

# Digital Transformation initiatives for Power Generation

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**MITSUI & CO.**

# Conference Theme & Keywords



# Agenda

1. Company Overview and Mitsui Digital Twin
2. Business Challenge
3. How the PI System was applied
4. How PI System is being applied now
5. Next steps towards Center of Excellence
6. Conclusions

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**mitsui & co.**

# Mitsui & Co., Ltd. at a Glance

## About Us



Number of Offices  
and Overseas  
Trading Affiliates

138

(As of Mar 1, 2018)



Number of Affiliated  
Companies for  
Consolidation

469

(As of March 31, 2017)

Revenue

US\$ 39.0  
billion

Global Network

66

countries/regions  
(As of Mar 1, 2018)

Total Assets

US\$ 102.7  
billion



Number of  
Employees  
(consolidated)

42,316

(As of March 31, 2017)

Date of Establishment

1947

Total Equity<sup>\*1</sup>

(As of March 31, 2017)

US\$ 33.3  
billion

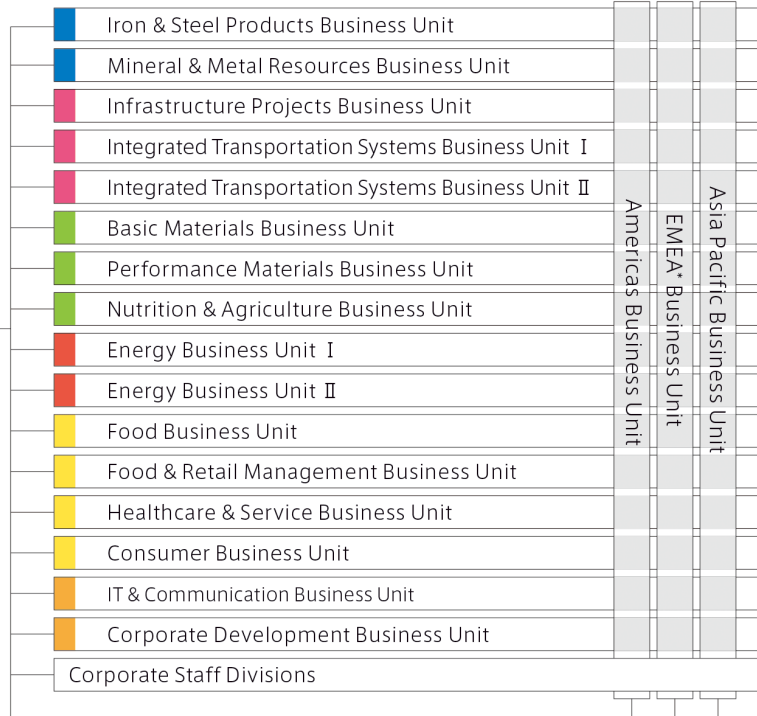
# Mitsui & Co., Ltd. Organization

**16 headquarters  
business units and  
3 regional business units**

President & CEO

**6 business areas**

- Metals
- Machinery & Infrastructure
- Chemicals
- Energy
- Lifestyle
- Innovation & Corporate Development



