



EQT Midstream – Reliability Centered Maintenance Program

Oscar Smith, Senior Principal Engineer, EQT Corporation

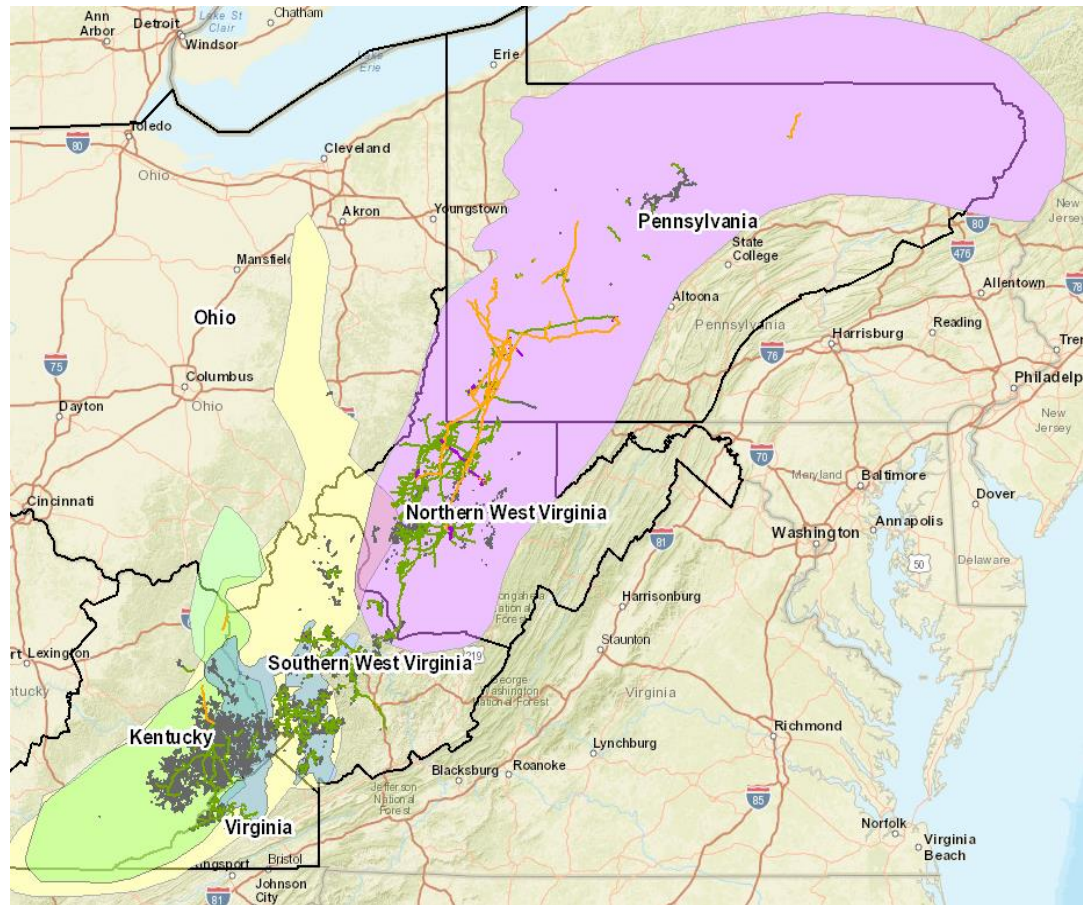
November 2, 2016



EQT Corporation...

Corporate Profile

- Company Headquarters: [Pittsburgh, PA](#)
- 130 Years in the Natural Gas Industry
- Operates throughout six states:
 - Ohio
 - Pennsylvania
 - West Virginia
 - Kentucky
 - Virginia
 - Texas
- Operating segments:
 - EQT Midstream - Gathering
 - EQT Midstream – Transmission
 - EQT - Production



EQT's Participation in the Natural Gas Value Chain



Project Focus: EQT Midstream Partners...

