Turning **insight** into **action**.

OSIsoft. USERS CONFERENCE 2011

Repairable Component Modeling: Natural Gas Transmission System

Presented by **John M. Cox, NiSource**
Matt Parks, NiSource

Agenda

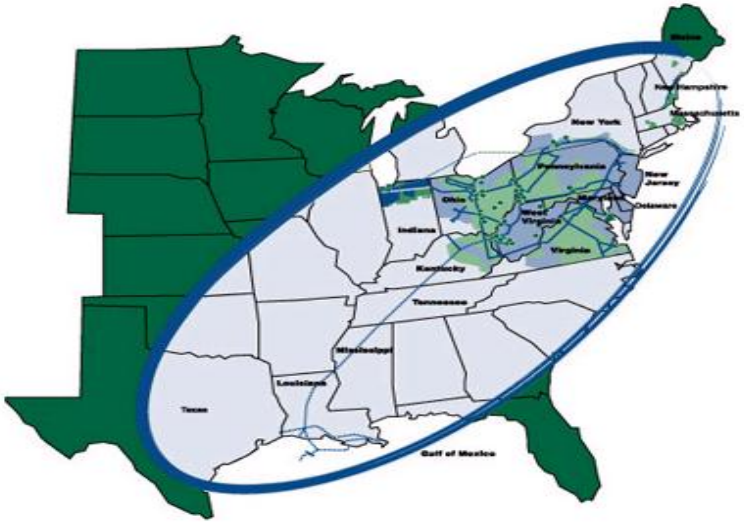
- Natural gas system adoption of a dual complimentary reliability strategy – O&M stakeholder defect elimination and a cultural transformation to long term strategic reliability growth.
  - NiSource Gas Transmission and Storage
  - Reliability and RCM Background
  - Evolution to Long Term Reliability Growth
  - Strategic Reliability and Subcharters
  - Evolution and Continuous Improvement

About NiSource

- NiSource Inc. (NYSE: NI), based in Merrillville, Ind., is a Fortune 500 company engaged in natural gas transmission, storage and distribution, as well as electric generation, transmission and distribution. NiSource operating companies deliver energy to 3.8 million customers located within the high-demand energy corridor stretching from the Gulf Coast through the Midwest to New England.

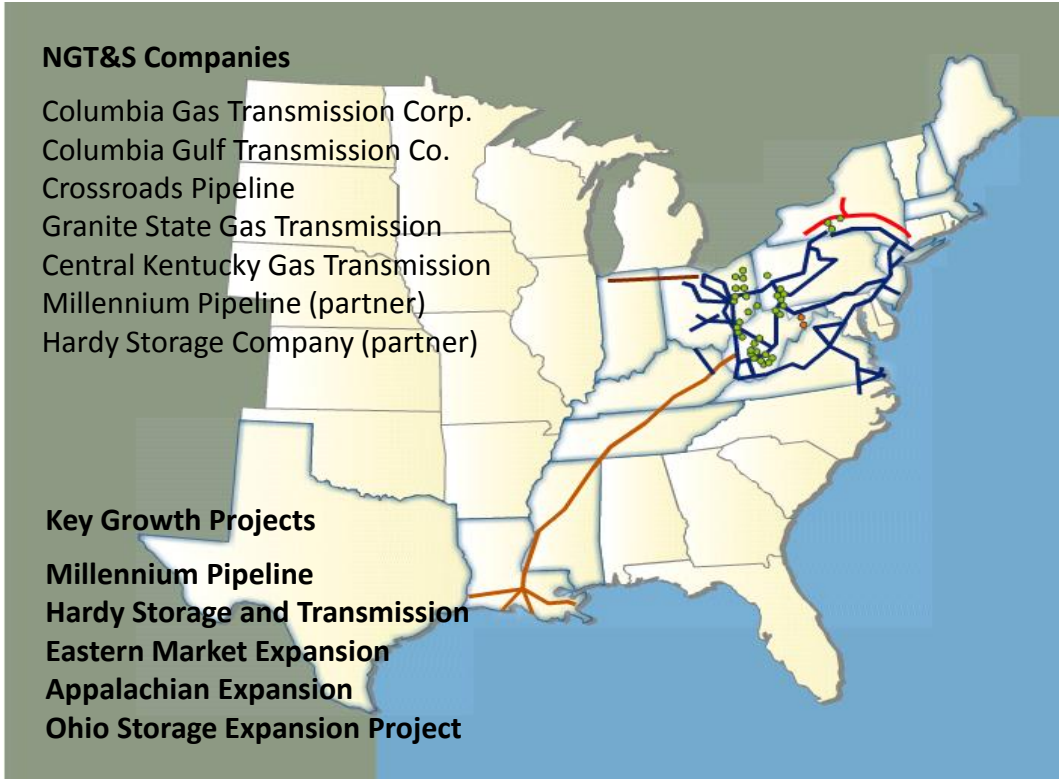
Subsidiaries:

