

The Avathon Autonomy Platform

World-Beating Operational Performance in MRO



Coming up with a clear, definitive value for the world’s combined industrial asset base turns out to be quite challenging. But a [recent McKinsey & Company report](#) concludes that the value of global assets under management (AUM) as of June of this year was \$147Tn (including verticals like defense, electricity, manufacturing, and mining). More to the point, for the purposes of this white paper, the global market for industrial asset management was estimated at \$167Bn in 2024, a 7% increase over the previous year, and a number forecast to grow to \$506Bn by 2030. All of which leads to the indisputable conclusion that efficiently and effectively maintaining your company’s asset base is a critical strategic imperative for any industrial firm, regardless of size.

This white paper presents a new paradigm for optimizing asset Maintenance, Repair, and Overhaul (MRO): Avathon’s Autonomy for MRO, a sophisticated decision science tool designed to integrate seamlessly with existing assets and platforms, whether aircraft, vehicles, manufacturing systems, or energy production equipment. Autonomy for MRO takes the next step beyond basic asset management, providing an intelligent new capability set that automates complex processes, optimizes MRO schedules, and provides accurate equipment failure forecasts, as well as prescriptive actions to mitigate those failures. This powerful new capability set enables asset operators to achieve unrivaled operating efficiency, significantly reduce operating and capital costs, and maximize revenue in a world increasingly driven by uncertain operating environments and governmental policies.

\$147T

Global industrial assets under management (AUM) as of June 2025*

\$167B → \$506B

Global industrial asset management market growth forecast 2024–2030*

7% YoY

Annual growth in industrial asset management from 2023 to 2024*

*McKinsey & Company

Why AI is the next step in MRO excellence

Most MRO today is based on OEM-provided physics-based modeling, using a complex series of mathematical equations to describe how a system or component should perform under normal conditions. Such methodologies typically model single variables using statistical process control (SPC) and recommend repair actions based solely on that variable. These models are frequently designed assuming “normal” or ideal operating conditions, whereas the reality is that your equipment rarely operates under ideal conditions. Throughout its lifetime, a system or asset will be exposed to multiple repairs, varying environments, extreme cold/heat, and other environmental conditions. Avathon Autonomy for MRO bases its analysis and recommendations on current conditions, noting the changes that led here and making it easier to adjust to ‘new normal’ operating states as assets age and maintenance practices change.

Traditional MRO	Avathon Autonomy for MRO
Physics-based models	AI-driven decision science
Single variable focus	Multi-variable contextual learning
Ideal operating assumptions	Real-world adaptive insights
Reactive repairs	Prescriptive, optimized actions

What if industrial asset owners don’t get it right?

Inadequate MRO practices can have significant and widespread consequences, resulting mainly from operational disruptions and potentially profound financial costs.

Operational Consequences

Inefficient or poorly performed MRO can affect core business operations by reducing asset performance and process stability.

Increased Unplanned Downtime: Equipment failures due to neglect or reactive maintenance halt production. For a large automotive plant, an hour of downtime can cost up to \$2.3Mn.

Reduced Asset Reliability and Lifespan: Improperly maintained equipment operates sub-optimally and wears out faster, shortening effective life and requiring costly, premature replacement.

Reduced Product Quality: Poorly maintained assets often lead to defective products, which can mean costly rework, scrap, or even product recalls, damaging a company's brand reputation.

Reactive Maintenance: Poor MRO practices can force maintenance staff into a reactive mode, where emergency repairs replace scheduled, proactive work. This creates a ripple effect of strained resources, unplanned downtime, and can even increase the probability of future failures.

Supply Chain Disruption: Unplanned asset failures often lead to unpredictable demand for spare parts, resulting in rushed, overpriced spot purchases, emergency freight costs, and challenges meeting production schedules and customer deadlines.

Safety and Compliance Risks: Poor MRO practices can lead to facilities and equipment that are more prone to accidents, compromising worker safety and increasing the risk of regulatory fines and legal liabilities.

The Ripple Effect of Poor MRO Practices

\$2.3 M/hr

Cost of downtime at a large automotive plant

20–30 %

Spare parts that go unused due to poor inventory control

+30 %

Increase in reactive maintenance labor cost vs. scheduled work

↓ ROA impact

Reduced asset life and efficiency drag return on assets

Financial Consequences

The operational consequences described above lead directly to major financial challenges, some of which are hidden or indirect.

Excessive Maintenance Costs:

Higher Labor Costs: Unplanned asset repairs frequently require overtime wages, making them more expensive than scheduled work.

High Acquisition Costs: Ad hoc procurement results in a high volume of small, uncoordinated purchases, which typically means missing out on volume discounts.

High Shipping Costs: Critical part stockouts oblige staff to order on an emergency basis, requiring higher cost expedited shipping and freight expenses.

Increased Inventory Holding Costs:

Excess and Obsolete Inventory: Poor inventory management can lead to overstocking (20–30% of spares can go unused) and parts duplication, tying up working capital and increasing storage, insurance, and eventual disposal cost.

Stockout Costs: Having insufficient quantities of critical parts on hand can result in higher downtime costs and lost production

Revenue Loss and Missed Opportunities:

Unplanned downtime translates to lost production volume and possible contractual penalties for missed delivery deadlines

Lower Return on Assets (ROA):

Shorter equipment lifespans and reduced operating efficiency reduce overall financial return on capital asset investments.