- Transmission:
 - Approximately 950 miles of FERC-regulated interstate pipeline connecting to seven interstate pipelines and multiple distribution companies.
 - Eighteen natural gas storage reservoirs with approximately 660 MMcf per day of peak delivery capability and 47 Bcf of working gas capacity
- Gathering:
 - Approximately 1,800 miles of gathering lines
 - Marcellus gathering capacity is approximately 2 Billion Cubic Feet per day
- Pipeline Compression Assets:
 - Engine/Compression Units ~100
 - Compression Facilities 37 with 200,000 HP



Business Challenge...

- **RCM Notifications** - What is difference between SCADA Alarm and a RCM Notification?
 - **SCADA Alarm** – Is a critical event that impacts the safe operation of a pipeline and/or facility. Immediate attention and subsequent actions are required by EQT Gas Control and Field Operations.
 - **RCM Notification** – Is an early warning event that is triggered well before a SCADA Alarm is triggered. An RCM notification is intended to make key personnel aware of a potential impending issue. Immediate attention is not required.



Technical Challenge...

- **Implement a Reliability Centered Maintenance (RCM) program**
 - Across roughly 650 Geographic Miles from Pennsylvania to Kentucky
 - Across numerous stand alone functional data systems

Data Systems

- SCADA
- Maximo
- Cognos
- Flowcal
- Automated Field Data
- Data Warehouse
- Emails
- Manual collection
- Control Systems



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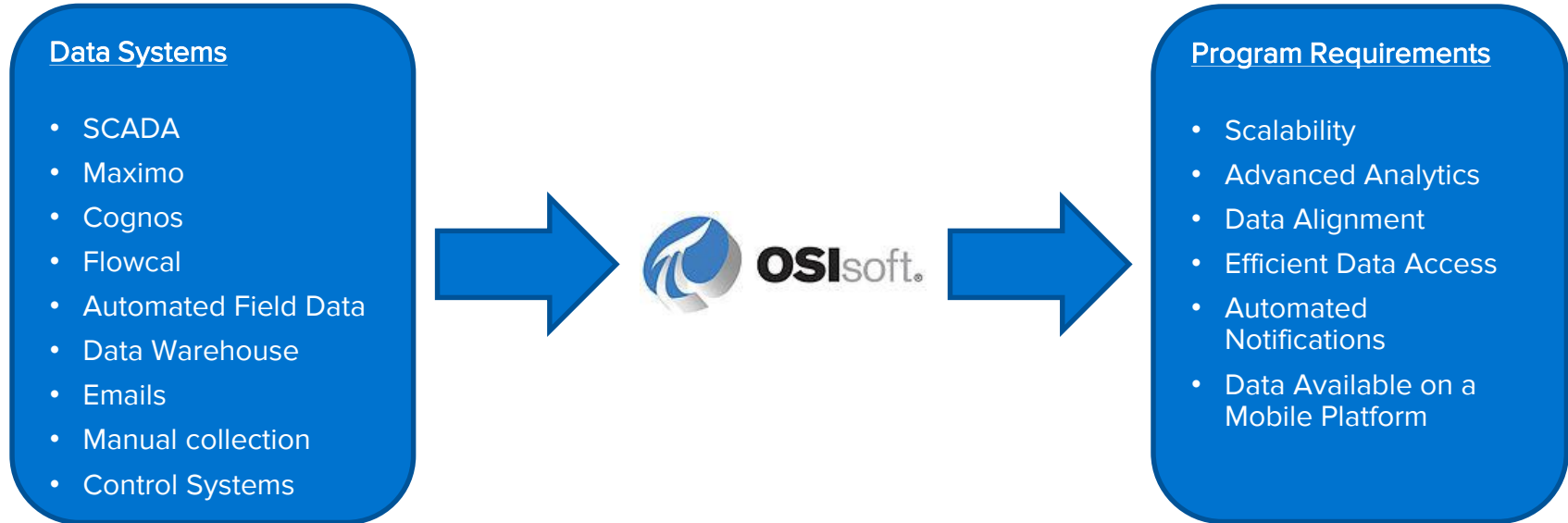
Program Requirements

- Scalability
- Advanced Analytics
- Data Alignment
- Efficient Data Access
- Automated Notifications
- Data Available on a Mobile Platform



Technical Challenge...

