



Artificial Intelligence is Enabling MHPS to Change the Utilities Business Model

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Agenda

- MHPS Overview
- Industry Challenge
- Implementation
- Details of SparkPredict®
- Case Study
- Future Plans
- Questions and Takeaways

Mitsubishi Hitachi Power Systems

Total Plant Monitoring, and the focus on digital solutions through the MHPS-TOMONI™ initiative.

Challenge:

Adapting to the demand of digital transformation and the optimization of the use of the data

- *Evolving Customers*
- *Aging Workforce*
- *Expanding expectations to total plant and non-OEM equipment*

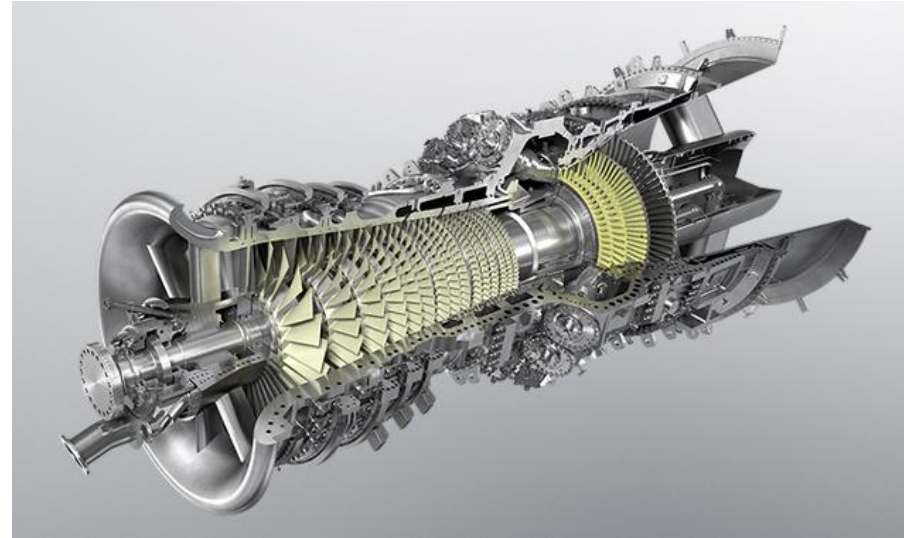
Solution:

MHPS collaborated with SparkCognition™ to assess the use of supervised AI at the asset level.

- *Operational Footprints created*
- *Anomaly Detection with top contributing factors*

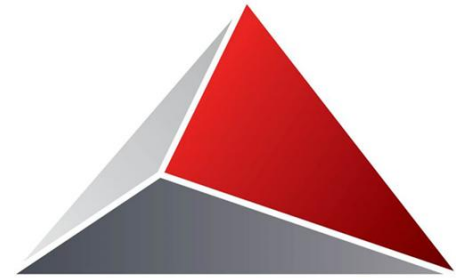
Results:

- *SparkPredict® was able to successfully distinguish varying operating modes*
- *MHPS future plans are now underway to expand capabilities to offer Total Plant Monitoring through AI analytics*



About Mitsubishi Hitachi Power Systems

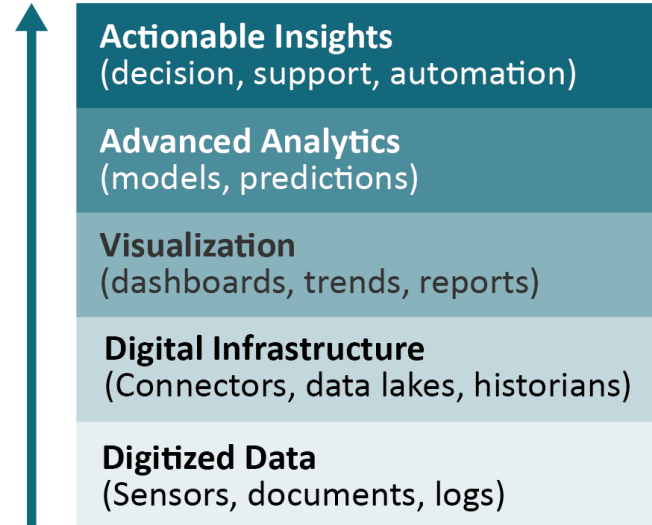
- MHPS is an industry leader in power generation technology including Advanced Class Gas Turbine.
- The MHPS Remote Monitoring Center (RMC) is **using the PI System** to monitor its customers' **power generation assets around the world**.
- Connectivity is tailored for the specific requirements of the customer. The RMC monitors OEM and non-OEM equipment across turbine classes.
- MHPS is currently expanding to Total Plant Monitoring under its digital initiative called **MHPS-TOMONI™**.



