

# Advanced Analytics and Diagnostics for Fleet-Wide Remote Monitoring

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ECG, Inc.

# Conference Theme & Keywords



# Agenda

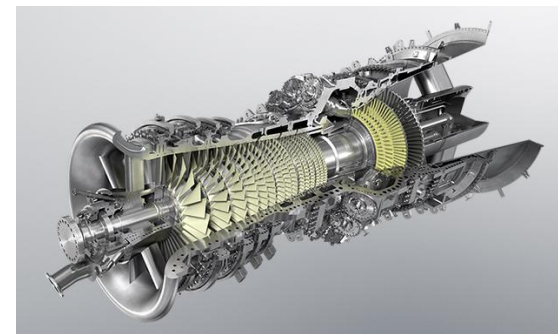
- About Mitsubishi Hitachi Power Systems America, Inc.
- Overview
- APR and Details of Predict-It
- Typical Day
- Results
- Next Steps, Future Plans of Predict-It and MHPS
- Takeaways and Questions

# Overview



Mitsubishi Hitachi  
Power Systems

MHPS monitors 90+ gas turbines and wanted to collaborate with best in class software to create a customized analytics tool, and minimize troubleshooting time.



## CHALLENGE

Finding the most efficient, user friendly, interactive, and collaborative software to customize for our specific needs.

- Looking for applications and suppliers that are:
- Adaptable
- Customizable
- Communicates
- Consistent with Updates

## SOLUTION

MHPSA collaborated with ECG, Inc. to implement Predict-It to create a self contained application that incorporated the data sources required and a software solution tailored to our needs.

- Engineers Identify and Address Issues and Resolve Potential Problems
- Strong collaboration with ECG.

## RESULTS

Engineering review time decreased, using customized views and annotations.

- Streamlined software development usage process to gain quicker reactions to potential issues within the tool and engineering related items.

# About Mitsubishi Hitachi Power Systems

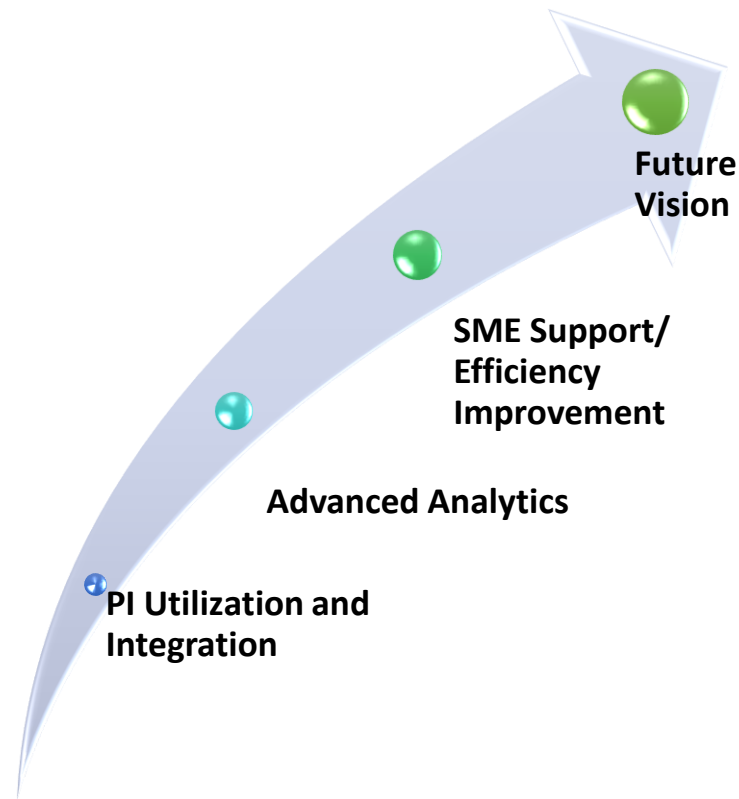
- MHPSA is an industry leader in gas turbine technology.
- The MHPSA Remote Monitoring Center (RMC) by the end of 2018 will be monitoring **90+ gas turbines around the world using the PI System.**
- Connectivity is tailored for the specific requirements of the customer. The RMC monitors OEM and non OEM equipment across turbine classes.
- The RMC is currently moving towards Total Plant Monitoring, and the company as a whole has been focused on digital solutions through the TOMONI™ initiative.



MHPS Digital Solutions  
**TOMONI**

# About Mitsubishi Hitachi Power Systems

- MHPSA 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 Predict-It coupled with Asset Framework and Analytics, and the PI System to drive R&D, mitigate potential issues, and troubleshoot and diagnose problems.