- Bay State Gas
- Columbia Gas of Kentucky
- Columbia Gas of Maryland
- Columbia Gas of Ohio
- Columbia Gas of Pennsylvania
- Columbia Gas of Virginia
- Columbia Gas Transmission
- Columbia Gulf Transmission
- NiSource Retail Services
- Crossroads Pipeline
- Energy USA-TPC
- Kokomo Gas and Fuel
- NIFL



NiSource Gas Transmission & Storage

- **Employees:** 1,571
- **Total Payroll:** $98 million
- **Operating States:** 17
- **Miles of Pipe:** approximately 14,000
- **Compressor Stations:** 100
- **Total Horsepower:** About 1.1 million
- **Annual Deliveries:** About 1 trillion cubic feet
- **Number of customers:** 72 LDCs and a variety of commercial users
- **Storage Fields:** 37 in four states
- **Total Storage Capacity:** 590 billion cubic feet
- **Total Working Gas:** 253 billion cubic feet
- **Peak Day Deliveries:** 7.4 billion cubic feet (4.5 bcf from storage)
- **State taxes paid annually:** $58.6 million



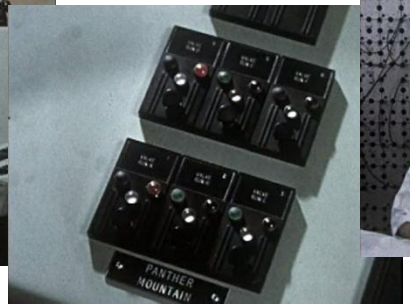
RCM Background

- Began RCM approach in 1999-2000
- Understanding of key functionality
- Sound foundation of FMECA developed for critical systems
- Maximo engaged as enterprise CMMS
- Revitalization of RCM in 2009 gave awareness of in depth information available and potential use and growth

Program Transformation

- At the core, data must be transformed into knowledge and that knowledge must be connected to tangible actions for risk mitigation. With a vision of common platform integration and a solid framework of OSIsoft PI System tools, we are migrating toward Microsoft SharePoint as a central hub of knowledge transfer into actions.
- To meet the needs of the customers and maintain total system awareness of the entire transmission and storage process, NGT&S is changing the way we think about data; data becoming information; and information becoming actionable knowledge.
- That knowledge empowers stakeholder employees to autonomously monitor and maintain assets for which they are responsible.