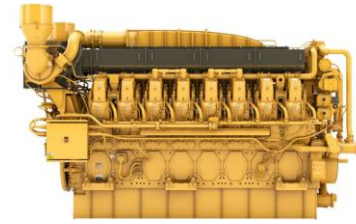
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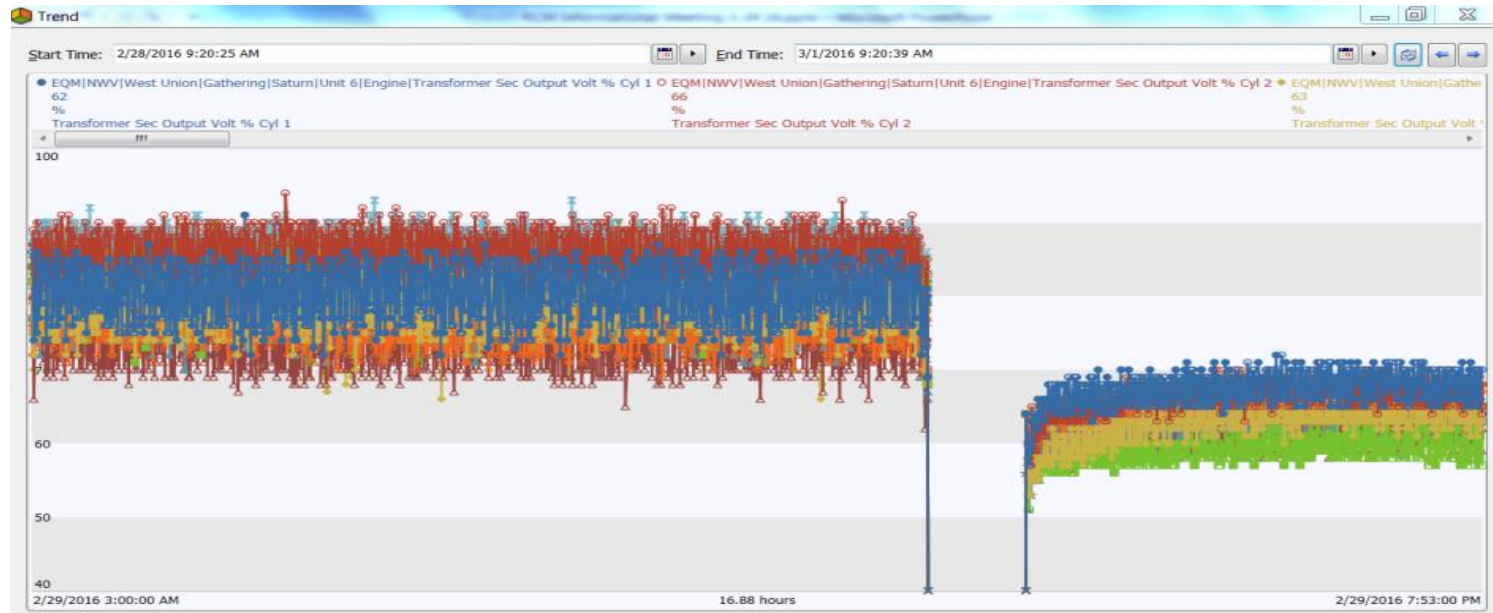
2016 Condition Based Maintenance Program...

- Scope:
 - Included five Compression Stations across two states totaling roughly 100,000 Horsepower.
 - Required collecting and archiving of roughly 30,000 PI data streams (tags) every second.
- Resulting Initiatives:
 - Development of a Spark plug replacement program
 - Proactive Station Hydrate Formation Predictions
 - Speed Governor Linkage Analysis.