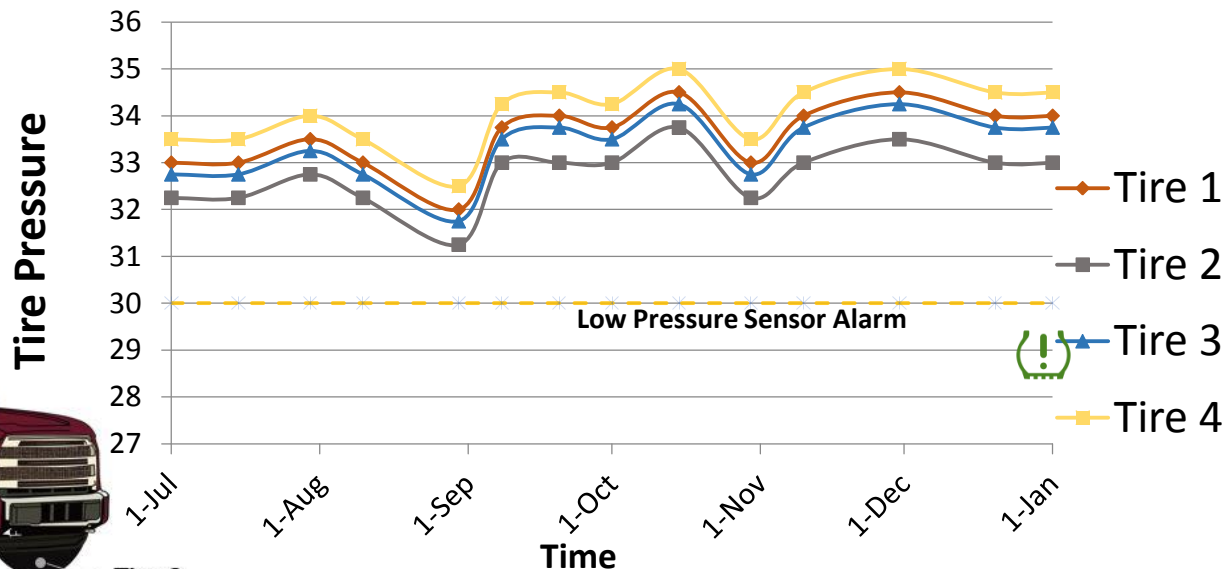
# Introduction to APR and Predict-It

- **Advanced Pattern Recognition (APR)** uses historical tag values to create models for assets based on past performance
- Algorithms detect even the most subtle changes in equipment behavior days, weeks and even months before conventional monitoring techniques
- Predict-It aids MHPSA with reviewing potential problem areas and escalating those requiring further action.