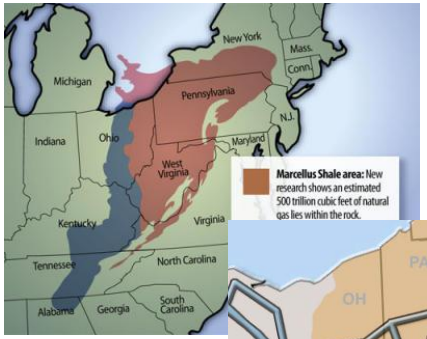
Industry Drivers



1950s Gas Control and Engineering

Currently In Service 1960s Unit Controls and Gages

Industry Drivers



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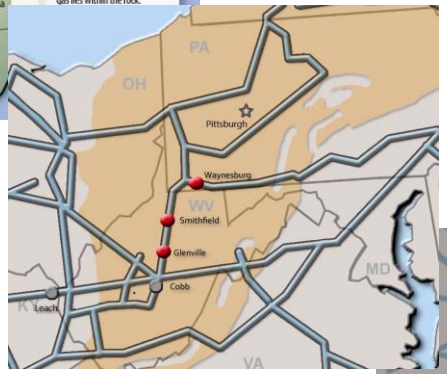
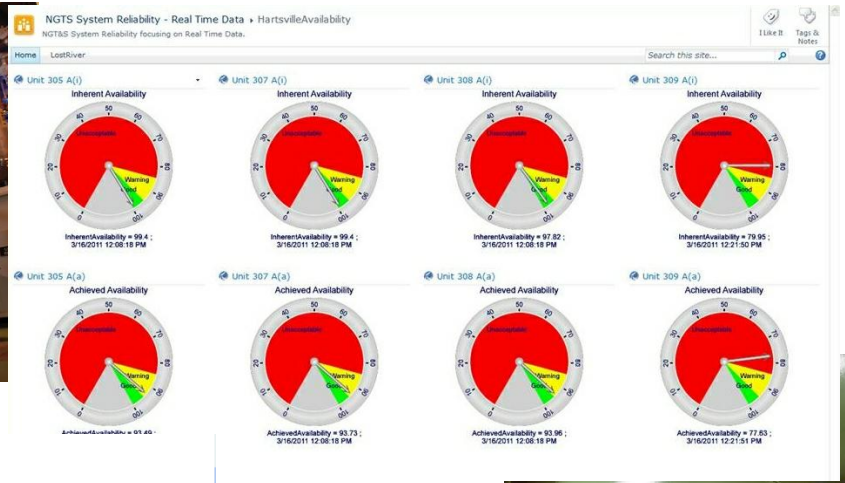


Smithfield Expansion

Southern Appalachia Growth

Personal Connection Between Workers and KPIs

Turbine Engines



Excel Web Access - ExcelWebPart

	A	B	C	D	E
1	Data Availability	Previous Day	Previous Week	Year to Date	YTD Unavailable Hours
2	Unit 5	100.0%	94.0%	64.9%	607.2
3	Unit 7	100.0%	94.0%	65.7%	592.9
4	Unit 8	100.0%	94.0%	66.2%	584.0
5	Unit 9	100.0%	94.0%	65.0%	604.1
6					

DataAvailability | OverView

A Look Into the Future

- Currently
  - 150K PI Server HA and upgrading to 200K
  - PI ACE
  - PI AF
  - PI DataLink
  - PI ProcessBook
  - iFix Interface
  - PI MCN Health Monitor
  - ODBC
  - Two custom PI interfaces

- Future
  - OSIsoft Enterprise Agreement
  - PI WebParts
  - PI Manual Logger
  - PI Notifications
  - PI OLEDB
  - Sigmafine
  - PI DataLink Server

NGT&S System Reliability Directive

- **Effective risk management, data analysis, coordination and execution will assure system availability and reliability by meeting all firm customer obligations.**

- Simply put, when a specific compression unit is required to be available to Gas Control based on the constraints – current and/or future – thereby making the constraints based selection of compression far beyond the capabilities of traditional SCADA

Strategic Reliability Growth Initiatives

Purpose: To manage risk of meeting firm customer requirements

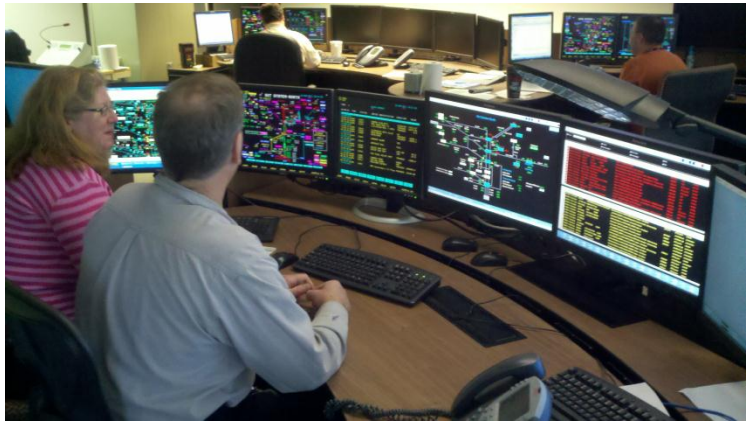
4 Interconnected Sub-Groups:

