of software solutions that integrate with AVEVA Predictive Analytics, including mobile applications, condition management systems, reliability-centered maintenance software, and more.

AVEVA™ Asset Strategy Library

By combining PI System data and predefined asset templates, an asset performance management strategy can be deployed up to 90% faster. The AVEVA Asset Strategy Library contains known failure mode data and preventive maintenance procedures for the most commonly found asset types in asset-intensive industries, including:

- 1,000 components
- 1,500 known failure causes with failure conditions
- 2,000 preventive maintenance tasks
- 5,000 prescriptive tasks
- 20 years and 22,000 person-years of experience

AVEVA™ Asset Information Management

AVEVA Asset Information Management turns data from multiple information sources and systems into trusted actionable insights, identifying and cross-referencing all the relationships between equipment, documents, drawings, and various data formats to create a 360-degree digital twin of the physical asset.

AVEVA™ Unified Operations Center

AVEVA Unified Operations Center empowers your team with a centralized view to help make informed decisions fast. With out-of-the-box industry solution templates, reports, dashboards, and operational KPIs seamlessly unifying your functional teams, departments, and sites under one platform, Unified Operations Center enables faster time to value.

AVEVA™ Mobile Operator

AVEVA Mobile Operator equips field workers with the information they need to make tough decisions on the spot using ruggedized handhelds or commercially available off-the-shelf mobile devices. Operators are provided access to details such as operations and maintenance procedures, equipment diagrams, and operating history. This helps decrease unscheduled downtime, improve plant productivity, increase safety and situational awareness, and improve visibility of regulatory compliance.

AVEVA™ Insight

AVEVA Insight simplifies the complex. It makes asset performance, OEE reporting, big data, and analytics easy. A cloud-based solution that provides information in the right context to enable anyone to easily manage your operations and assets from anywhere, at anytime.

Monitoring and Diagnostic Service Center

Reduce maintenance costs and capital expenditures by leveraging our Monitoring and Diagnostics Services Center for remote monitoring of your industrial assets as a service.

AVEVA™ Asset Strategy Optimization

AVEVA Asset Strategy Optimization generates optimized maintenance and spare parts strategies by first looking at the company's business strategy and objectives, and then prioritizing actions down to an individual asset level to maximize return on asset investment.

AVEVA™ APM Assessment

AVEVA APM Assessment enables clear understanding of the current status of the business, and where improvement opportunities will provide the quickest financial return, resulting in a comprehensive action plan to execute against.

AVEVA™ Operational Safety Management

Plan and perform safe, compliant work on complex engineering assets. AVEVA Operational Safety Management enables asset operators to eliminate, minimize, or mitigate operational risk while optimizing asset performance. AVEVA Operational Safety Management provides risk assessment, work permitting management, work activity plotting, isolation planning and execution and safe job analysis and lessons-learned reporting to reduce operating risk and maximize workforce safety.

For more information, visit:
aveva.com/en/products/predictive-analytics

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