# Predict-It Approach

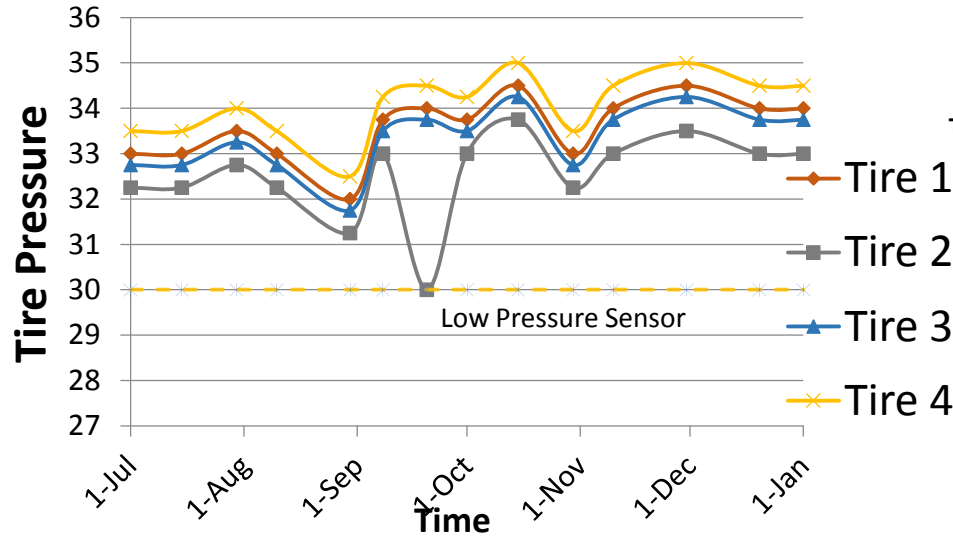
PREDICT<sup>it</sup>



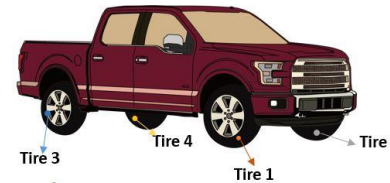
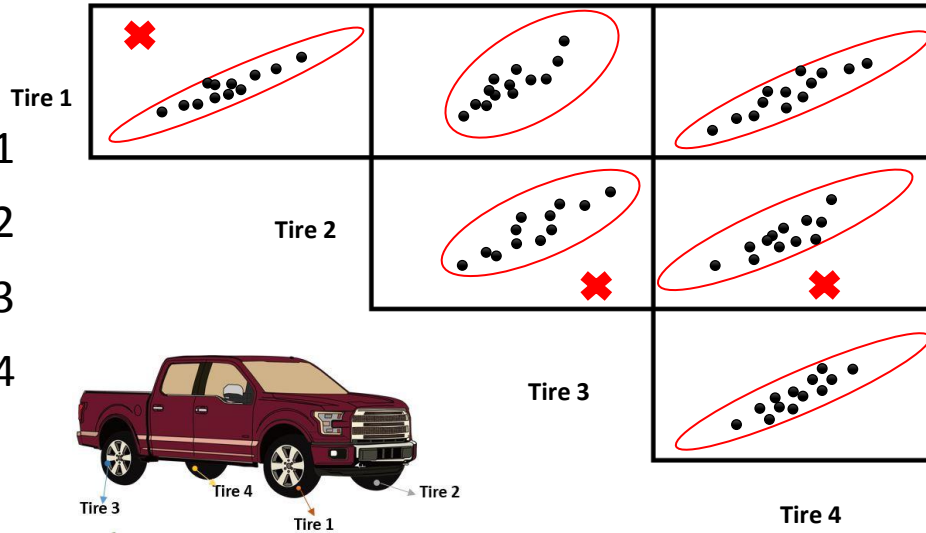


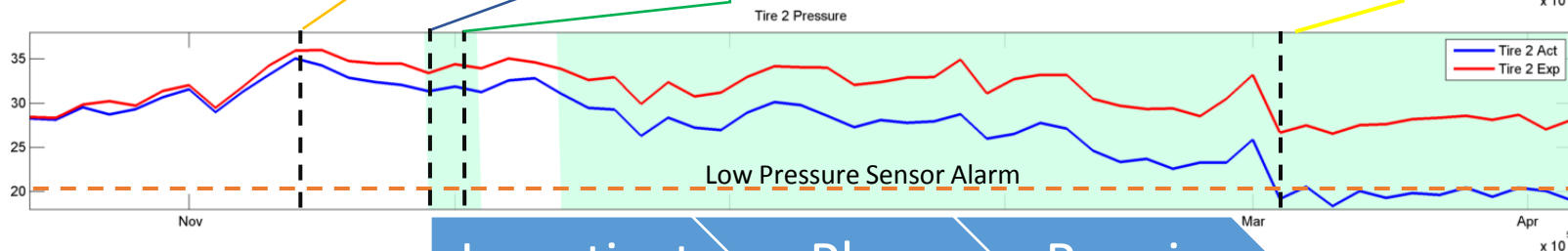
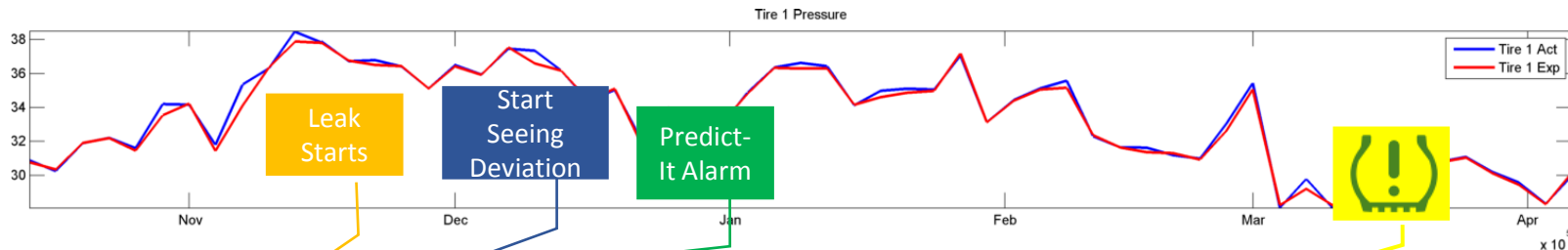
# Predict-It Approach