Critical Assessment System Strategy

Core Reliability

Real Time Data Systems

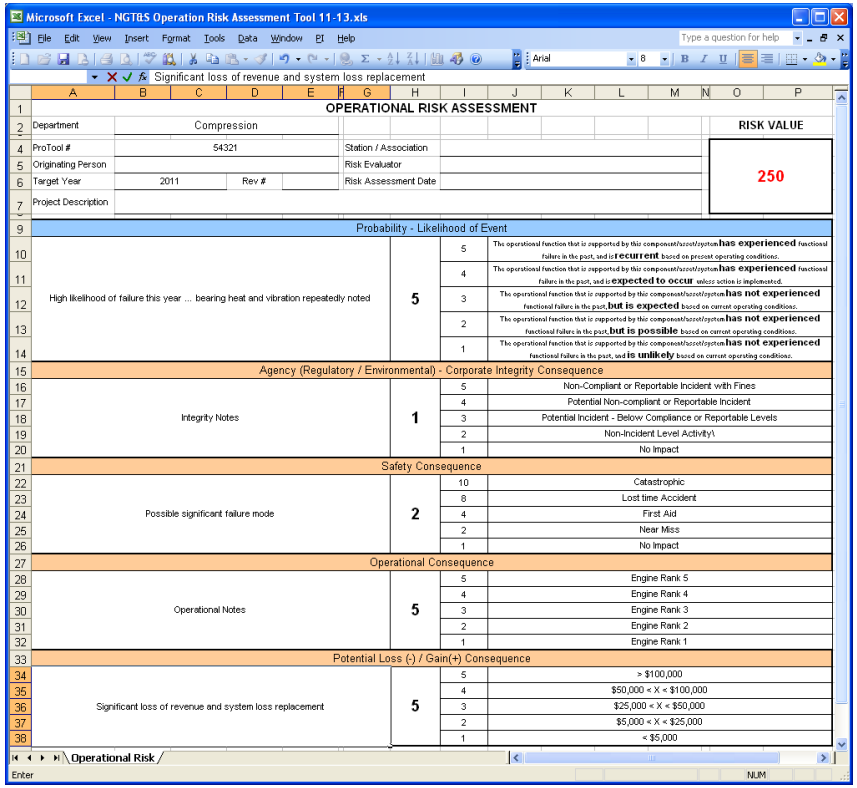
Modernization & Automation



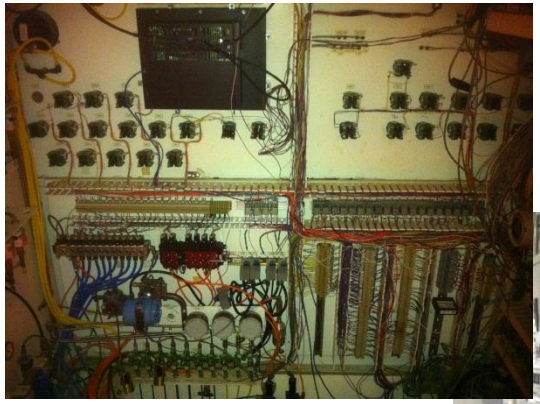
Reliability End State

- Where we want to be:
  - Reliability Program – Define and document effective and efficient maintenance processes & procedures, based on reliability best practices, that when executed will exceed customer requirements.
  - System Assessment and Strategy - Criticality rankings of facilities will be known and available. System reliability improvement and maintenance strategies will be in place.
  - Facility Modernization - NGT&S has a living, near and long term strategy for modernizing and automating its gas transmission and storage system that meets reliability, environmental, optimization and market goals.
  - Real Time Systems - Reliable, accurate operational information that is readily available and easily accessed to proactively enable system reliability efforts

