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Asset Performance Management

Top 10 Best Practices and Tips

eBooklet

Introduction

There is a tendency within organizations to blur the line between a Predictive Analytics software platform and an Asset Management Program. An industrial Asset Management Program has multiple components and domains that, when working in conjunction, create a holistic, sustainable, enterprise level asset management solution. While the Predictive Analytics engine is at the core of the asset management program, a successfully sustainable OT Asset Management Program, with Asset Performance Analytics, includes much more. The success of an Asset Performance Management solution is highly dependent on foundational components of the related Asset Management Program. This booklet outlines the key program areas, how they affect performance management, and ten best practices to ensure successful adoption of Asset Performance Management.

The adage, **"Garbage in, garbage out"** appropriately applies to asset management. Other than financial systems, asset management programs are some of the most data intensive systems used in industry today. To deliver full value of an OT Asset Management Program, data is required not only from the equipment sensors and IoT devices in the form of time series values, but from a range of disparate business systems that can include operational planning, inventory and procurement sources, work-order systems, maintenance planning, laboratory test results, technical document libraries, and third-party manuals or information systems. Poor source data quality is the greatest hinderance to asset management systems and analytics solutions.

Anyone who has experience in training Machine Learning (ML) applications knows that the above adage is particularly applicable when training ML asset models for automated performance analyses. Not only does the asset historian data need to be clean, of consistent quality, and in a consistent format but so does the data consumed from other sources. There may be control over the asset data, but there is probably less control over, say, the SAP Daily Production Target values or the format of those values. Depending on how data is used, a change by the owner of the SAP system can have significant impact on asset or process analytics that rely on the targets as part of their analytics.

Where the data is coming from, who owns it, who can modify it, what path it takes to get to you, how you maintain it and how you maintain regulatory compliance, where applicable, are all considerations in designing a successful and sustainable asset management program. Initially this information is readily available, and everyone is eager to assist one getting it - what about a year from now? Five years?

Much like the data requirements, long term program sustainment requires assurance that as your program grows, and they all do, your foundation can grow with it and that your data is protected. In developing the program, consideration is given to scalability and future network protocols that will impact the ability to collect and store the increased data and growing number of program outputs. These outputs can include failure notifications, performance reports, work orders, schedules and inventory requisitions. Of course, as soon as we talk about infrastructure and networks, we must include the protections that are in place to ensure our data and outputs are safe from cyber-security intrusion.

10, 9, 8, 7.... With the infrastructure, network and security in place, the source data management squared away and an analytics engine selected, is the asset management program ready to 'launch'? While the majority of industrial technology initiatives successfully get off the ground at the project execution stage, 70% fail to 'obtain and sustain orbit'. The primary reason: **RESISTANCE TO CHANGE.**

Resisting change is a human trait driven by the natural fear of the unknown. Lack of understanding, fear of failure, fear of job or position loss, lack of trust and change fatigue have been identified as common factors that contribute to failure of an asset management program initiative to reach sustainable operationalization. In the end, a program's success depends on people.

Lack of Understanding	Fear	Threat/Loss	Lack of Trust	Change Fatigue
• I don't know what is happening or why. • Leadership doesn't understand the impact this will have.	• I am going to fail. • I don't know what I am supposed to do	• My role will become redundant, my skillset won't be relevant. • I will lose my authority, position, expertise, control, reputation, autonomy. • My performance measures will change, I won't be successful.	• Leadership isn't thinking about the impact of this. • Leadership doesn't care about me or my opinion. • No one has asked for my input.	• I can't take any more changes. • The last project was a disaster. • Nothing good came from the last changes.