Iron & Steel Products



Mineral & Metal Resources



Infrastructure Projects



Integrated Transportation Systems I, II



Basic Materials



Performance Materials



Nutrition & Agriculture



Energy I



Energy II



Food



Food & Retail Management



Healthcare & Service



Consumer



IT & Communication

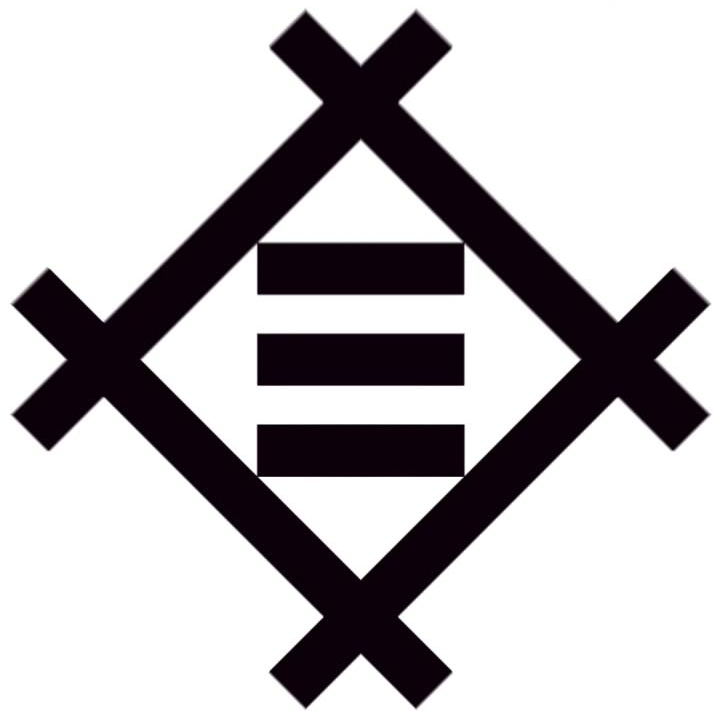


Corporate Development



\*EMEA: Europe, the Middle East and Africa

Note: China, Taiwan, South Korea, and the CIS region report directly to the Head Office



**MITSUMI & CO.**



# Transforming business through digital technology

## Business



## Digital Technologies (Mitsui's partners)



## People



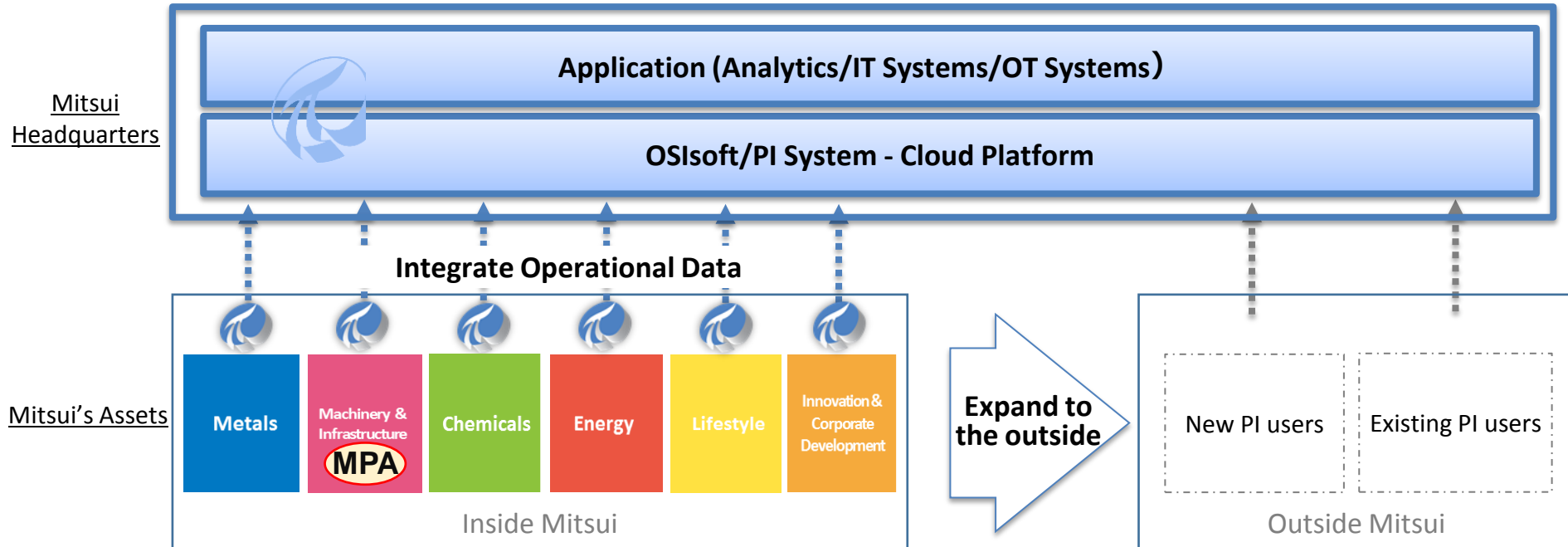


# “Mitsui Digital Twin”

Mitsui Digital Twin helps organizations drive the digital transformation

The platform provides not only technology but capability acquired through the projects at Mitsui’s assets