MHPS Digital Solutions
TOMONI

About Mitsubishi Hitachi Power Systems

- MHPS-TOMONI™ uses the approach of partnering with best-in-class software companies, combined with our engineering expertise to create solutions in a timely and effective manner.
- The RMC uses the PI System to drive R&D, mitigate potential issues, and troubleshoot and diagnose problems, and in this instance the collaboration was with SparkCognition™.

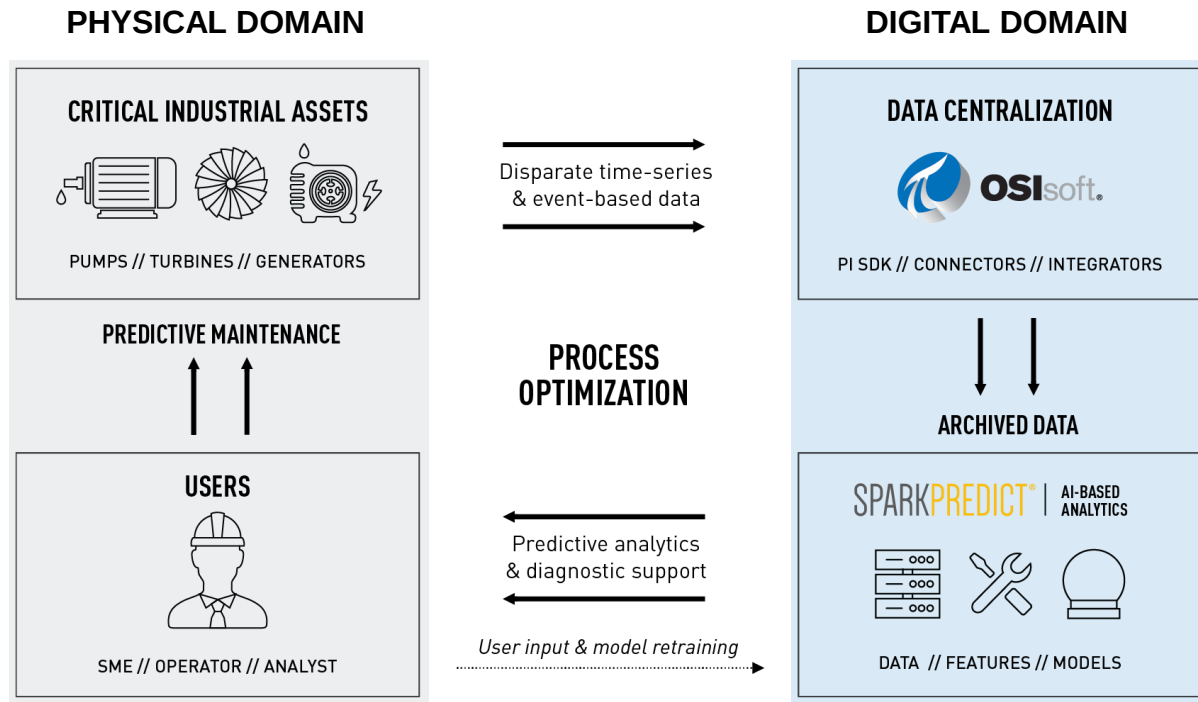


Business Challenge

- The focus and emphasis in the Remote Monitoring Center is on Total Plant Monitoring, and the company as a whole has an initiative to develop an evolving business model.
- Our industry needs to embrace new methods and ideas to improve revenue, profitability, and customer support, and the exploration of using AI to address industry issues



OSISoft Data in Predictive Analytics



Introduction to SparkPredict[®]

Introduction to SparkCognition™ and SparkPredict®

Through Predictive Maintenance:

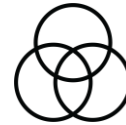
- Maximize asset availability
- Minimize unnecessary & unexpected expenses



Asset Monitoring
& Analytics

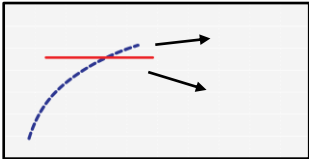
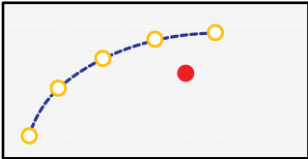


