



UPTIME AI

ELIMINATE SURPRISES



Artificial Intelligence Based Expert for Predictive Maintenance

UptimeAI operationalizes artificial intelligence (“AI”) to the needs of plant engineers enabling them to predict equipment and performance issues in advance before they result in losses. Combining AI and subject matter knowledge, UptimeAI mimics experts by continuously learning and explaining complex issues to achieve high availability, high efficiency, and reduced maintenance.

www.uptimeai.com

Achieving Excellence in Reliability, Availability, & Maintenance

Do you feel like you hit a wall in

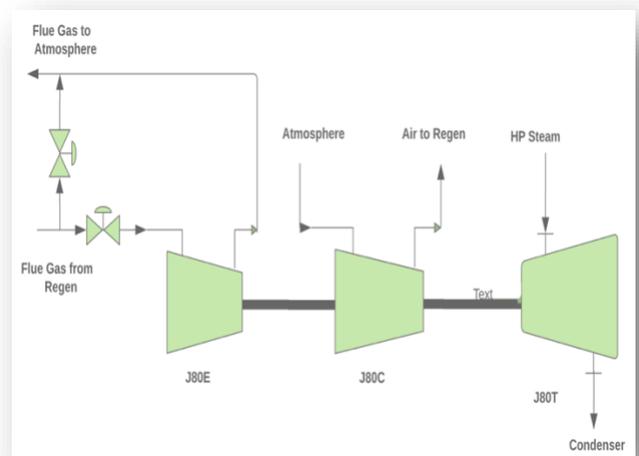
- Cutting down reactive maintenance (something broke, fix it now)?
- Increasing efficiency?
- Avoiding excessive and unnecessary scheduled maintenance?
- Increasing turnaround time between planned shutdown?
- Reducing production loss due to unplanned downtime?
- Driving enterprise consistency and digital knowledge management?

If you answered yes to any of these questions, you need to look beyond traditional maintenance techniques; Else, you might be leaving anywhere between \$1.4M to \$50M¹ of annual lost revenue. This lost opportunity is driven by **unexpected failures and performance loss that blindside even the best engineering**. Further, with experienced workforce retiring, innovative digital solutions are needed to enable next generation engineers to succeed and achieve operational excellence.

I already use condition monitoring & APR. Do I need UptimeAI?

Traditional Preventive, Condition-Based, and Advanced Pattern Recognition solutions have been introduced between 1950s and 1980s. They use thresholds and manual rules-based approaches on one or more tags pertaining to an equipment to predict issues. However, such rules-based approaches **produce 100s of noise alarms, require significant effort in keeping them up-to-date, and are ineffective at solving complex issues originating due to dynamics between multiple equipment**.

Industry needs a solution that can handle the complexity of processes and let engineers make decisions rather than worrying about rules. Meet UptimeAI.