**MPA** is the first company employed the platform for its digital transformation

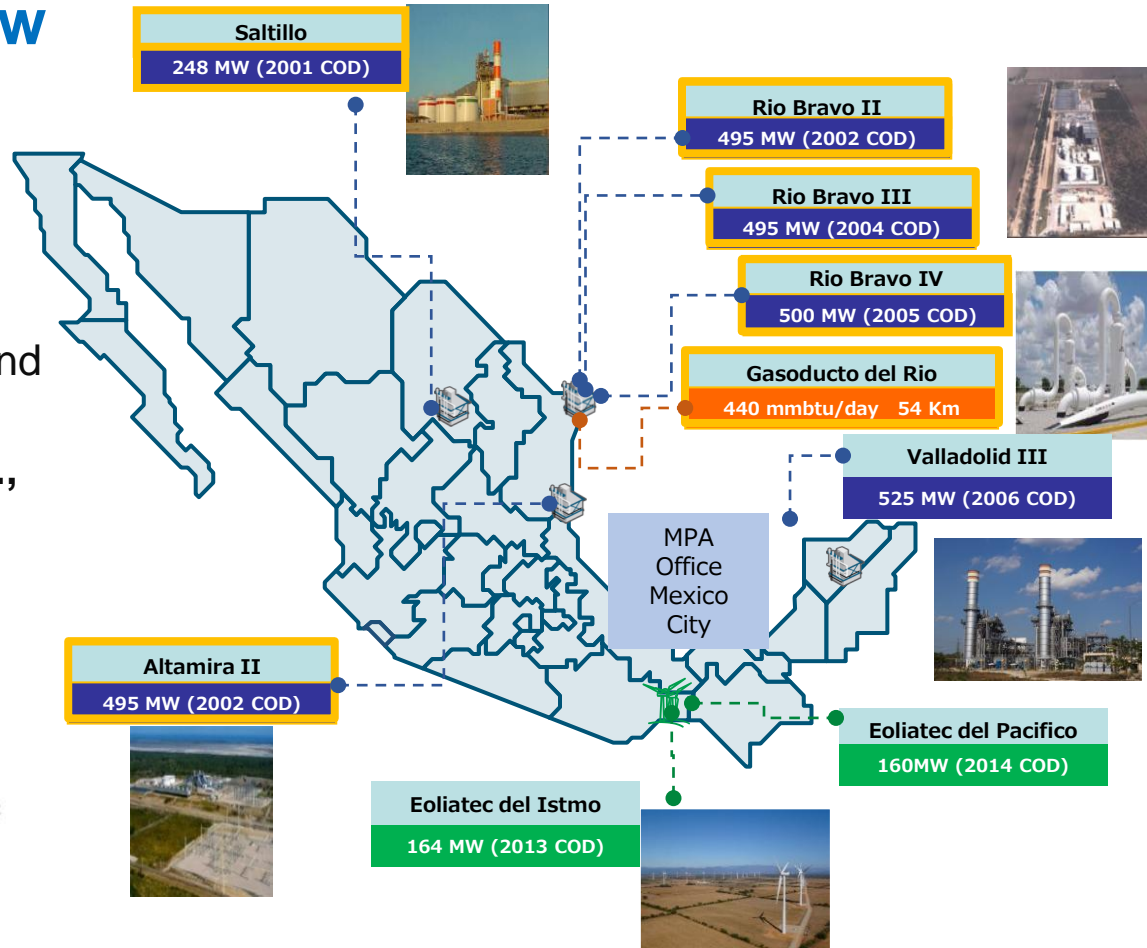


# MPA Company Overview

- **Mitsui & Co Power Americas** provides services for the Administration, **Operation and Maintenance** to MT Falcon, Valladolid (Jera and Mitsui & Co) and EDI/EDP (EDF and Mitsui & Co).
- A 100% Subsidiary of **Mitsui & Co., Ltd** since **2010**.
- MT Falcon is an asset-holding company composed by:



Tohoku Electric  
Power Co., Inc.



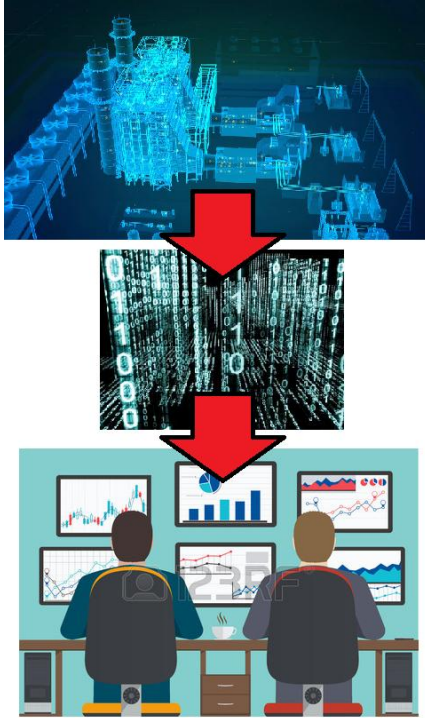
# MPA Business Challenge

1. MPA is facing a increasingly competitive Mexican Electrical Market and intends to provide similar service to other Mitsui & Co. power generation assets.
2. MPA Monitoring Area needs to optimize **time consuming tasks and resources** to provide similar or even better results and become CENTER OF EXCELLENCE for these assets around the World.
3. In addition MPA is a unique company in Mitsui & Co due to O&M knowledge so is becoming a strategic “user” for many Digital Transformation for Power Generation initiatives of the company.