Subject Matter Expert
(SME) Governance

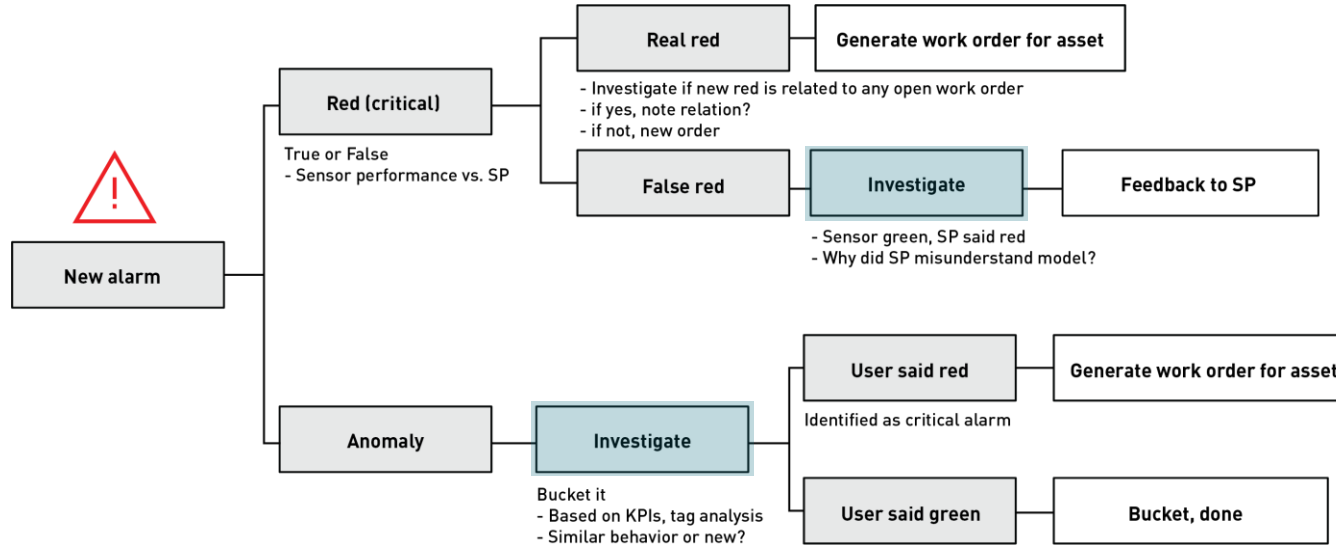


Process Optimization

Moving toward ML in the IoT space

<i>Diagnostic / Prognostic Methodology</i>		
Rule-Based Decision-Making	Statistical Reasoning	Machine Learning / Artificial Intelligence
		
<i>Threshold Detection</i>	<i>Regression</i>	<i>Complex Event Analysis</i>
Reliance on few variables	Allows for curve fitting	Event-level analysis
Examples • Time or threshold-type alarms • Simple pattern matching	Examples • Outlier detection • Predictive maintenance based on known statistical curves	Examples • Identifies relevant features from large datasets • Intelligent decisions • Codify “expert” knowledge in a computer platform