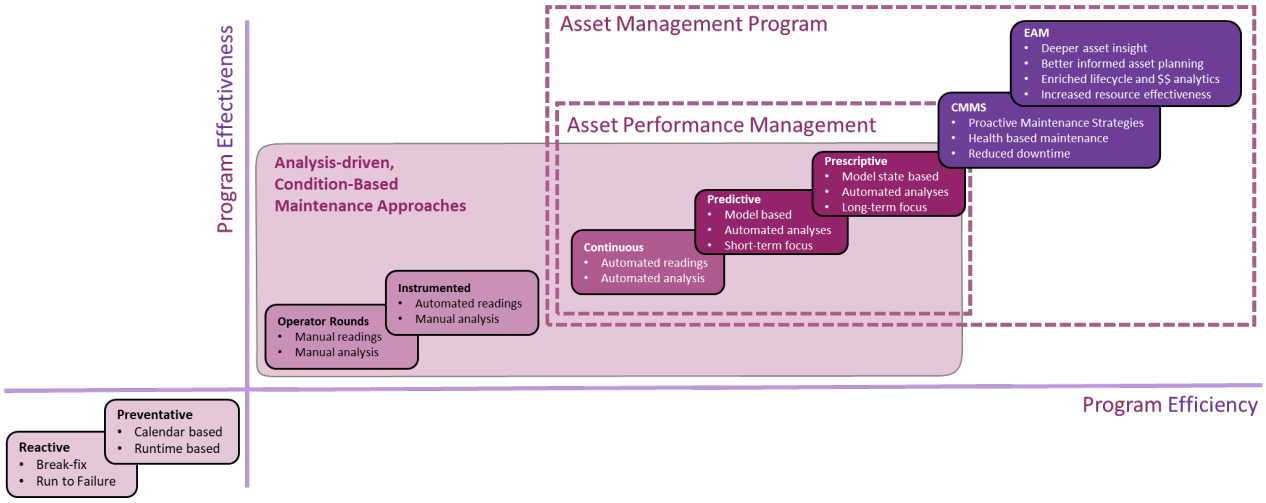
Figure 1 - Common Resistance to Change Factors. (copyright Prosci)

In industrial operations there is a distinct separation between the project team responsible for deploying the technology change and the operations team who are responsible for post-deployment technology use and sustainment. The Project team has a defined scope and schedule. When the deployment is done and commissioned, the team moves to the next project. The Operations team is typically given the "keys", the owner's manual, and pointed at the "car" as the Project team is leaving the showroom. A structured approach to change management from program inception to go-live ensures operational readiness, program adoption and sustained value realization.

The success of an Asset Management Program is dependent on the alignment of four functional domains described in the preceding paragraphs, with the program objectives. Formally these domains are:

- **Change Management**
- **Data Governance and Compliance**
- **Infrastructure, Network and Security**
- **Source Data and Data Transformation**

Ensuring that these domains are aligned within the Asset Management Program requirements provides the assurance that the program, the Asset Performance Management and the Predictive Analytics solution will be successfully adopted. Regular assessment of the state of each domain guarantees long term program operational sustainment and growth.



The core of an Asset Management Program is the **Asset Performance Management (APM)** solution which drives condition-based maintenance by providing advance notification of pending asset failures and/or process issues. There are multiple approaches available to drive asset condition-based maintenance, including:

- **Operator Rounds** – The asset performance data is manually collected and manually analyzed. This is an entry level approach that can deliver immediate results for a limited set of critical assets. The drawback to the approach is that the manual analyses are resource intensive and time consuming, limiting the number of assets that be effectively monitored.

- **Instrumented** – The asset performance data collection is automated and stored in a repository for manual analysis. While this approach reduces the data collection effort and risk of data entry errors, the same analysis resource constraints as Operator Rounds are experienced and the same restrictions on the number of assets managed apply.

- **Continuous** – The Continuous approach introduces automated analyses of the stored asset data and automated notifications of pending rudimentary failures. The automation of the analyses allows a greatly expanded set of assets to be monitored and maintained but the analysis performed is generally based on operating limits and catastrophic failures only. There is no concept of a particular asset (e.g. - a bearing) as a part of the collection of the assets that make up an asset model (e.g. – a pump).

