Utilizing the OSIsoft PI System Across Power Generation Corporate Boundaries

Presented by

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WG
WOOD GROUP GTS

Wood Group GTS is a leading independent <u>Service Provider</u> 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!
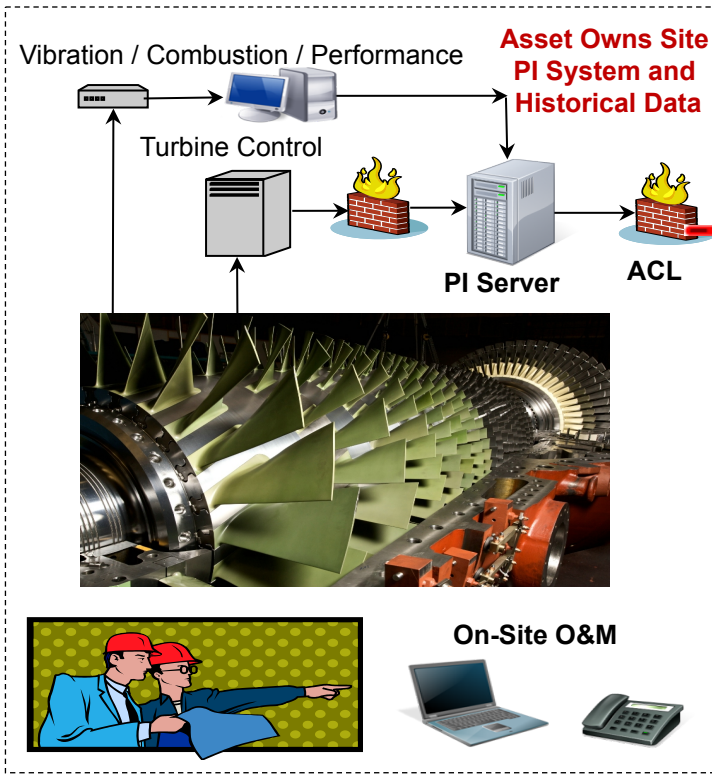
Utilize This!

To Avoid This….

Alert! Combustion Dynamics High
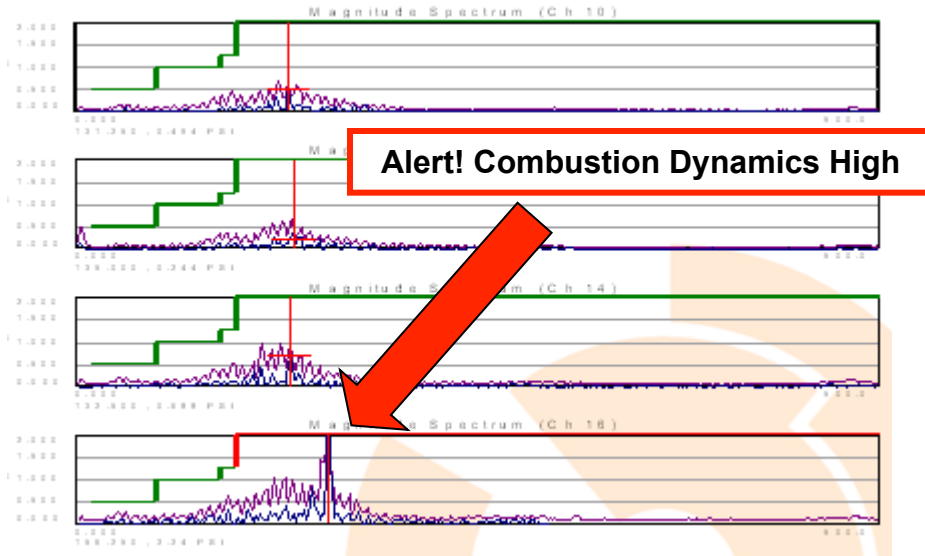
WG RM&D Infrastructure - PI to PI Across Corporate Boundaries
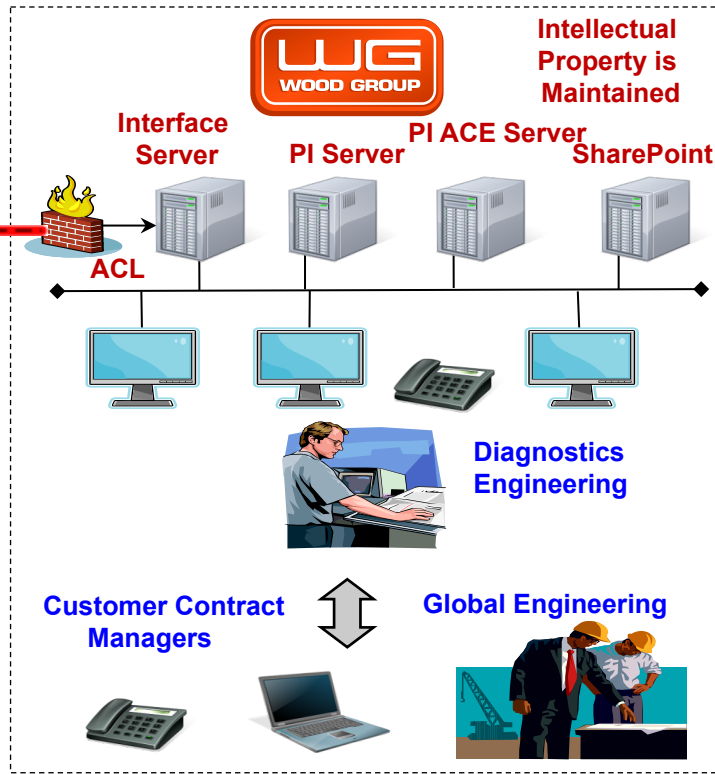
Wood Group is Connecting PI System Data Across Corporate Boundaries – Globally !