## Training Data

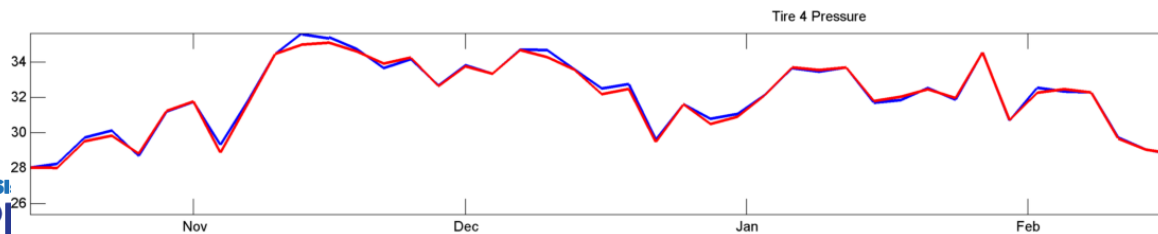
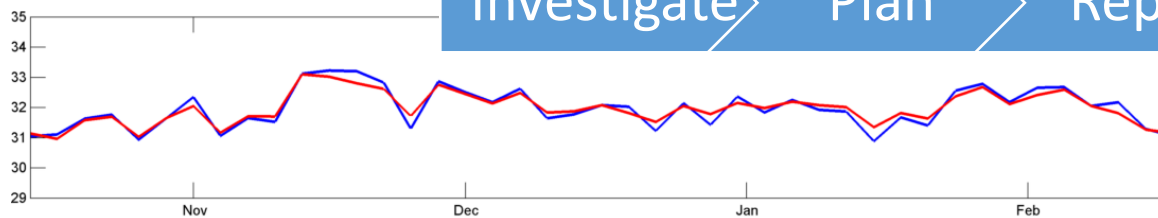


## Scatter Plot





Investigate Plan Repair

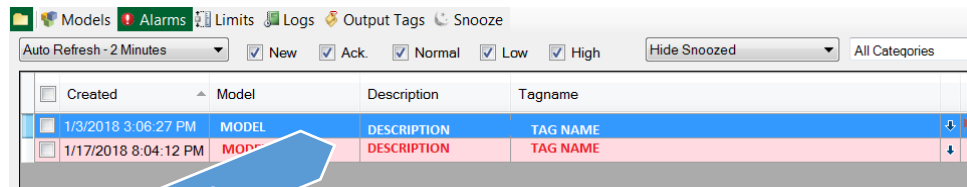


# Connecting It All Together



# Typical Day at MHPS with Predict-It

- Engineering review of new alerts, including duty engineering roles
- In depth analysis and review of trend and modeling data
- If review is deemed not to be a model issue, then a disposition and report is created and provided to the customer



The screenshot shows the 'Alarms' tab in the Predict-It software. At the top, there are tabs for Models, Alarms, Limits, Logs, Output Tags, and Snooze. Below these, there are filters for 'Auto Refresh - 2 Minutes', checkboxes for 'New', 'Ack.', 'Normal', 'Low', and 'High', a 'Hide Snoozed' dropdown, and 'All Categories'. The main table has columns for 'Created', 'Model', 'Description', and 'Tagname'. Two rows are visible: one from 1/3/2018 3:06:27 PM and another from 1/17/2018 8:04:12 PM. The first row is highlighted in blue, and the second row is highlighted in red.

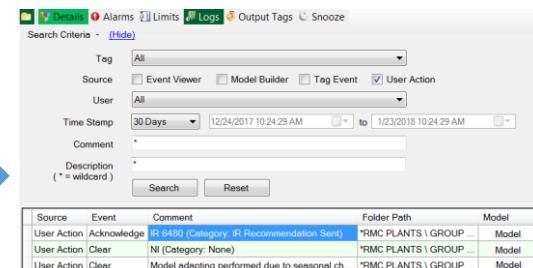
Created	Model	Description	Tagname
1/3/2018 3:06:27 PM	MODEL	DESCRIPTION	TAG NAME
1/17/2018 8:04:12 PM	MODEL	DESCRIPTION	TAG NAME