Evolution to Long Term Reliability Growth

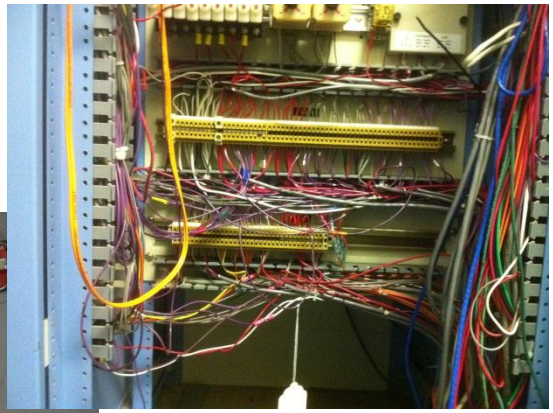


Comprehensive Real-Time Infrastructure



Station Control Panel

Motor Control Center

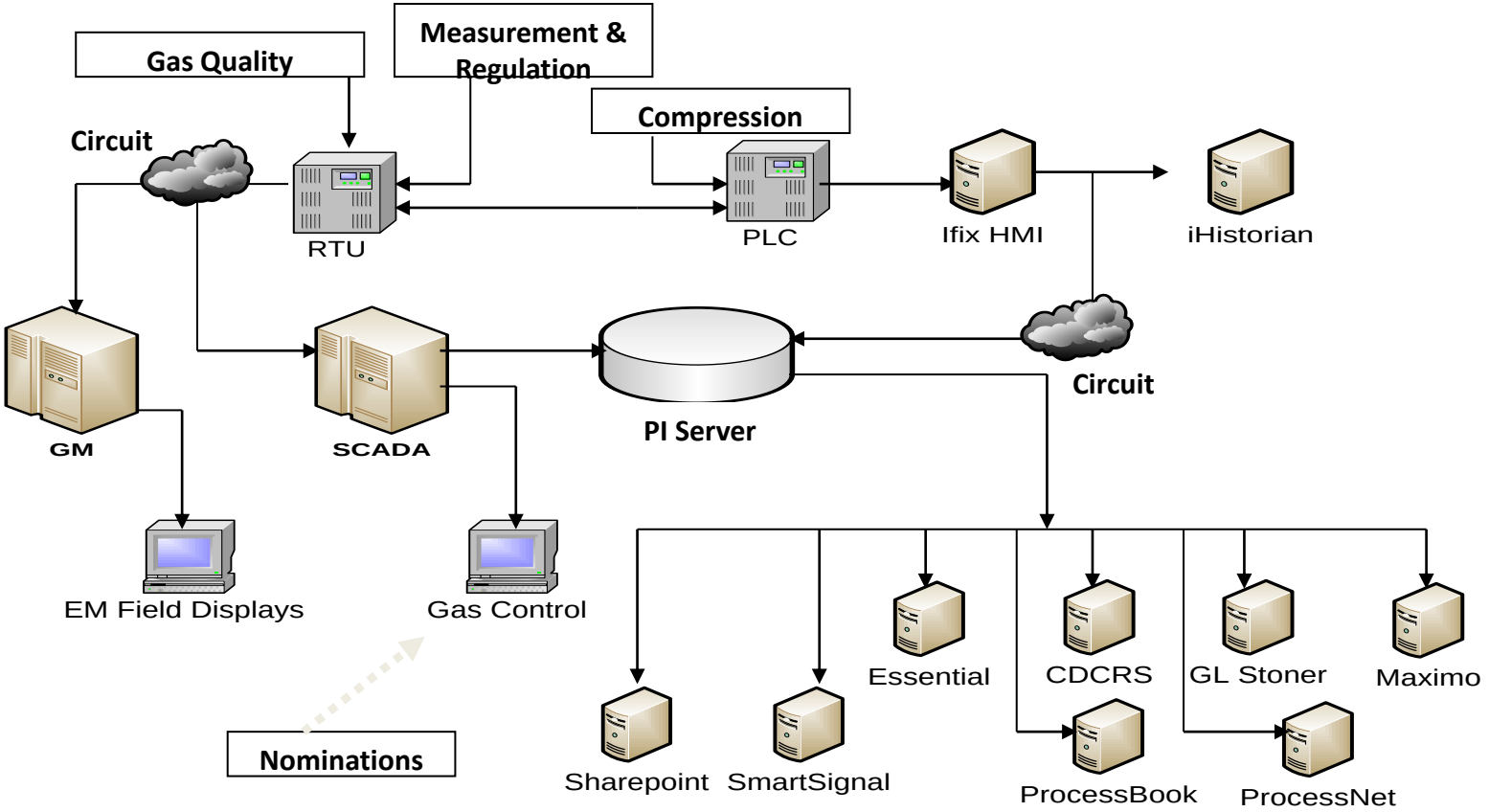


Unit Control Panel

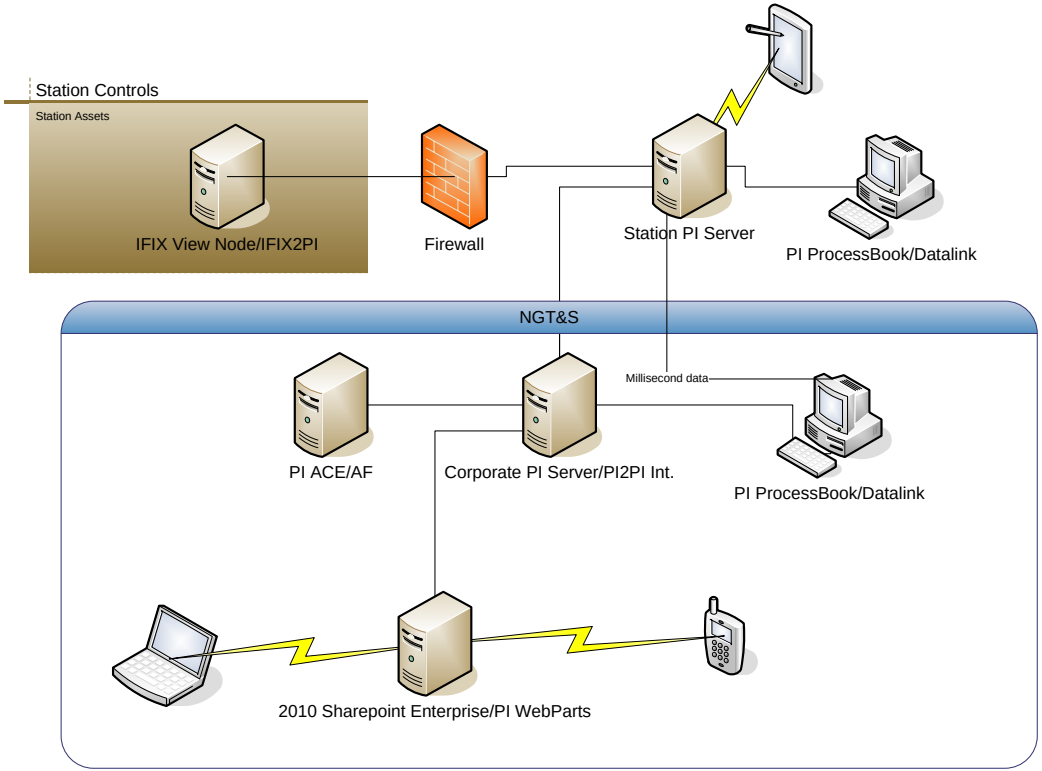
Real Time Data's Role in System Reliability

- To enhance the effectiveness and efficiency of the RCM Program by providing dependable access to Critical Operational Data to assure system reliability and availability of our critical assets.
- The Current state of NGT&S RTDS architecture is fractured and proprietary
- Real Time Data Systems must operate under a unified architecture to achieve high availability required for online diagnostics.
- Key deliverables under the RTDS charter are intentionally focused on providing the correct infrastructure to facilitate long-term sustainability.