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"

WG WOOD GROUP GTS

ZERO Asset Ownership !
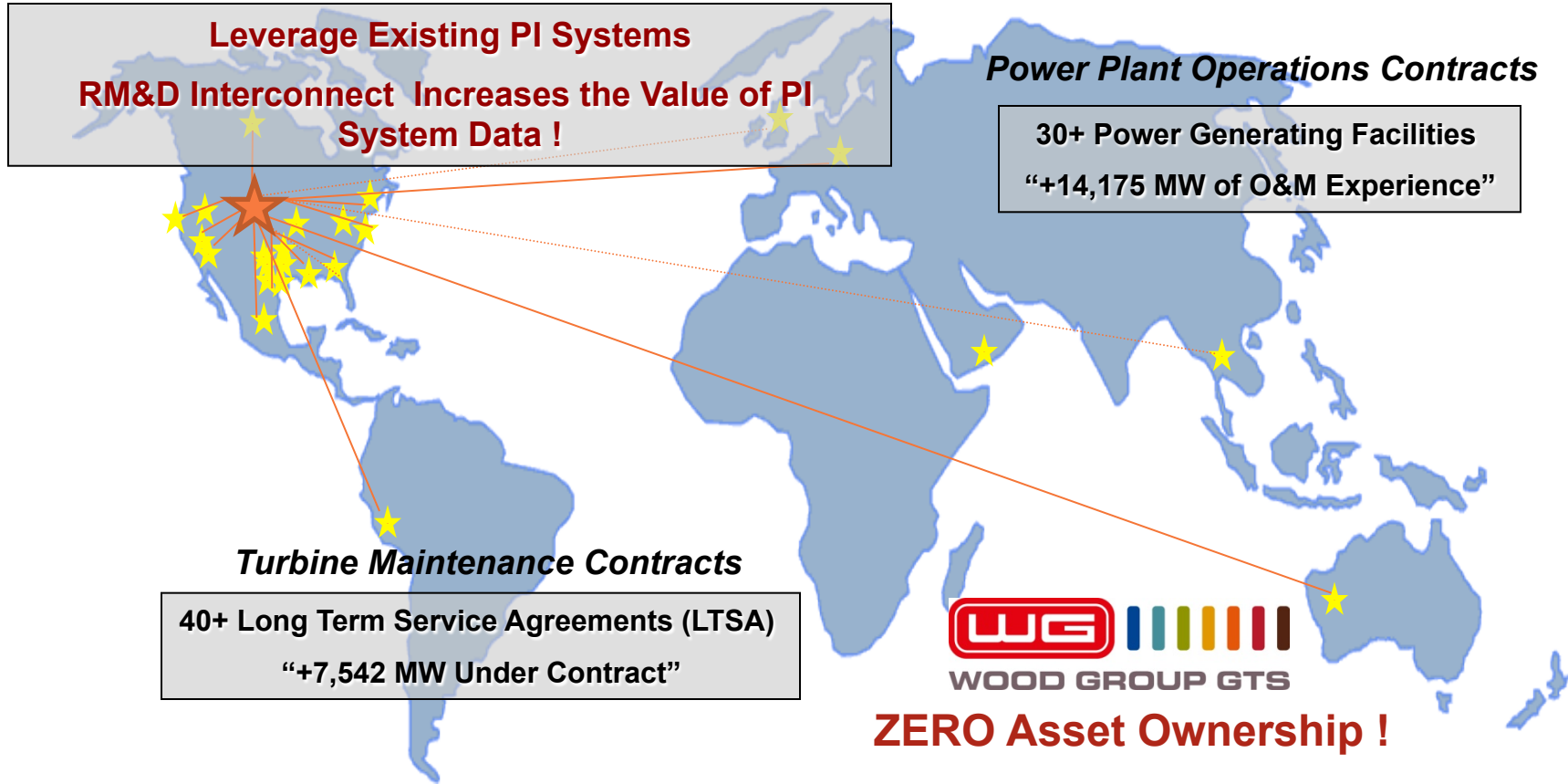
3 Examples of Utilizing PI System Data Across Corporate Boundaries to Solve Business Challenges