Sparkplug Replacement Initiative...



- Results: Planned Maintenance Shutdowns!
 - Spark plug replacement scheduled for February 29th.



Station Hydrate Formation Initiative...

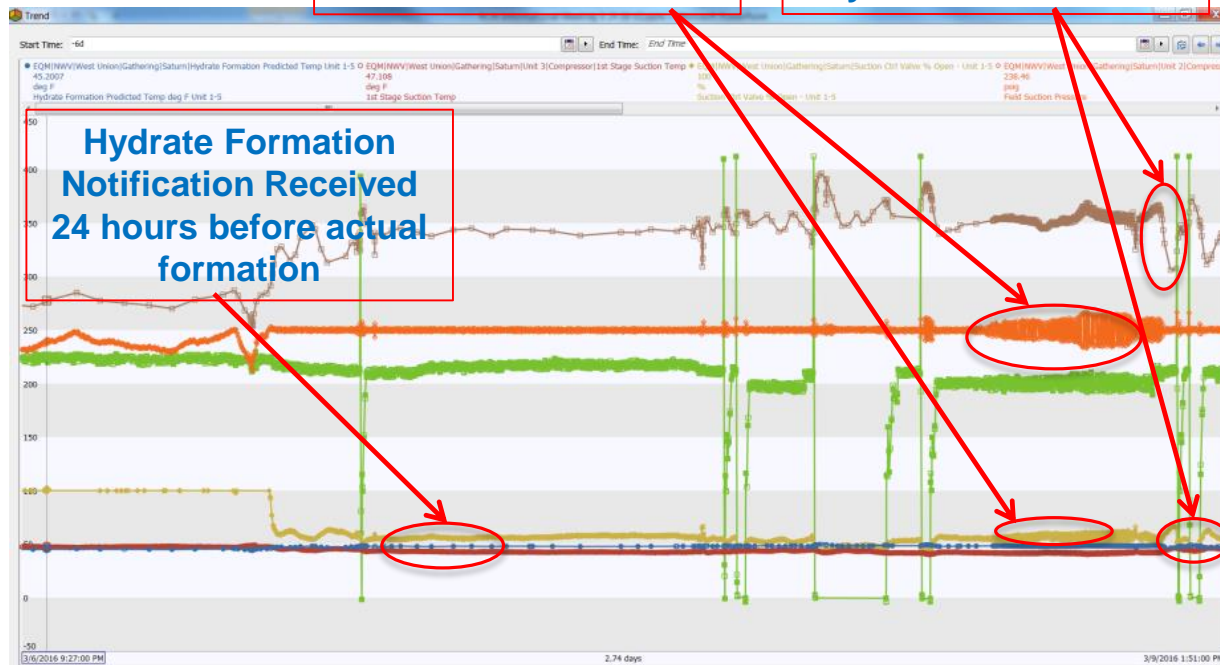


- Station Hydration Formation
 - Problem
 - Restriction in pipe – Causing Unplanned Shutdowns
 - Gas quality issues with Downstream Customers
- Results: Proactive Station Hydration Formation Predictions!
 - Significant Cost Savings to EQT/Month