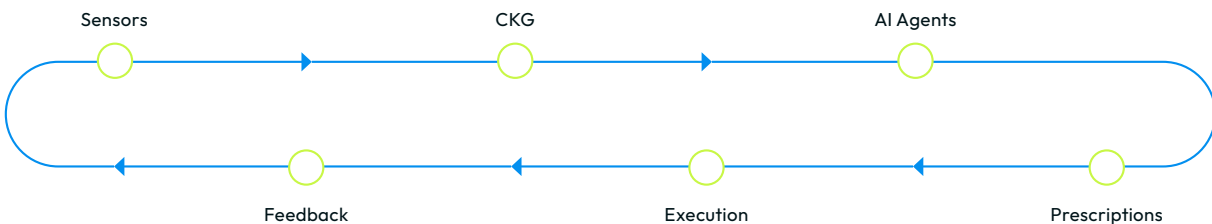
Unnecessary part or system replacements can throw off operating budgets, affecting the bottom line.

Avathon Autonomy for MRO

Avathon Autonomy tackles all these challenges by harnessing the power of AI to turn today's MRO practices from static and reactive to dynamically planned and proactive. Autonomy for MRO empowers users to rapidly detect emerging maintenance and repair issues, prescribe the most effective actions, and align the entire maintenance ecosystem in real time. Using Avathon's proprietary Computational Knowledge Graph (CKG) methodology to map assets, resources, schedules, and dependencies, the platform enables AI agents to anticipate maintenance needs, optimize parts and workforce deployment, and coordinate supply chain actions in real time.

Autonomy for MRO's wide-ranging feature set equips asset managers—whether aircraft, vehicles, manufacturing equipment, or power generation systems—to extract the most value from their asset base while minimizing recurring and capital costs. Features of the Autonomy for MRO platform include:

The Avathon Autonomy Loop – how AI continuously optimizes MRO operations



Normal Behavior Modeling: Ingests and evaluates years of historical data to unearth maintenance insights that model, monitor, and provide proactive alerts of impending maintenance problems for a complex system of components, basing these alerts not only on the values of individual parameters but holistic understanding of the entire system.

Predictive Maintenance/Failure Prediction: Analyzes vibration, pressure, temperature, flow, torque, acoustic, and visual data to predict failures weeks or months in advance. Autonomy for MRO estimates how many hours/days a component can run before failure, helping maintainers predict failure modes, recommend troubleshooting steps, identify applicable technical orders, and repair/return assets to service.

Prescriptive Maintenance and Parts Forecasting: Prescribes precise corrective actions, accounting for required parts, work orders, crew availability, and downtime windows, ensuring maintenance is executed efficiently, reducing operational disruption and maximizing asset uptime. Part needs are forecast based on equipment condition, usage patterns, seasonality, and project schedules, reducing excess inventory and avoiding stock-outs.

Computer Vision for Inspections: Uses existing cameras and sensors to automatically detect leaks, corrosion, loose bolts, blocked gauges, fires, unsecured doors, etc., reducing the need for inspections and enhancing safety.

Dynamic Work Scheduling: Generates, ranks, and optimizes work orders, matching tasks with the right technicians, tools, and parts while optimizing routes and timing. AI agents adjust schedules in real time, ensuring resources are deployed effectively and safely, and work is completed with minimal disruption or risks to production.

Digital Twins: Combines physical models and AI to simulate asset behavior under different loads and environmental conditions, enabling scenario-based maintenance planning.

Natural Language & GenAI Assistants: Retrieves historical work orders, maintenance histories, OEM manuals, and procedures, enabling technicians to troubleshoot faster in the field.

Augmenting Skilled Workforce: Promotes machine learning and data analytics training. Avathon Autonomy for MRO streamlines workflows, automating and accelerating resolution for junior maintainers. This is a critical backstop to overcoming the challenge of maintaining technical expertise as the workforce ages, making operations knowledge readily available to a new generation of workers.

Alert Calibration: Mitigates noisy alerting mechanisms that contribute to alert fatigue. Smart alerts and auto-calibration of thresholds are tunable via real-time SME feedback to automatically categorize, benchmark, and compare alerts, reducing false positives.

Explainability: Includes evidence and confidence levels with every diagnostic outcome, failure prediction, and action prescription, ensuring traceability and compliance throughout the maintenance lifecycle.



“The MRO industry is at a critical inflection point, with evolving political and regulatory decisions creating immense operational uncertainty. Our Autonomy for MRO platform is the answer. We’re not just providing a dashboard; we’re providing a fully automated intelligent system that makes real-time decisions, transforming how assets are managed from the ground up. We believe that the future of MRO is autonomous.”

— Pervinder Johar, CEO

The Time for Excellence in MRO is Now

Avathon’s Autonomy platform turns traditional MRO operating plans into living, AI-powered systems, delivering immediate, enduring cost savings, efficiency, and improved asset performance. By combining all these platform features into a unified, adaptive plan, operators can significantly reduce operating costs, minimize downtime, and maximize the revenue potential of their capital-intensive asset portfolios.

Avathon first introduced its asset performance management (APM) system nearly a decade ago and has, since then, been instrumental in contributing to the growth of the MRO industry. Continuing advances in this sector now demand a more comprehensive solution, one that includes not only asset management, but also an end-to-end focus on operational process optimization. Avathon Autonomy for MRO is that solution, available today to take your global asset management to the next level of operational performance.

About Avathon

Avathon develops innovative software solutions that accelerate MRO operations. Our mission is to empower asset owners with the tools they need to collaborate, automate critical workflows, and make more informed decisions that maximize asset returns while delivering on client commitments.