	LTSA Units		O&M Units		ECOMAX Only Units	
	WP-APP-PI-01		WP-APP-PI-01	WP-APP-PI-02	WP-APP-PI-01	WP-APP-PI-02
Units Running	7		3	5	3	13
Total Output	409 MW		92 MW	606 MW	399 MW	1,072 MW

Offline — Fuel Oil
Part / On
Base
Peak — Updated: 3/27/13

WG LONG-TERM SERVICE AGREEMENT

8 Units - 515 MW

	GT 1	GT 2	GT 3
NYPA - 7FA	161.5	157.3	
MEG ENERGY- 7EA	86.8		
PERU LNG- LM2500 (elec)	8.1	8.1	Off Line
PERU LNG- 7EA (mech)	144 psi	150 psi	

WG OPERATION AND MAINTENANCE

24 Units - 2,925 MW

	GT 1	GT 2	GT 3	GT 4
APEX- 7FA	-0.0	0.0		
DELL- 7FA	-1.6	-1.2		
NEWCREST TELFER- LM6000	31.4	31.4	33.0	
PANOCHE- LMS100	-0.0	-0.1	-0.0	-0.2
TILTON-LM6000	0.0	0.0	0.0	0.0
GILA RIVER Block 1 (1A, 1B) - 7FA	-0.4	-1.3		
GILA RIVER Block 2 (2A, 2B) - 7FA	139.4	-1.2		
GILA RIVER Block 3 (3A, 3B) - 7FA	113.7	114.1		
GILA RIVER Block 4 (4A, 4B) - 7FA	122.7	123.3		

ECOMAX - Only

27 Units - 3,740 MW

	GT 1	GT 2	GT 3	GT 4
ODESSA - 7FA	94.1	97.6	111.4	110.7
GUADALUPE - 7FA	139.4	-0.4	120.6	138.3
VALENCIA - 7FA	0.1			
UNION - 7FA	146.6			
CORPUS CHRISTI - 7FA	-0.1	0.0		
CARVILLE - 7FA	155.2	153.7		
ONETA - 7FA	-0.0	0.2	0.1	0.1
HIDALGO - 7FA	-360.0	0.2		
BOSQUE - 7FA	144.5	144.1	110.4	
SANTA ROSA - 7FA	158.1			
PINE BLUFF - 7FA	-1.1			
PASADENA - 501F		131.2	130.2	

OSIsoft PI to PI interface allowed RM&D within 1 day with No Travel!
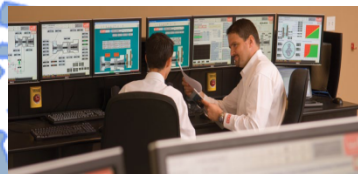
Loveland, CO