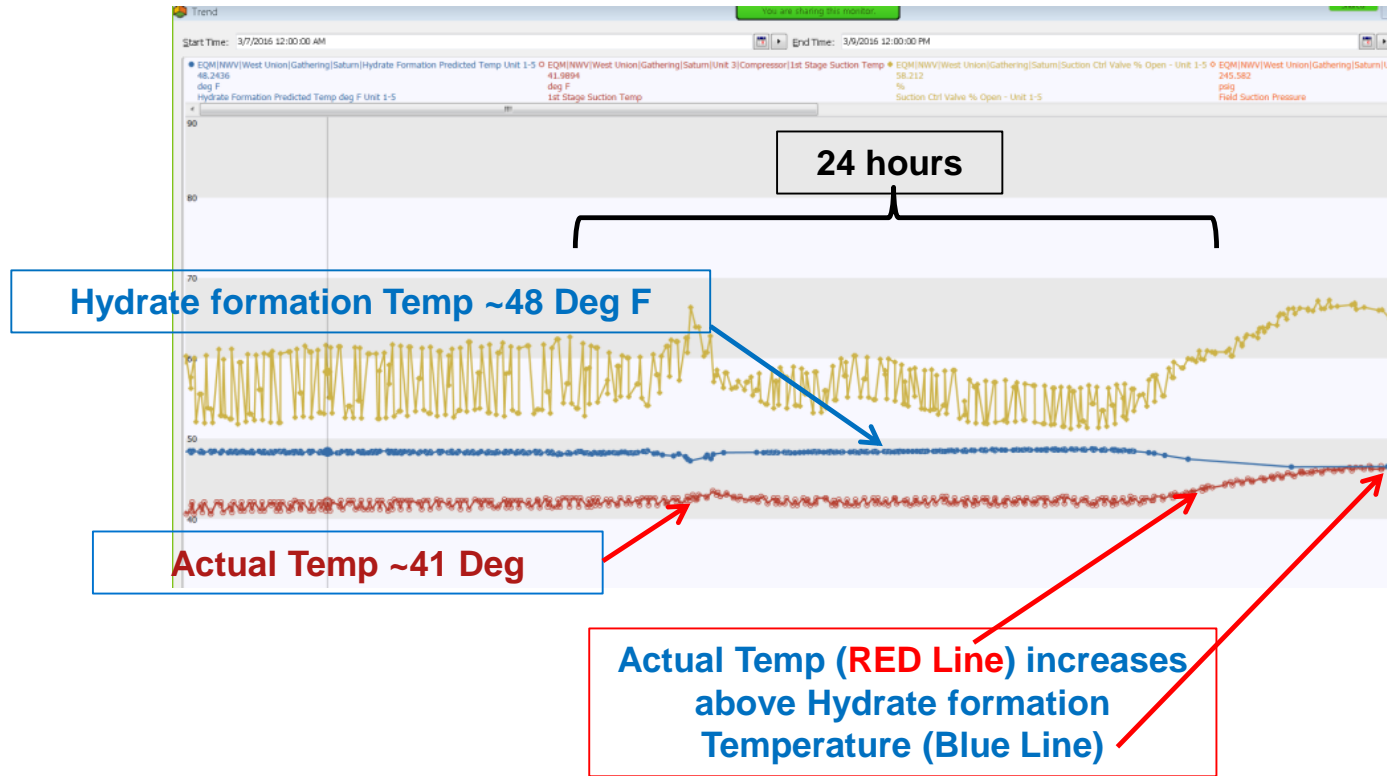
Station Hydrate Formation Initiative...

Hydrate Beginning to Form ~24 hours Later
Cycling Valve and
Pressure fluctuations

Field Well Pressures
reduced
Temperatures rise
Hydration eliminated

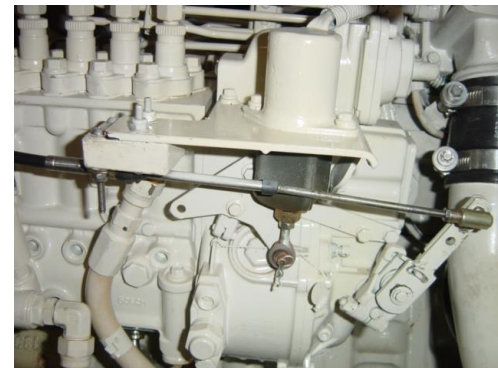


Station Hydrate Formation Initiative...