- **Predictive** – Using past and current data for asset modeling, predictive analysis uses statistical models, historic data and machine learning and custom algorithms to produce alerts or notifications of pending failures. Predictive analytics provide time-to-failure predictions and suggestions for maintenance, but often stop short of recommending actions.

- **Prescriptive** – Where Predictive analytics is asset model based; Prescriptive analytics add the model state for consideration. Building on the Predictive Analytics foundation, Prescriptive Analytics involves complex data models that include business and operational data, adding actionable recommendations to the notifications.

Deploying a successful Asset Performance Management (APM) solution is not a simple plug and play operation. There are many pitfalls that can result in either an APM solution that doesn't work or, worse, one that is not trusted by those that rely on accurate results. Following are ten best practices that will help ensure the APM deployment is successful and sustainable. These best practices are key to the success of an APM, but they by no means are the all-inclusive answer.

Top 10 Best Practices

1. Establish Clear Asset Hierarchies

In OT asset predictive analytics, establishing clear asset hierarchies is a foundational best practice. It involves organizing assets according to their criticality and function, ensuring that predictive models can focus on the most vital components of the system. Creating this hierarchy allows predictive analytics tools to prioritize monitoring and predictive maintenance efforts on the most critical assets, minimizing downtime and operational risks.

Clear asset hierarchies improve communication between different teams, such as operations, maintenance, and technical support. It helps align teams on which assets are most critical; ensures that predictive analytics insights are translated into actionable strategies; and eliminates over-maintenance of non-critical assets. To maximize effectiveness, businesses should regularly audit and update their asset hierarchy to reflect any changes in the operational environment, such as asset upgrades or shifting priorities.

***Tip**: Use digital tools like asset management software to create visual representations of the hierarchy for improved communication, collaboration, and clarity.*

2. Foster Actionable Outcomes Based on Analytics

The key to successful predictive analytics in OT asset management is transforming raw data into actionable outcomes. Analytic outputs should offer insights that are directly translatable into maintenance actions, such as scheduling repairs or adjusting operating parameters. This ensures that predictive maintenance leads to tangible operational improvements, avoiding unnecessary downtime or unexpected failures. Companies should define clear criteria for when and how maintenance should be triggered based on predictive models.

To foster actionable outcomes, it's crucial to embed analytics outputs into the organization's broader decision-making framework to ensure the data isn't just informative, but also has practical use. Actionable prescriptive analytics can provide detailed recommendations, such as estimated outage time, which parts to inspect or which operating process adjustments to make.

***Tip**: Establish feedback loops where maintenance teams provide regular updates on the success of actions taken based on analytics insights. This loop can refine future predictions, making them and the maintenance efforts more accurate and useful over time.*

3. Ensure Source Data Quality

High-quality source data is a prerequisite for a successful OT asset performance management strategy. Poor data quality can lead to inaccurate predictions, faulty maintenance schedules, and missed opportunities for optimization. Data quality has a direct impact on the results when training machine learning models.

Ensuring that the data collected from IoT sensors and operational assets is clean, consistent, and comprehensive is essential for building reliable predictive models. Implementing robust data validation checks at the point of data entry helps eliminate errors early in the process, ensuring that only high-quality data enters the system. Source data quality also involves maintaining accurate documentation and metadata to provide context for the data being used. This makes it easier for data scientists and engineers to trace the data back to its origin, which is critical for debugging and fine-tuning predictive models.

***Tip**: Regularly audit the data being collected against a Data Governance Framework to identify gaps or inconsistencies and establish automated monitoring systems to flag data quality issues in real-time.*

4. Integrate and Centralize the Data

Integrating and centralizing OT, IT, business, and operational data into a single platform is key for optimizing predictive analytics. Fragmented data across systems or silos can lead to incomplete insights, making it a challenge to develop holistic asset performance models. By unifying data sources, companies can provide a more accurate view of asset health and performance, improving predictive maintenance and decision-making capabilities. A centralized platform also allows for better data visualization and cross-functional collaboration.