Real Time Data Systems



Future Architecture



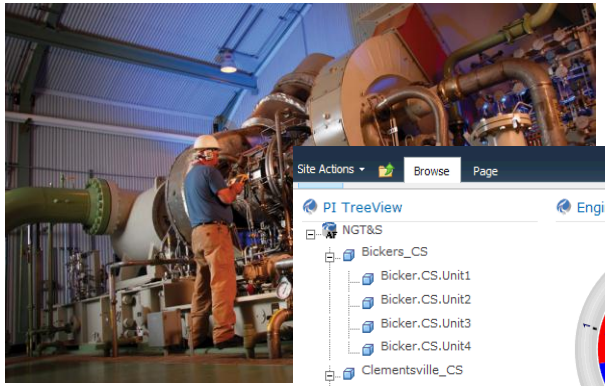
Where will online condition monitoring utilizing the PI System be deployed?

- Six strategic compression stations
- Fully develop each as a distributed location with PI System, and third party condition monitoring
- As proven to be a tools needed for Reliability Growth, future deployment at additional critical sites.

What Does the Real Time Data Landscape Look Like in 3-5 Years?

- Enterprise Agreement with OSIsoft in place as the chosen RTDS architecture.
- Microsoft SharePoint Enterprise utilized as the Portal Framework for RTDS collaboration.
- Reliability Dashboards created with PI System Tools and integrated with SharePoint environment (sample screens provided)
- Dependable Network communications at Critical Locations
- Online Condition Monitoring utilized to drive event-based Work Orders
- PI ProcessBook used as an Enterprise-wide HMI graphic tool for real-time data.

Role Based Dashboards



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6					

DataAvailability | OverView

Site Actions | Browse | Page | Nancy J Shifflet

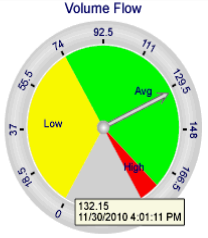
PI TreeView

- NGT&S
  - Bickers_CS
    - Bicker.CS.Unit1
    - Bicker.CS.Unit2
    - Bicker.CS.Unit3
    - Bicker.CS.Unit4
  - Clementsville_CS
    - CS2.Unit1
    - CS2.Unit10
    - CS2.Unit2
    - CS2.Unit3
    - CS2.Unit4
    - CS2.Unit5
    - CS2.Unit6
    - CS2.Unit7
    - CS2.Unit9
  - Corinth_CS
  - Hartsville_CS
    - CS3.Unit5
    - CS3.Unit7
    - CS3.Unit8
    - CS3.Unit9
  - LostRiver_CS
    - LostRiver.CS.Unit1

Engine Status

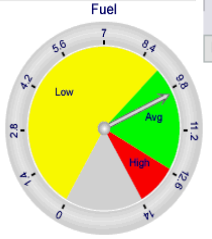
\\AMETEST\LostRiver.CS.iFix.Unit1.Engine.Status; Unit 2-Bit Status = Run ; 11/30/2010 1:35:11 PM

Volume



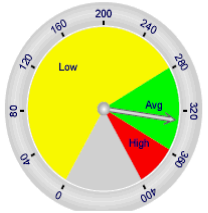
\\AMETEST\LostRiver.CS.iFix.Unit1.Volume.Daily.Rate; VOLUME PUMP BY ENGINE = 132.15 ...

Fuel

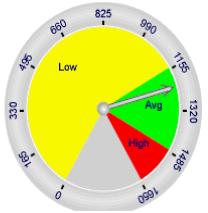


\\AMETEST\LostRiver.CS.iFix.Unit1.Fuel.Rate; UNIT Fuel Flow Rate - Corrected = 10.005 MSCFH; ...

Speed



BHP



Addressing the Drivers

- As with any competitive industry, natural gas transmission and storage service providers must continue to evolve their compressors, regulators, and measurement devices.
- With new production sources and directional flow modifications affecting the marketplace, capacity constraints are now forcing management to achieve measured system reliability with tactical foundations where and when maximum operational capacity is required.
- Establishing a foundation and protocol to address “defects” in the entire transmission and storage system at all levels is fundamental to achieving a resilient and sustainable reliability culture in a service business

Turning **insight** into **action**.

Questions

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Thank you