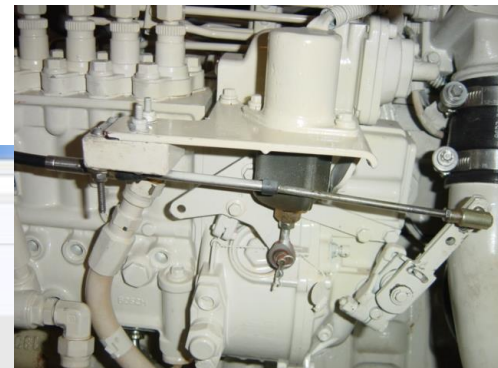
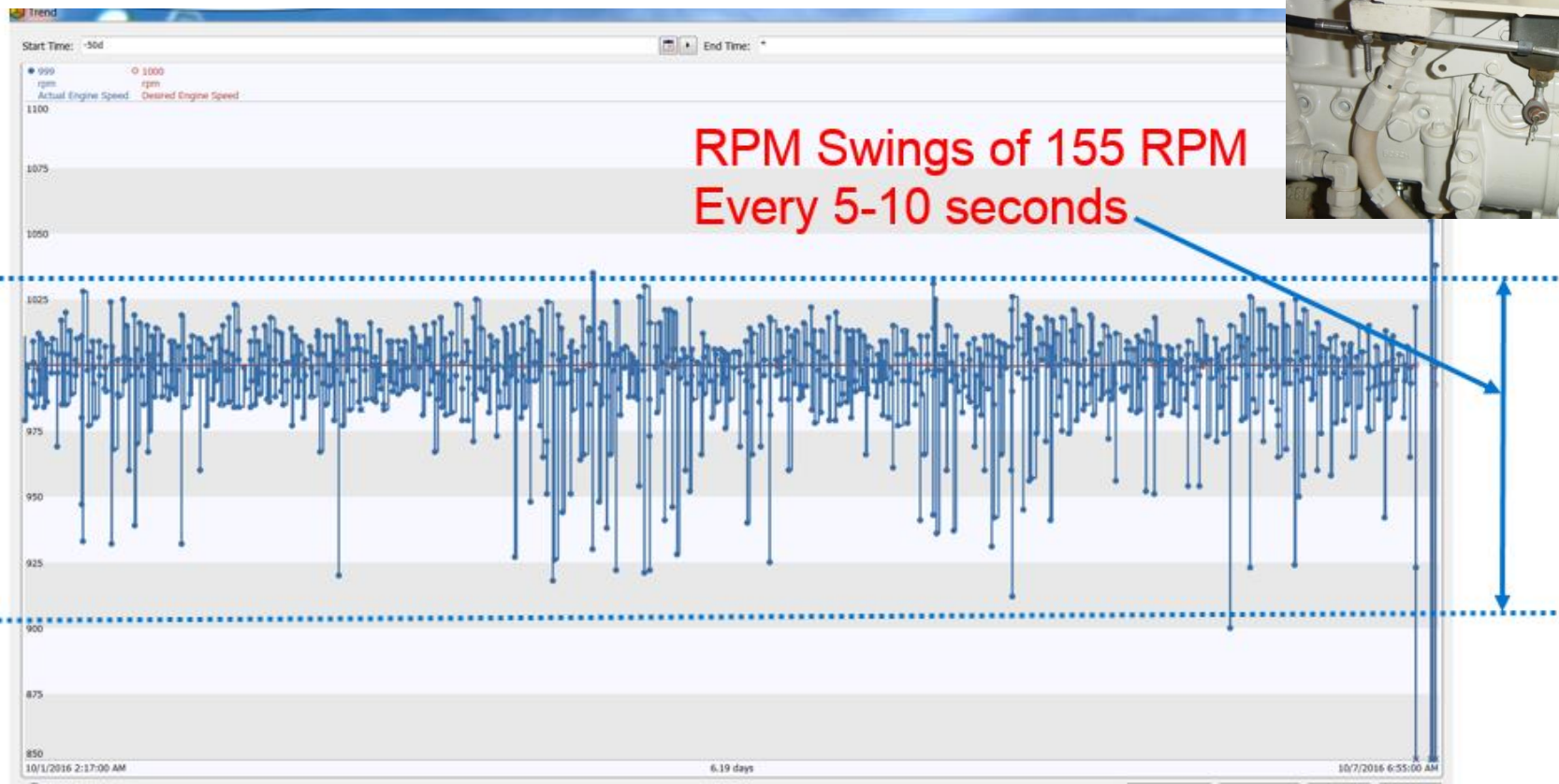
Speed Governor Linkage Initiative...