Alarm



Investigate

Disposition/Note/Action

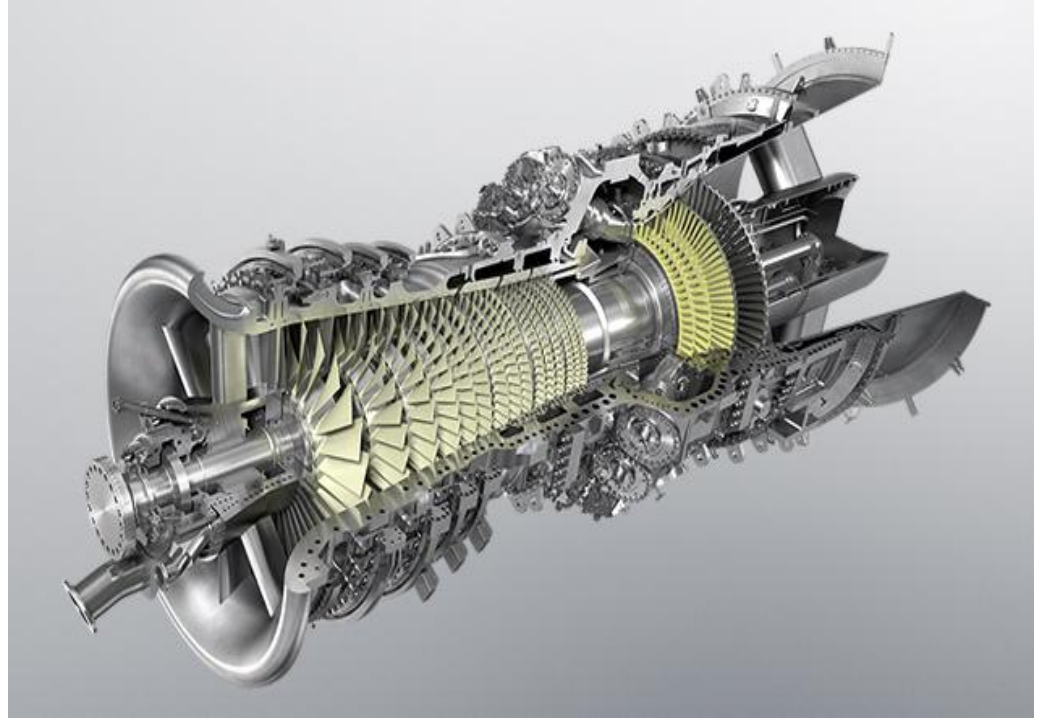


The screenshot shows the 'Details' tab in the Predict-It software. It includes search criteria for 'Tag', 'Source', 'User', 'Time Stamp', and 'Comment'. Below the search criteria, there is a table with columns for 'Source', 'Event', 'Comment', 'Folder Path', and 'Model'. The table contains several rows of data, including 'User Action Acknowledge', 'User Action Clear', and 'Model adapting performed due to seasonal ch...'. The first row is highlighted in blue.

Source	Event	Comment	Folder Path	Model
User Action	Acknowledge	92.6480 (Category: 92 Recommendation Set)	*RMC PLANTS \ GROUP	Model
User Action	Clear	NI (Category: None)	*RMC PLANTS \ GROUP	Model
User Action	Clear	Model adapting performed due to seasonal ch...	*RMC PLANTS \ GROUP	Model

# Typical Day at MHPS with Predict-It

- Early detection of faults aids in improving downtime, and also aids in outage planning and preparation
- Early detection of faults can prevent catastrophic failures, which can result in millions of dollars of lost revenue and/or parts cost



# Interoperability with PI

- Functionality improved, because of the way the software interacts with OSIsoft PI servers we have the ability to review models on any date range that we have data available.
- If a data issue occurs PredictIT has the ability to backfill data.



# Results of Predict-It

- Models update in real time. If an event occurs and no models exists, PredictIT has the ability to create the model after the event took place, and evaluate the event and test for model accuracy.



# Results of Predict-It

- Overall model health and general information on the model is immediately available in the browser, eliminating the time consuming process of individually reviewing models to see its accuracy.