Data centralization ensures that all stakeholders - maintenance teams, reliability engineers, data analysts, and management - have access to a single source of truth. This leads to more consistent and reliable decision-making and reduces the likelihood of conflicting interpretations of asset health.

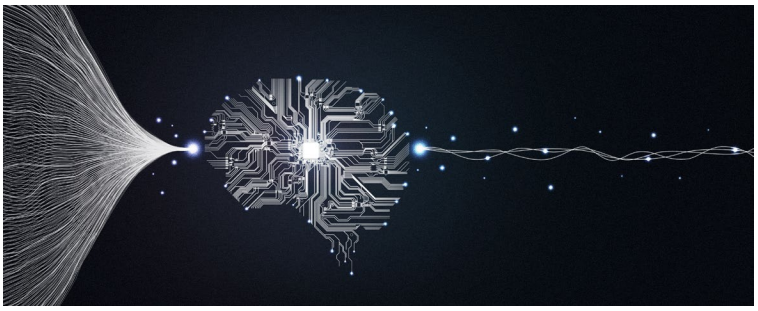
***Tip**: Consider instantiating a centralized asset management repository server to house a copy of all the data required for the APM solution with data pushed to it from the disparate sources. This greatly simplifies data access management, source data quality, protects the data sources from a security point of view, and increases system performance.*

5. Establish a Data Governance and Standardization Framework

A strong data governance and standardization framework ensures that data used for predictive analytics is trustworthy, compliant, and aligned with organizational standards. Data governance establishes policies on data quality, security, and lifecycle management, ensuring that every piece of data is used effectively and securely. Standardization enables predictive models to confidently and consistently interpret data across different systems, reducing the risk of misalignment or false positives.
A comprehensive data governance framework also improves compliance with industry regulations and standards, safeguarding data from misuse and ensuring that organizations can pass audits or certifications as needed.

***Tip**: Create a cross-functional data governance committee responsible for enforcing policies and continuously improving data standards across all departments.*

6. Implement Machine Learning in the Right Places



Machine Learning (ML) can enhance automated predictive analytics by identifying patterns in asset performance data that might not be visible to human analysts. Machine learning algorithms can be trained to predict asset failures, optimize maintenance schedules, and even suggest operational process improvements based on patterns in historical data. However, to maximize its effectiveness, ML should be applied in the right context—typically, where historical data is rich, failure modes are complex and real-time condition alerts are not required.

It's crucial to ensure that the ML models are continuously trained with fresh data and retrained when assets are replaced or upgraded. This adaptability helps the models stay relevant and accurate over time.

***Tip**: Use ML in conjunction with human expertise and the asset hierarchy. ML algorithms can spot patterns and maintenance teams can provide real-world context to ensure that predictive outcomes are practical and actionable. The notifications may not be timely to prevent critical asset outages. Consider using real-time performance monitoring rather than ML for critical assets or processes.*

7. Promote Cross-Functional Collaboration

Predictive analytics in OT asset management thrives when there's strong collaboration between different teams, including operations, IT, data science, and maintenance. Cross-functional collaboration ensures that the insights derived from analyses are grounded in operational realities and are actionable. Regular communication between teams helps align data-driven insights with maintenance strategies, ensuring that predictive analytics inform daily operations effectively.

Collaboration also encourages knowledge sharing, ensuring that the maintenance and reliability teams understand how predictive models are built and data scientists comprehend operational constraints and realities.

Tip: *Establish regular cross-functional meetings to discuss the results of predictive analytics and their operational implications. This fosters a culture of collaboration and continuous learning across teams.*

8. Implement Scalable Solutions

Implementing scalable solutions is critical to the success of industrial operational technology changes. It ensures the system can grow and adapt with the business. In industrial environments, technology changes must move beyond isolated "science projects" and focus on operational readiness. Build scalable solutions with the flexibility to handle increasing volumes, more complex workflows, and future expansions without requiring a complete system overhaul. This forward-looking approach minimizes disruptions and reduces the need for repeated investments in short-term fixes.