WG RM&D Engineering PI Client Tools and Apps

WOOD GROUP GTS

Houston, TX

WG Sub-contracted Data Center RM&D PI System

PI System Data Across Corporate Boundaries

WT, Australia

WG operates a Power Plant at a remote mine

Mining Company Has PI System

Off-Grid Mining Customer Requires Maximum Power Plant Reliability = $$$

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

Remote data latency < 15 min
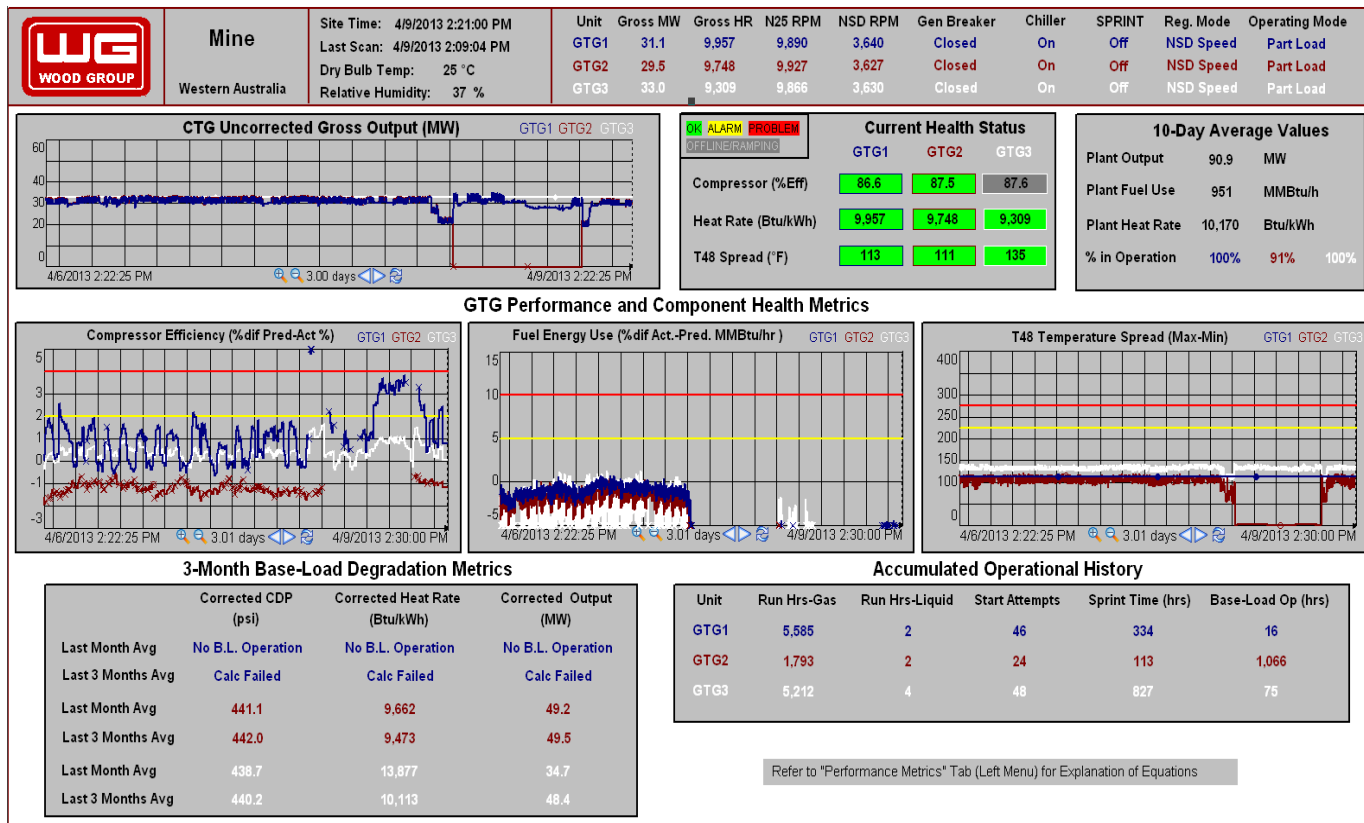
OSIsoft PI System RM&D Infrastructure Allows Remote Combustion Tuning