Predict-It 1.0.0.0 (santuccim)

File Edit View Tools System Help

Asset Navigator

No Filter

New... 1:3004 PM

System

- Asset Types
- AA (45)
- AAA Plant (2)
- ACE Power (60)
  - Asset Types
  - AMPower (19)
    - Fans (2)
    - Mills (17)
      - DemoMill
      - MILL 1B (4)
      - MILL 1C (2)
      - MILL 1D (7)
        - ID PA FAN (6)
        - MILL1A Perf (1)
        - MILL1D MODEL
        - MILL 1E (1)
        - MILL 1E - 2017-11-15 10:47:4
        - MILL 1F
        - MILL 1G
        - MILL 1H
        - MILL 1J
        - MILL 1K
        - MILL 1Z
    - Plant 1 (12)
    - Power (3)
    - Reference Tags
    - Venice (18)
    - Weather (8)
    - Alex (54)
    - Caleb (347)
    - Caleb2 (10)
    - Drew (43)
    - folder1
    - folder2
    - folder3

ACE Power

Options

Refresh Acknowledge Clear Comment

Created Model Description Tagname Category Actual

Current Status: HA - 1 Items

Current Status: HQ - 1 Items

8/9/2017 8:53:22 AM \Plant 1 \Unit 1 \BRA \Sinusoid interspersed with bad quality sinusoid

Current Status: HR - 14 Items

Created	Model	Description	Tagname	Category	Actual
1/6/2018 7:34:57 AM	\AMPower \Mills \MILL 1	Weather - Philadelphia, Pa Weather_Temp_PHIL_PA			57.4
1/5/2018 9:20:32 AM	\AMPower \Mills \MILL 1	Weather - Pittsburgh, Penn Weather_Temp_PITT_PA			48.4
11/17/2017 11:59:48 AM	\AMPower \Mills \MILL 1	ECG Mike's Office Temper ECG_TEMP_UL_PO104_Mi			72.4
11/14/2017 6:04:06 AM	\AMPower \Mills \MILL 1	STATOR SLOT 5 H2 TEMP MN_01SCSTE_0002755			55.4
10/10/2017 1:40:21 PM	\AMPower \Mills \MILL 1	STATOR SLOT 3 H2 TEMP MN_01SCSTE_0002753			56.1
10/10/2017 1:40:21 PM	\AMPower \Mills \MILL 1	STATOR SLOT 4 H2 TEMP MN_01SCSTE_0002754			57.4
10/10/2017 1:40:21 PM	\AMPower \Mills \MILL 1	STATOR SLOT 6 H2 TEMP MN_01SCSTE_0002756			54.5
7/20/2017 8:33:42 AM	\Venice \Power123	ECG Chance's Office Temp ECG_TEMP_UL_PO115_Cha			76.5
7/19/2017 9:03:54 PM	\Venice \Power123	Basement Phase C Power ECG_LL_C_Power			2021.4
7/19/2017 4:53:44 PM	\Venice \Power123	ECG Upper Level Break Ro ECG_TEMP_UL_BR110_Upg			77.4
7/15/2017 8:14:16 AM	\Venice \Power123	ECG Vacant Office 2 Temp ECG_TEMP_UL_PO114_Vac			77.1
7/13/2017 10:39:00 AM	\Venice \Power123	ECG Upper Level Receptio ECG_TEMP_UL_REC106_Re			77.3
1/13/2017 9:11:19 AM	\AMPower \Mills \MILL 1	STATOR SLOT 1 H2 TEMP MN_01SCSTE_0002751			59.1
1/13/2017 9:11:19 AM	\AMPower \Mills \MILL 1	STATOR SLOT 2 H2 TEMP MN_01SCSTE_0002752			55.4

Current Status: LA - 10 Items

Current Status: LR - 10 Items

Current Status: NQ - 3 Items

Created	Model	Description	Tagname	Category	Actual
11/2/2017 3:55:24 PM	\Power \MTS Power	Mike Phase A Power Mike_A_Power			137.4
8/9/2017 8:54:21 AM	\Venice \Test1	Stator Temp 02 cdt158 01h FLATLINE			75.4
8/9/2017 8:53:22 AM	\Plant 1 \Unit 1 \BRA \	Sinusoid that periodically DigitalStatesSinusoid			2.0