Ensuring operational readiness means the new technology should be fully integrated into production processes, with robust testing and validation in real-world conditions. This guarantees the technology is ready to deliver value from day one and avoids the pitfalls of solutions that work in controlled environments but fail under operational pressures.

Focusing on scalability also improves long-term return on investment. It ensures that the technology can evolve with changing business needs and market demands, which is critical in industries like oil and gas, where operations often grow and shift rapidly. Solutions that can adapt to larger production scales or integrate with new technologies protect the organization from future challenges and costly redesigns.

Tip: *Before implementation, stress-test the solution at different operational scales. This will help ensure that the system performs reliably, not just as a pilot or a proof of concept, but under real, increasing operational demands.*

9. Adopt Proven Change Management Practices

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Change management, when done effectively, reduces operational disruption, enhances productivity, and ensures the organization fully realizes the benefits of its investment. Effective change management practices are essential to ensure the success of any industrial operational technology change, including asset management. This practice drives not only a clear vision for the desired outcome but also a structured approach to drive the shift in behavior and processes at all organizational levels. Employees must understand why the change is necessary and the specific benefits it brings, both for the organization and for themselves. Without this understanding, resistance can grow, leading to delays, inefficiencies and apathy.

Ensuring that individuals and teams have the knowledge and skills to embrace the new technology is equally crucial. Training, ongoing support, and clear communication about the new operational expectations can make or break the adoption of new or enhanced systems. Leadership must play a proactive role, from inception through sustainment, in fostering a positive attitude toward change, emphasizing the importance of commitment and the opportunities it unlocks.

A key element in effective CM is reinforcing the changes so they stick. Implementing a new technology or enhancing an existing one, isn't enough; organizations must build mechanisms to support long-term adoption. Regular check-ins, metrics that track the success of the technology integration, and recognition of employees who excel in the new system can help solidify the shift.

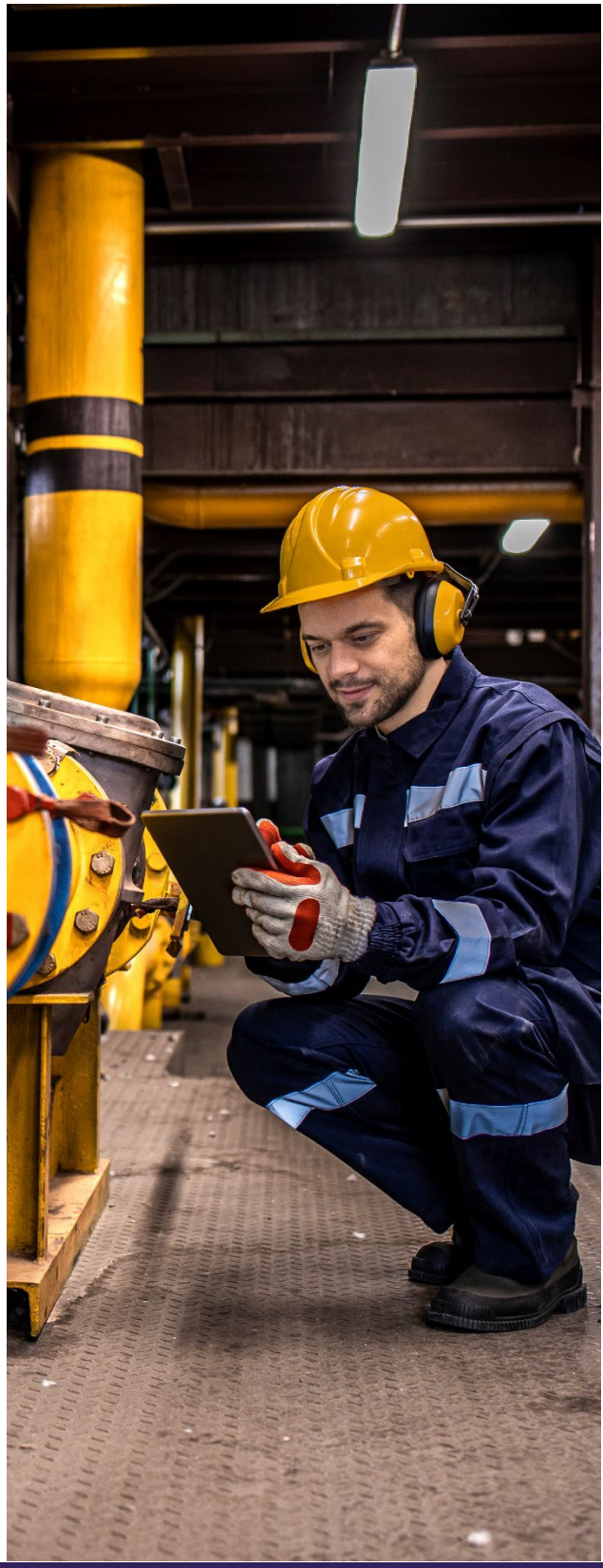
Tip: *Tailor your communication strategy to the diverse needs of different stakeholder groups. Each team or department may need different types of information, ranging from technical insights to business impacts, to fully buy into the change.*

