Utilizing the PI System for Power Generation Optimization Across Corporate Boundaries

Presented by Dave Olsheski – Engineering Director
Gas Turbine Optimization & Upgrades
Loveland, CO USA
Wood Group GTS is a leading independent Service Provider for gas turbines in the global oil & gas and power generation industries

- Power Plant Operations & Maintenance (O&M)
- Field Service
- Global Repair & Overhaul Facilities
- Power Plant EPC & Equipment Relocation
- Asset Optimization & Upgrades
- Engineering Services

3,400 Employees, $1.2B Annual Revenue
Wood Group GTS - Remote Monitoring & Diagnostics

Leverage IT Technology to Provide World-Class Remote Engineering Service & Support

Allow Real-Time Wood Group Engineering Interface With Global Service Asset Fleet

Real-Time Technical Support & Long-Term Asset Optimization = Customer Value!

Utilize This!

To Avoid This….

Alert! Combustion Dynamics High
WG RM&D Infrastructure - PI to PI Across Corporate Boundaries

Power Plant – Various Owners / Operators

Vibration / Combustion / Performance
Turbine Control
Asset Owns Site
PI System and
Historical Data
PI Server
ACL

Solutions

SERVICES
Remote Monitoring
Web Graphics/Trends
Periodic Reports
Engineering Analysis
Technical Support
Recommendations
Pager / E-mail Alerts

On-Site O&M

Future
PI Cloud Connect
?

Process Data
IPsec VPN

Wood Group RM&D Center - Common

PI Interface Server
PI Server
PI ACE Server
Sharepoint

Intellectual
Property is
Maintained

Diagnostics
Engineering

Customer Contract
Managers

Global Engineering

WG RM&D - Common

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WG RM&D - Common
Wood Group is Connecting PI System Data Across Corporate Boundaries – Globally!

Leverage Existing PI Systems
RM&D Interconnect Increases the Value of PI System Data!

Power Plant Operations Contracts
30+ Power Generating Facilities
“+14,175 MW of O&M Experience”

Turbine Maintenance Contracts
40+ Long Term Service Agreements (LTSA)
“+7,542 MW Under Contract”

ZERO Asset Ownership!
Examples of Power Generation Optimization Using the PI System Across Corporate Boundaries

“I have become a data addict in the last ten days so we need to keep PI running!!”

- Wood Group Plant Manager
OSIsoft’s PI to PI Interface allowed RM&D within 1 day with No Travel!

WG operates a Power Plant at a remote mine

Mining Company Has PI System

WT, Australia

WG operates a Power Plant at a remote mine

Mining Company Has PI System

Houston, TX

WG Sub-contracted Data Center RM&D PI System

Loveland, CO

WG RM&D Engineering PI Client Tools and Apps
WG RM&D supports WG on-site operations to ensure maximum power plant reliability & performance

10,500 Miles Distant

14 hours Time Difference

Configuration of PI to PI interface between (2) corporate PI Systems took approximately 6 man-hours

OSIsoft Technology saved over 5 man-days of travel time and nearly eliminated configuration costs
PI System based RM&D Infrastructure Allows Remote Combustion Tuning

F-Class Heavy Industrial Gas Turbine DLN Combustors are designed to provide single digit NOx & CO emissions from 50% to 100% Load

This is achieved via Lean Premix Combustion

External Causes of Lean Premix Combustion Issues

- Changes in Ambient Conditions Temperature & Relative Humidity
- Changes in Fuel Properties Temperature, Pressure, Composition / Wobbe Index
- Degradation / Replacement of Combustion Hardware Fuel Nozzles, Liners, Transition Pieces
- Combustion Dynamics Management
Proper Combustion Tuning Increases Gas Turbine Reliability and Performance

Typical Unit Operating Regime

- NOx
- CO
- Lean Blow Out
- Flame Stability
- Dynamics

Drift due to ambient (Cold Weather)

Shift due to mechanical issue

Daily Operating Envelope
As left from last tune

Drift due to ambient (Hot Weather)

PM3 Fuel Split

58% - 64%

50% load - 100% load

Nominal PM3 Split Schedule

Dynamics

Stability

NOx > 9 ppm

Mode 4 - Mode 6
Gas Turbine Combustion Tuning = $50k / year

Each Gas Turbine typically requires on-site combustion tuning by a specialized Engineer 2x / year
PI System based RM&D Infrastructure Allows Remote Combustion Tuning

Wood Group RM&D Provides On-Call Remote Combustion Tuning - Maximizing Value!

Loveland, CO
WG RM&D Engineering  PI Client Tools and Apps

Customer Power Plant, Anywhere
On-Site PI Server & Controls Interfaces

PI System Data Across Corporate Boundaries
PI System based RM&D Infrastructure Allows Remote Combustion Tuning

Standard PI ProcessBook Displays Utilized for Consistency

PI System Data Across Corporate Boundaries
PI System based RM&D Infrastructure Allows Thermal Performance Management

Gas Turbine Thermal Performance Naturally Degrades Over Time

- Inlet Air Contaminants Foul Inlet Filters & Compressor Section
- Mechanical Wear – Seals, Coating Deterioration, Blade / Vane Damage, Rubs, Fitment
PI System based RM&D Infrastructure Allows Contractual Guarantee Management

WG LTSA Contract Language Guarantee with Liquidated Damages for Non-Compliance

GT Guarantee

Power: 168,775 kW
Heat Consumption (HHV): 1,762.2 $10^6$ BTU/hr
Gross GTG Heat Rate (HHV): 10,441 BTU/kWh

“...after an Outage, unless otherwise mutually agreed in writing, to return Unit’s

(A) output and heat rate to new and clean levels, subject to expected degradation, and

(B) NOx emissions to 9 ppmvd @ 15% O2 (operating on gas) and 42 ppmvd @ 15% O2 (operating on oil)…”
STEP 1: RM&D Services via PI to PI interface over Corporate Boundaries

BE CAREFUL! Site PI Server Exception / Compression May NOT be Adequate for RM&D
PI System based RM&D Infrastructure Allows Contractual Guarantee Management

Use PI System to calculate Thermal Performance Metrics
Correlate with Maintenance Events to Insure Contractual Guarantees are Met

Corrected Unit Maximum Output - Last 12 Months
Critical Contractual KPI – Monitored via PI System & Proactive RM&D
Wood Group RM&D Inherently Interconnects PI System Infrastructure Across Corporate Boundaries

This Architecture Naturally Increase the Value of PI System Data!

OSIsoft PI Cloud Connect May Be In Our Future Questions?
THANK YOU

Brought to you by OSIsoft.