Current Status: NR - 30 Items

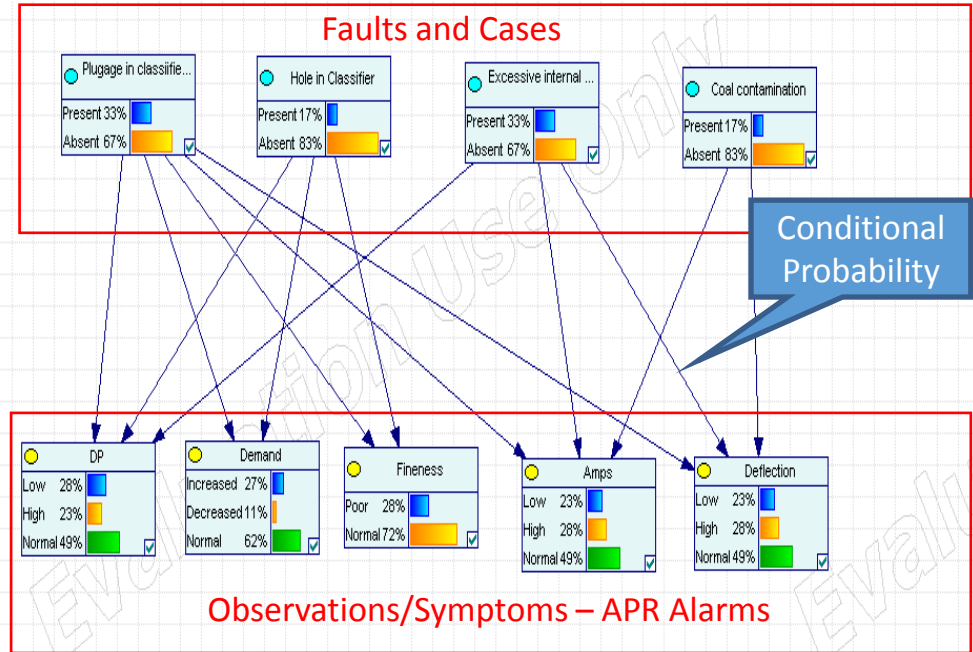
Total Alarm Count: 60

Ready Mike Previous Login: 3/16/2018 12:50:07 PM



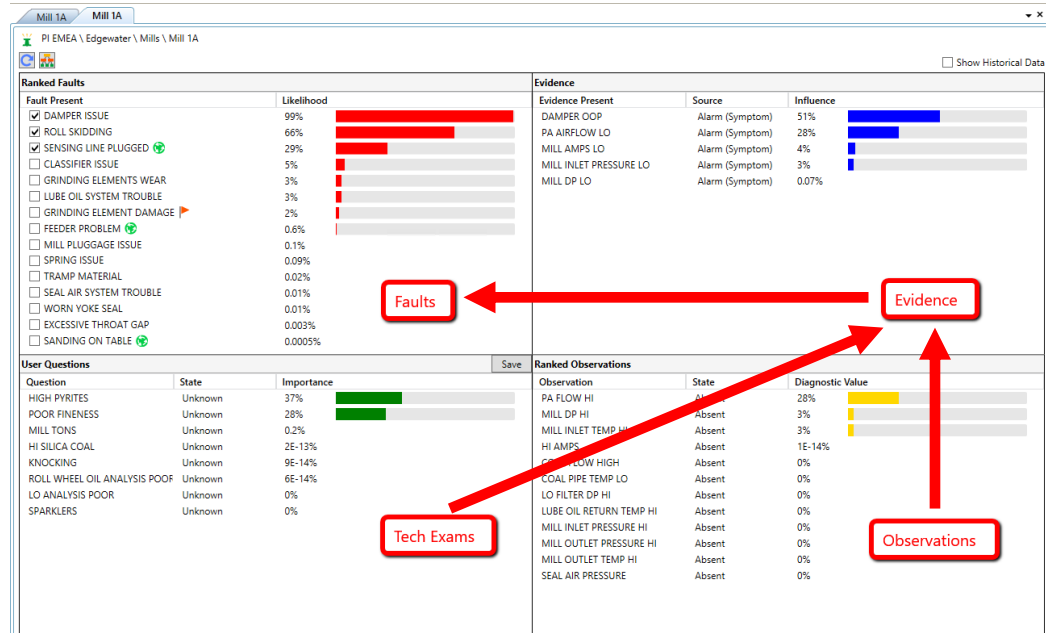
# Next Steps and Future Plans of MHPS and Predict-It

- A major initiative taking place, as a collaboration with ECG, Inc. is the development of a diagnostic advisor.
- Combining our technical expertise and a preliminary version of the diagnostic advisor we are building an APR enabled and Bayesian based tool to calculate the probability of a fault given events as they occur.