SparkPredict® & MHPS diagnostic process

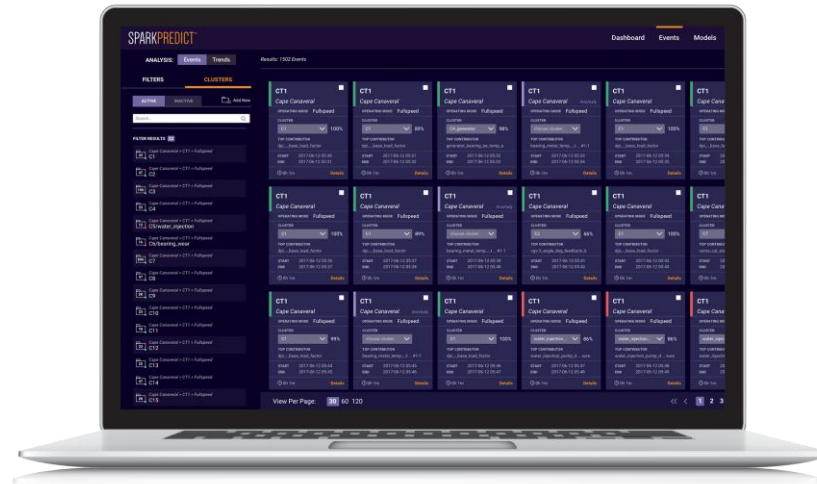


SparkPredict® UI Features

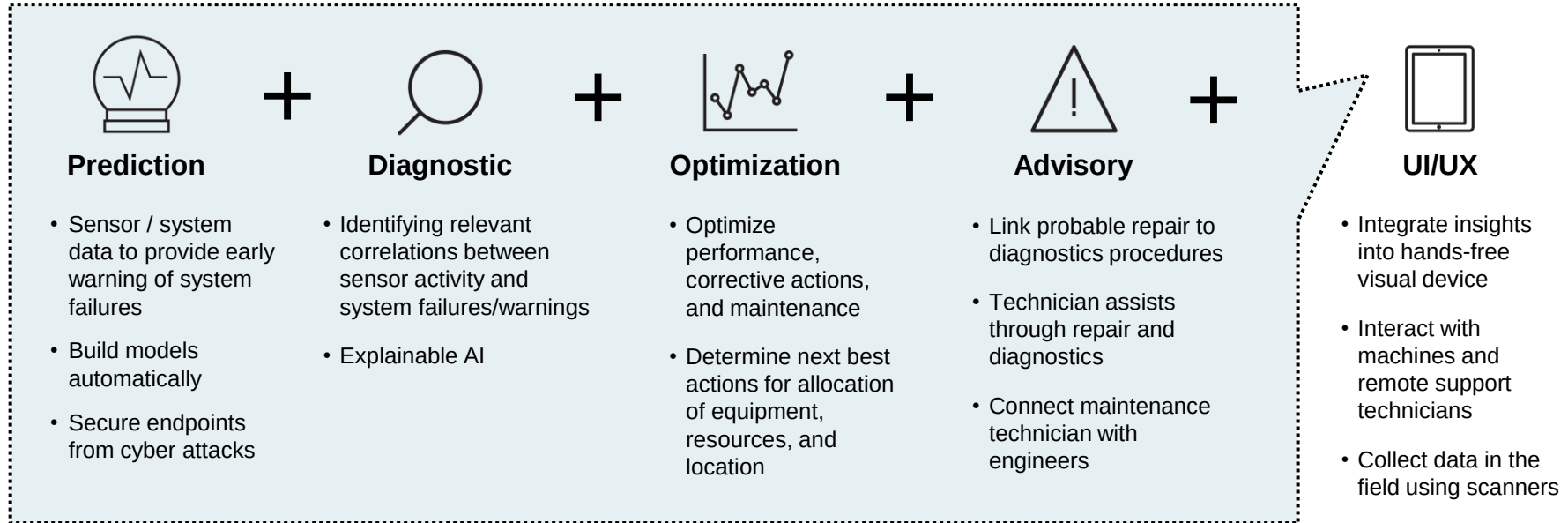
- Advanced Tag Analysis
- Prioritized Contributing Features
- Custom Time Scaling
- Cluster Comparisons
- Feature Filtering

SparkPredict® & MHPS diagnostic process

- Incorporates subject matter expertise into algorithms
- Insights become part of the monitoring system

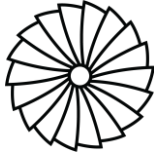


AI is key for the autonomous plant of the future



SparkPredict[®] building blocks

Industrial Asset Data Ingestion



- Turbines
- Compressors
- Generators
- Pumps

Machine Learning Models



- Data Cleansing
- Feature Selection
- Model Building
- Retraining

SME-Friendly Application



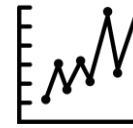
- Alarms
- Analytics
- Diagnostics
- Insights

Deploy Quickly | ***Improve Predictive Results*** | ***Maintain Performance***

Power Generation Case Study

Highlighted use case fault

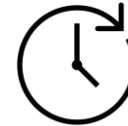
After individual data point and system analysis, the fault profile was determined for a known fault. A summary of the varying data points and signatures were summarized. The goal was to assess the capability of SparkPredict® to detect the same signature.