- Speed Governor Linkage
 - Problem
 - RPM Swings cause unplanned shutdowns
 - Currently difficult to troubleshoot
- Results: Automated Alerts enable planning of maintenance outages!

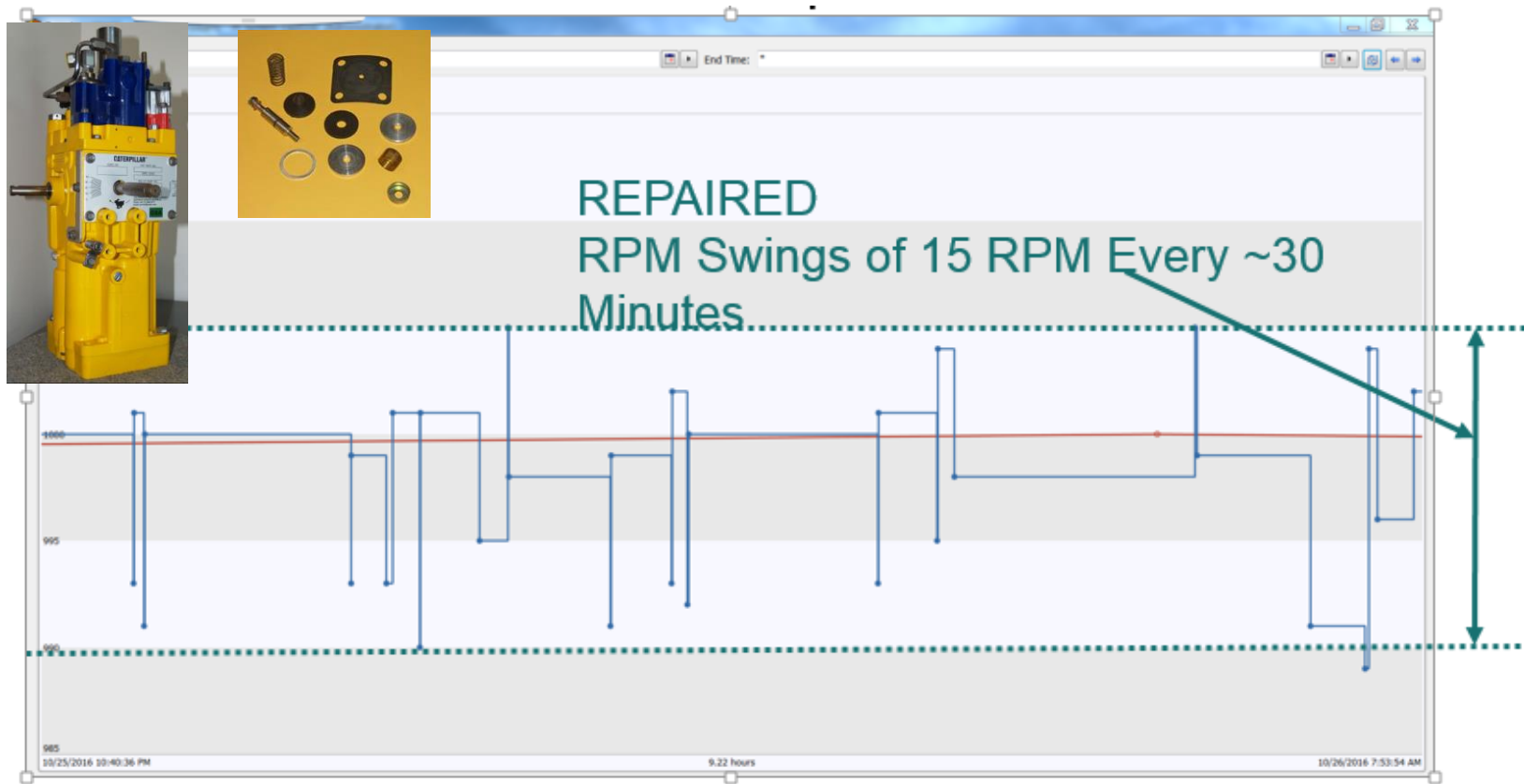


Notification Name	Occurrences in Last 24 Hours	Occurrences in Last Week	Occurrences in Last Month	Occurrences YTD	Date of Last Occurrence	Level
Saturn - Unit 3 - Eng - Speed High Delta Alert	7	64	169	410	10/3/2016 7:26	Level 1
Saturn - Unit 3 - Eng - High Fuel Position % Alert	0	8	11	11	10/1/2016 14:03	Level 1
Saturn - Unit 3 - Comp - Throw High Disch Temp Theo v Actual Alert	0	6	14	275	10/1/2016 21:15	Level 2
Saturn - Unit 3 - Comp - Shutdown Alert	0	4	10	51	9/29/2016 20:15	Level 1
Saturn - Unit 3 - Comp - Low Speed Alert	0	2	4	17	10/1/2016 11:25	Level 3
Saturn - Unit 3 - Eng - Load % Alert	0	1	1	6	9/29/2016 19:08	Level 2

Speed Governor Linkage Initiative...



Speed Governor Linkage Initiative...



Summary of the RCM Journey...

COMPANY and GOAL

EQT Corporation has been in the Natural Gas Industry for 130 years. The objective was to develop a scalable system that could Monitor, Control & Optimize Pipeline and Facility Operations across the EQT Midstream business segment.



CHALLENGE

Develop a scalable Reliability Centered Maintenance (RCM) program.

- Accessing multi data sources
- Operational data visualization
- Improved analysis tools
- Automated notifications

SOLUTION

Implement the OSIsoft Real-time data and events infrastructure across five compression stations, two states and roughly 100,000 horsepower.

- PI Server & Asset Framework & Visualization tools

RESULTS

The initial RCM program deployment is complete. Currently planning to expand the RCM program across additional compression stations in 2017.

- Sparkplug replacement program
- Proactive station hydrate formation predictions.
- Speed governor linkage analysis

Significant Cost Savings to EQT!



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Questions

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



State your **name & company**

Please remember to...

Complete the Survey for this session

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Safeco Field – Seattle, WA – September 20, 2016

Evaluation Form

Name: _____ Company: _____
Email: _____

Quality of presentations

	Poor	Good	Excellent	N/A
1. Digital Transformation with Today's PI System – OSIsoft	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. PI Coresight 2016: New Vision, New Display Editor, New Look and Feel – OSIsoft	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Monitoring Health and Performance of Grid-Scale Energy Storage Systems – UniEnergy Technologies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Using PI Integrators to Improve the Value of your PI Data – OSIsoft	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. PI Asset Framework Ties Together Enterprise OEE for Clearwater Paper – Clearwater Paper	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Solving Business Initiatives with the PI System – OSIsoft	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. PI Analytics and Coresight for Business Process Improvement – Arista	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Seeq helps customers get even more value from their OSIsoft PI System – Seeq Inc.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. What's Really Going on with your Beer's Fermentation? – Deschutes Brewery	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Quality of seminar

	Poor	Good	Excellent	N/A
1. Presentation topics meeting your needs or interests	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Time allowed for lunch/breaks/discussions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Pace and time allocated to the presentations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Thank You



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