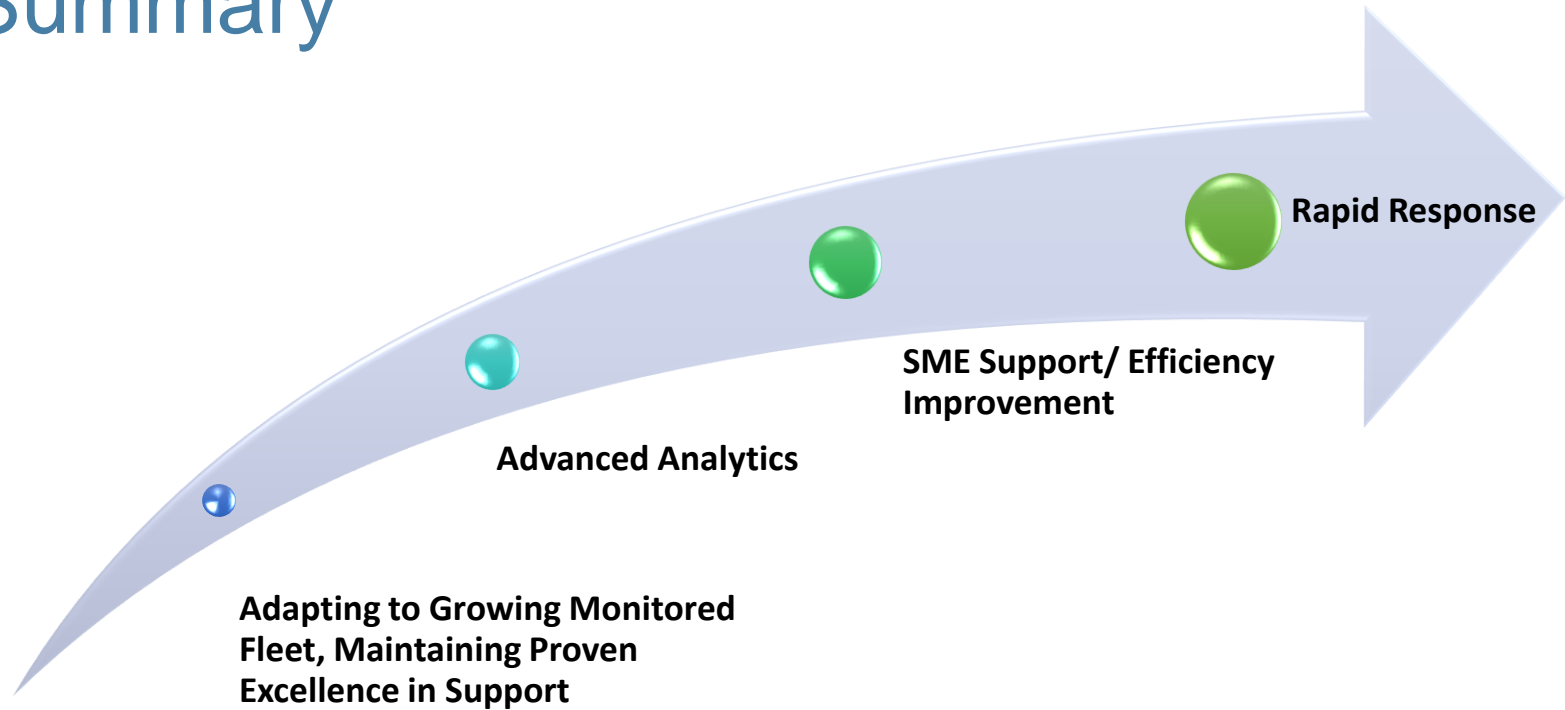


# Next Steps and Future Plans of MHPS and Predict-It

- Future goal will be to attach work instructions for the operators and engineers so that troubleshooting potential major events happens as quickly as possible.
- The tool is also adaptive so that events outside of known diagnosis will be retroactively created when the root cause and indicators are determined.



# Summary



# Questions

Please wait for the **microphone** before asking your questions

State your **name & company**



# Please remember to...

Complete the Online Survey for this session



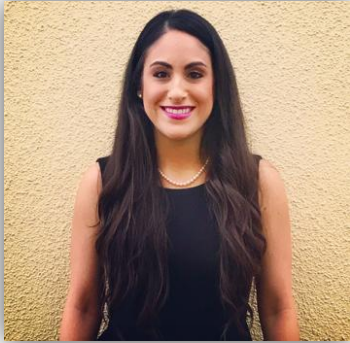
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Sales and Marketing Specialist

ECG, Inc.

Merci

谢谢

Спасибо

Danke

Gracias

Thank You

감사합니다

ありがとう

Grazie

Obrigado

Optional: Click to add a takeaway you  
wish the audience to leave with.