10. Evolve a Continuous Improvement Culture

Evolving a continuous improvement culture in OT asset predictive analytics is essential for long-term success. Predictive models, maintenance strategies, and operational processes should be constantly evaluated and refined based on real-world performance. A continuous improvement mindset encourages teams to regularly review predictive analytics outputs, asset performance, and maintenance outcomes to identify and communicate areas for optimization. This can involve adjusting predictive models to better account for changing asset conditions or refining maintenance processes to be more responsive to analytical insights. Teams should also be encouraged to experiment with new technologies or methodologies to improve their results over time.

Moreover, fostering a culture of continuous improvement requires empowering employees to participate in the process. Maintenance teams, for instance, can provide valuable feedback on how predictive analytics are being applied in the field, and data scientists can offer insights into how models can be optimized. By encouraging collaboration and feedback across departments, organizations can ensure that their predictive analytics solutions remain agile and effective.

Tip: *Implement regular "review and reflection" meetings where teams can assess the effectiveness of their analytics-driven maintenance strategies and propose adjustments based on the latest information. This ensures that the organization remains proactive rather than reactive and is constantly evolving in response to new challenges and opportunities.*



READY TO MAXIMIZE YOUR ASSET PERFORMANCE?

Let Dexcent Guide You.

Implementing and sustaining an Asset Performance Management (APM) solution can be complex—but it doesn't have to be overwhelming. At Dexcent, we specialize in guiding industrial organizations like yours through each step of the journey, from setting up data governance frameworks to deploying cutting-edge predictive analytics that drive real, measurable results.

We've shared our top 10 best practices to help you succeed, but taking your APM to the next level requires expertise, strategy, and a partner you can trust. That's where we come in.

Let's Work Together to Drive Sustainable Asset Management Success

Our team of experts is ready to collaborate with you to tailor a solution that fits your unique operational needs and long-term goals. Whether you're just starting to explore asset performance solutions or looking to enhance an existing program, Dexcent has the insights, tools, and support you need to:

- **Streamline Your Data:** Ensure clean, high-quality data for accurate predictive maintenance.
- **Boost Efficiency:** Automate asset monitoring and maximize uptime with predictive and prescriptive analytics.
- **Enhance Collaboration:** Align teams and integrate technology to create a seamless asset management strategy.
- **Foster Long-term Sustainability:** Implement scalable solutions and change management practices that drive continuous improvement.

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Consult Us Today for a Consultation

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