Analysis of individual data points



Summary of event



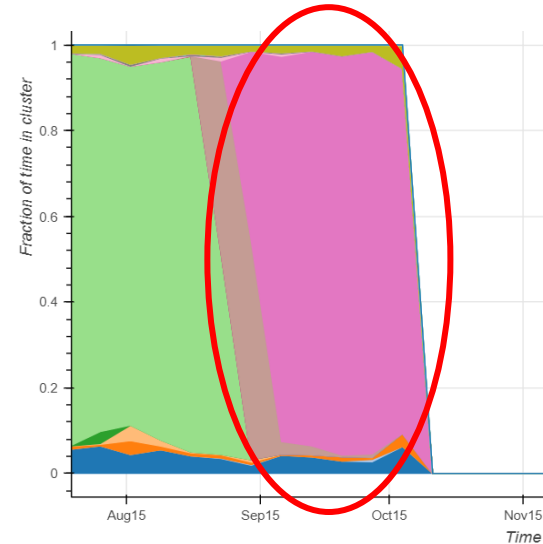
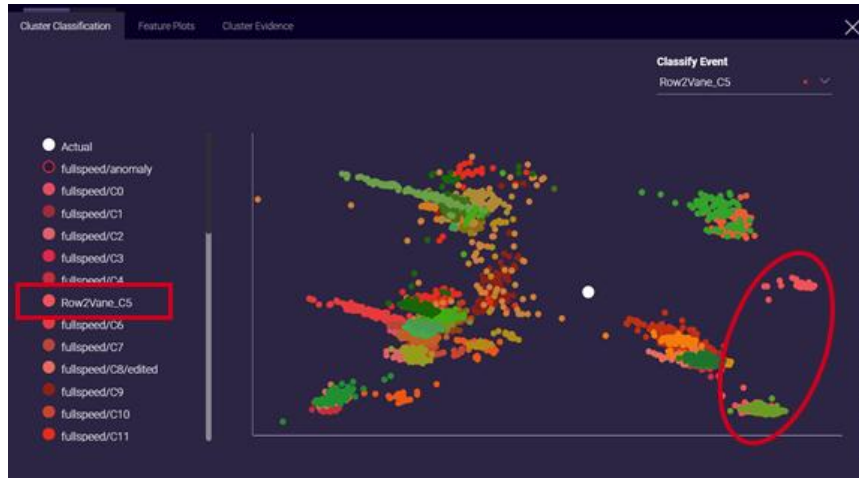
Future analysis recommendation

Data analysis by SparkCognition™



SparkCognition defines operating profiles based on multiple sensors

Fault definition by SparkCognition™



SparkCognition successfully defined the operating profiles prior to the fault

Multivariate data analytics by SparkCognition™

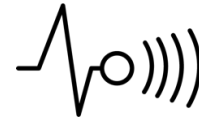


SparkCognition defines operating profiles based on multiple sensors

Summary of proof of concept

- SparkCognition™ was able to classify clusters for several faults over the two year period
- With the input from MHPS Subject Matter experts, we were able to define the fault profiles

MHPS will be able to use these profiles to define faults and quickly determine inspection and troubleshooting efforts to prevent/minimize downtime.



Sensor Data



Analysis & Visualization



Predictive Insights

Future Plans

Total plant initiative MHPS

Common Assets



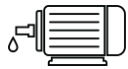
Turbines



Compressors



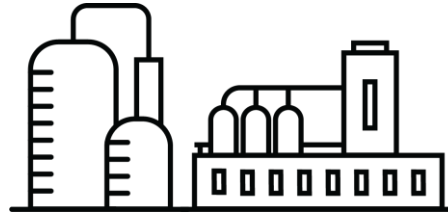
Generators



Pumps



Motors



That Produce

Fuel



Steam



Electricity



Chemicals

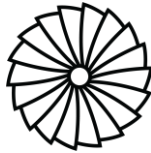


Movement



Next generation maintenance by SparkCognition™

Asset Performance Management (APM)



Monitor



Alert



Diagnose



Decide

SparkPredict®

Predictive Maintenance

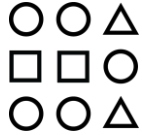
*What is going to fail?
When is it going to fail?
What is the cause?*

DeepNLP™

Prescriptive Maintenance

*How do I fix it?
Where are the parts and labor?
What are the right instructions?*

Natural language processing by SparkCognition™



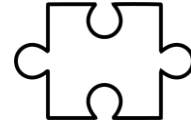
Analyzes unstructured data

Adds structure to documents to understand grammar and context



Understand complex questions

Evaluates possible meanings and determines what is being asked



Presents answers & solutions

Based on supported evidence and quality of information found

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Questions?

Please wait for
the **microphone**

State your
name & company



Please rate this session in the mobile app!