Equipment don't operate in isolation. Uptime AI recognizes this

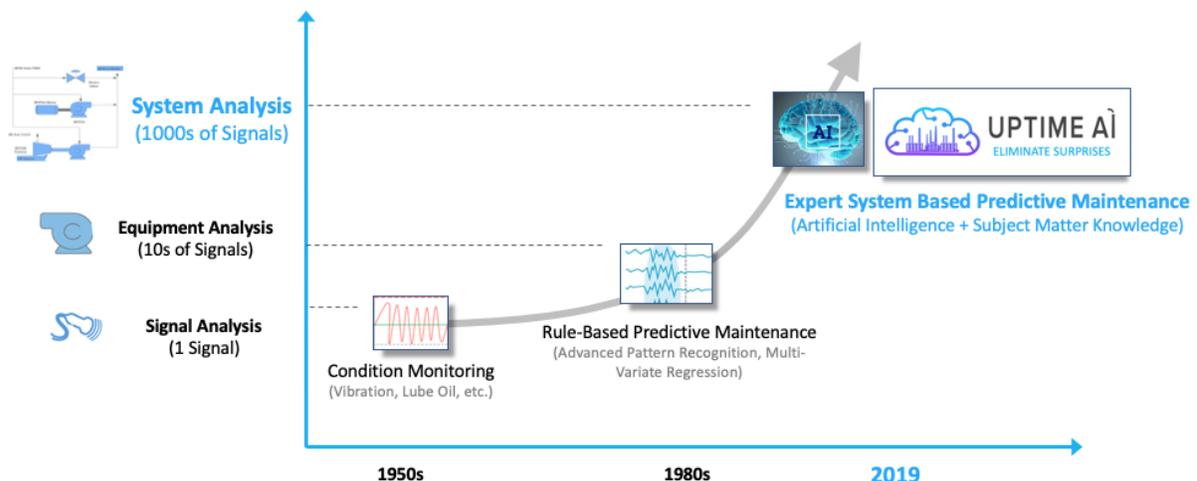


Figure 1: Evolution of Predictive Maintenance Techniques

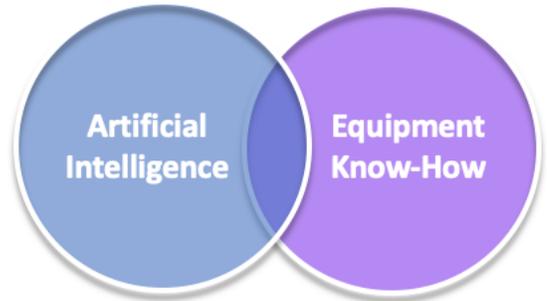
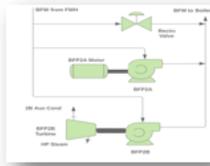
1. Solomon Associates benchmarking study of over 8000 process units:
<https://www.solomononline.com/benchmarking/reliability-and-maintenance>

How is UptimeAI different?

Contrast to threshold based and rule-based monitoring techniques, UptimeAI offers an expert system based predictive maintenance solution that **mimics an expert by continuously learning, predicting, and explaining impending problems**. UptimeAI uniquely **combines Artificial Intelligence with Subject Matter Knowledge** to explain interrelations across groups of equipment, adapt to changes, identify anomalies, and give prescriptive diagnosis like a human expert would, resulting in high availability, high efficiency, and reduced maintenance.

- **Explains complex issues**

- *Takes hours Vs weeks to explain why?*



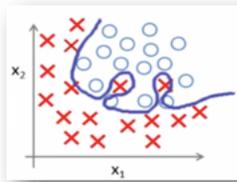
- **Continuous Self Learning**

- *No manual rules Vs 1000s of rules*



- **High Accuracy**

- *10s of pin-pointed alerts Vs 1000s of ineffective alerts*



MIMICS HUMAN EXPERT

Figure 2: UPTIMEAI's Unique Expert System Based Predictive Maintenance

What is the business impact of UptimeAI?

Performance Improvement

Identified sources of performance loss to improve vacuum and heat rate on a 2-pass condenser unit with a value of \$225,000/yr.

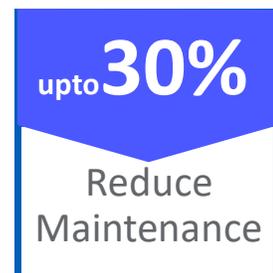
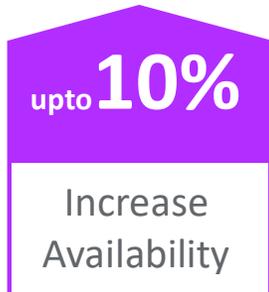
Equipment Failure

Detected a generator stator winding insulation issue 4 months in advance with a potential saving of \$750,000/yr.

UptimeAI Benefit

2x

Traditional Pred. Maint. Software



How does UptimeAI work?

UptimeAI's artificial intelligence engine builds **unsupervised deep learning models** from past timeseries, failure, and maintenance data to differentiate good and bad operation. The software analyzes the **real-time operational data from the historian** to generate alerts about impending issues.

UptimeAI's inference engine with **built-in knowledge base of equipment failures and recommendations** interprets alerts from AI engine and proactively explains and suggests mitigation steps.

Further, UptimeAI's **workflows provide maintenance information from EAM systems** to enable engineers make right decisions. These decisions are in-turn utilized by AI engine to **continuously improve models** resulting in up-to-date and high accuracy models.

Understand the why behind complex issues

UptimeAI groups related equipment into one unit, and trains the artificial intelligence models with all the related signals together. This improves the overall chance of detecting system wide events, and enables the engineer to understand the **effect of upstream and downstream** process changes.

- High Accuracy
- Explains complex issues
- Learning never stops
- Separate data quality module
- Grouped alerts
- Failure mode diagnosis
- Prescriptive recommendations
- Detect process degradation
- Collaboration/Knowledge mgmt.
- Advanced analysis
- Integrated maintenance info.

- Developed for plant engineers
- Fast deployment in weeks
- Scale quickly to entire plant
- Integrates with Historian/CMMS
- Sensor & Equipment agnostic
- Built-in fingerprints for 100+ rotating & static equipment

Continuous self-learning: no manual rules

UptimeAI uses **unsupervised learning to self-learn** the correlations between various parameters. In addition, this approach can scale to big data volumes increasing prediction accuracy. This is quite contrary to manual approaches where humans write rules. This means that engineers don't have to spend time trying to keep the rules up-to-date with process changes. Instead they can focus on making more strategic decisions about the plant operations.

High Accuracy

UptimeAI uses **deep learning models which can learn from 1000s of tags simultaneously** and produce highly accurate alerts. This allows UptimeAI to represent models that are highly non-linear similar to first-principle based models as opposed to simple clustering or regression-based approach.

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