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**

quaternary gas

— primary gas

— secondary gas

— tertiary gas
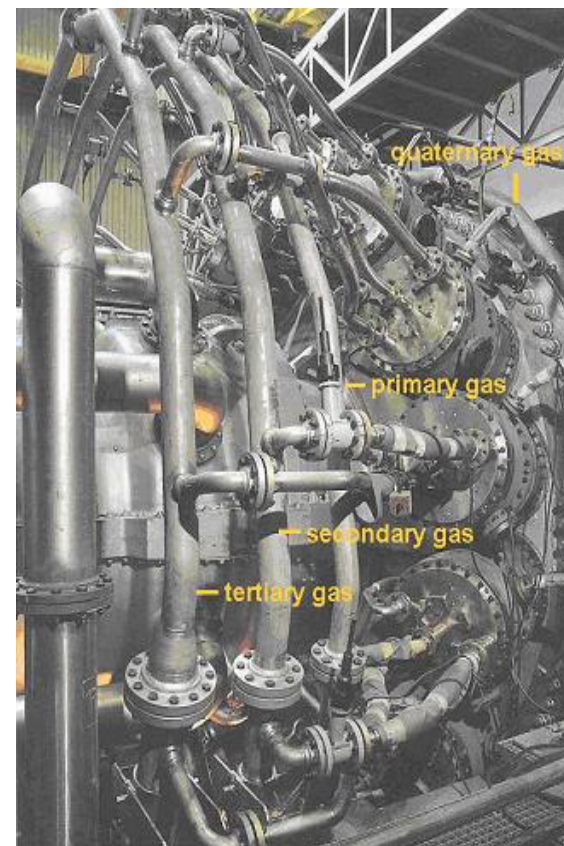
Gas Turbine Combustion Tuning = $50k / year

Each Gas Turbine typically requires on-site combustion tuning by a specialized Engineer 2x / year

PM3/2 Schedule #2

As Left		As Found	
FXKPM3F2_n	FXKPM3S2_n	PM3F2_n	PM3S2_n
2100	83.50	2100	83.50
2130	81.50	2130	81.50
2170	77.50	2170	77.50
2200	75.50	2200	75.50
2230	73.50	2230	73.50
2260	69.50	2260	69.50
2300	67.30	2300	68.30
2330	66.50	2330	68.00
2380	62.50	2380	63.50
2410	61.40	2410	61.40

OSIsoft PI System RM&D Infrastructure Allows Remote Combustion Tuning

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

PI to PI

Fuel Split Adjustments to On-Site Ops via Phone based on Real-Time PI System Data

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

Wood Group GTS Acquired Gas Turbine Efficiency (GTE) in 4Q 2011
Resulted in <u>Redundant</u> US-Based RM&D Centers

Business Challenge – Consolidate with NO Interruption of RM&D Service

GTE RM&D Infrastructure - Orlando, FL

RM&D Engineering – Orlando, FL

Wood Group RM&D Infrastructure - Houston, TX

RM&D Engineering – Loveland, CO

OSIsoft PI System Infrastructure was used at BOTH RM&D Centers
Implemented 2-Year Migration Plan

Future Cloud Connect ?

Engineering & IT Coordination

Unity
Unifying IT for the Group

1Q 2012 → **1Q 2013**

Wood Group Data Center - Houston

- (10+) Point-to-Point VPN Connections

- 50,000 Tag Enterprise PI System

- 32-Bit VM Environment

GTE RM&D Infrastructure – Orlando

- (7) Point-to-Point VPN Connections

- 10,000 Tag HA PI System 2010

- 64-Bit Machine Environment

Wood Group Data Center - Houston

- (21+) Point-to-Point VPN Connections

- 50,000 Tag Enterprise PI System (PI-01)

- 32-Bit VM Environment

- 20,000 Tag PI System 2010 (PI-02)

- 64-Bit VM Environment

- Common Client VM's to Direct-Connect to on-site PI Systems

OSIsoft PI System Infrastructure was used at BOTH RM&D Centers

Solution – Combine PI System Licenses & Physically Relocate Software to WG Data Center

Consolidation of PI System Data Between Corporate Boundaries !

GTE RM&D Infrastructure

Duplicate Systems were run in parallel for 3+ months utilizing PI to PI as Site Connections were cut-over

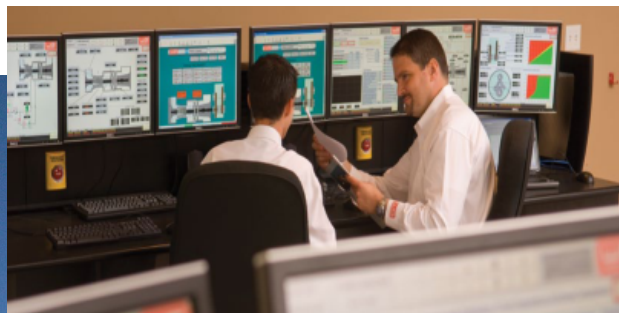All GTE OSIsoft software was re-licensed and re-used in the Wood Group environment

All GTE hardware was re-used in Wood Group lab environment and RM&D Monitoring Center

Key OSIsoft knowledge resources were retained and relocated

Wood Group Data Center

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

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