# MPA Business Challenge

1. MPA is facing a increasingly competitive Mexican Electrical Market and intends to provide similar service to other Mitsui &
2. **Let' see how PI System can help us with this!!!**
3. In addition, the company is becoming a strategic “user” for many Digital Transformation for Power Generation initiatives of the company.

# MPA Monitoring Area



## Objectives:

IMPROVE REALIABILITY AND EFFICIENCY

MAINTENANCE AND OPERATION COST SAVINGS

DECISION-MAKING: PAYBACK ANALYSIS

TECHNICAL SUPPORT FOR TROUBLE SHOOTING

## Key Activities:

- ✓ Condition monitoring
- ✓ Performance monitoring
- ✓ Decision-making analysis

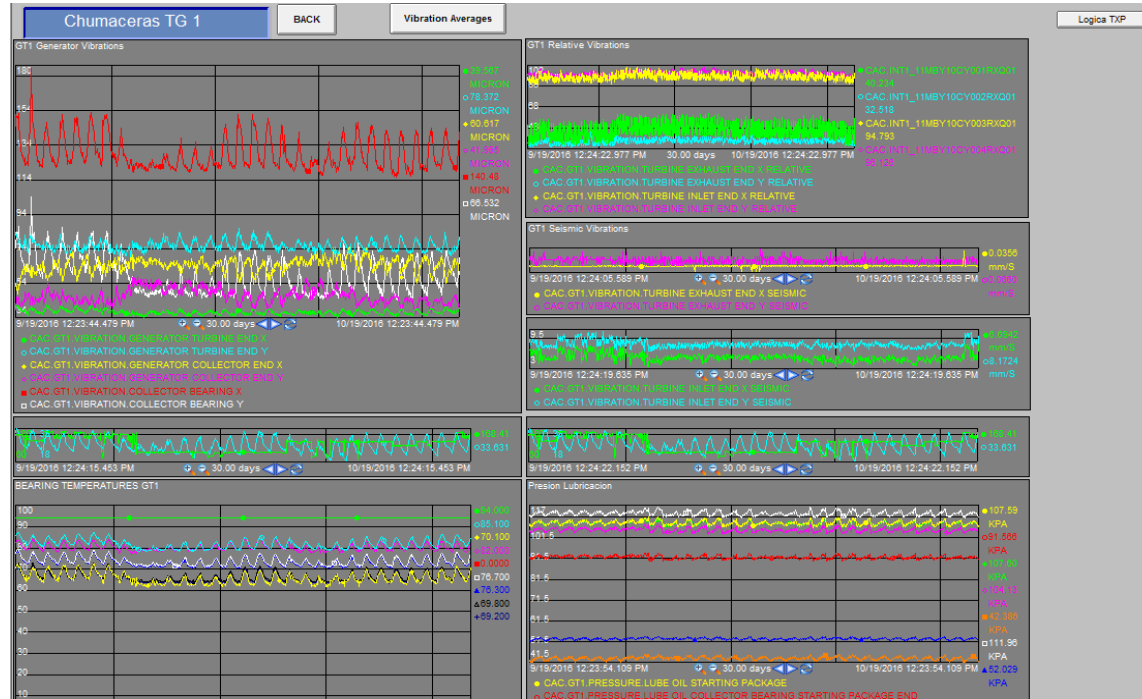
# How PI System was applied

2011



PI ProcessBook

## CONDITION MONITORING



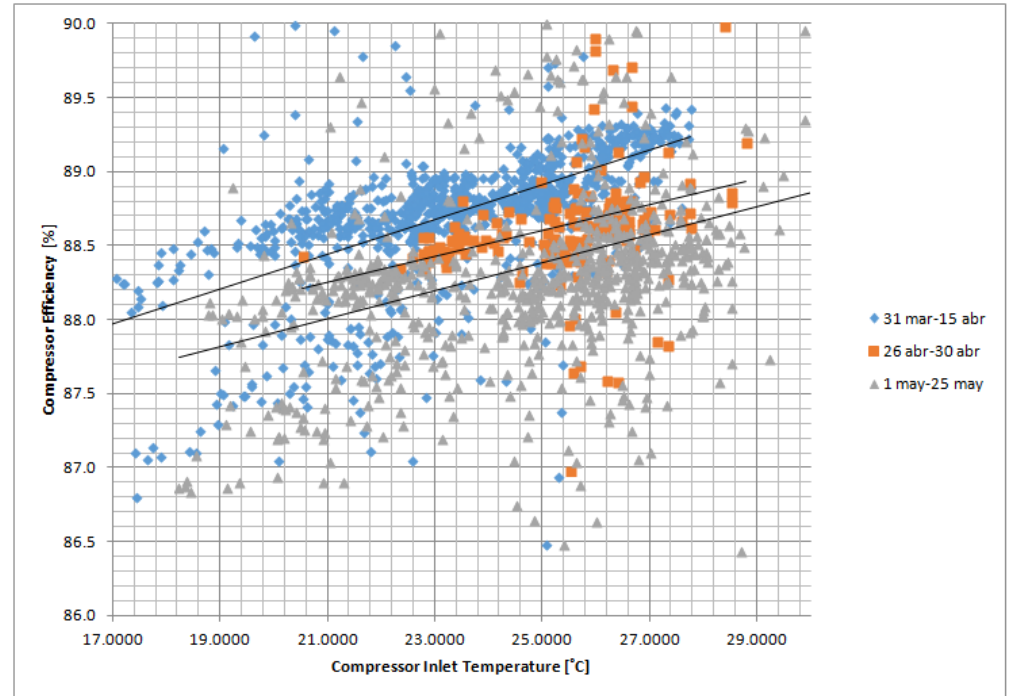
# How PI System was applied

2011



PI DataLink

PERFORMANCE  
MONITORING AND  
ANALYSIS





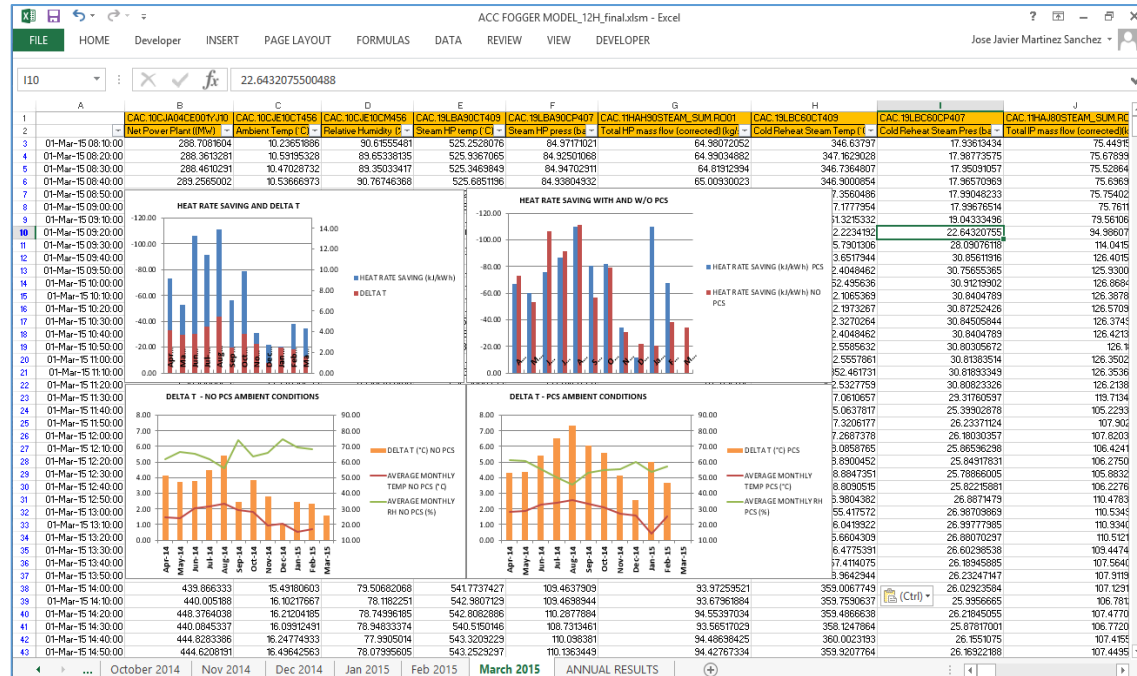
# How PI System was applied

2011

## PERFORMANCE MONITORING AND ANALYSIS



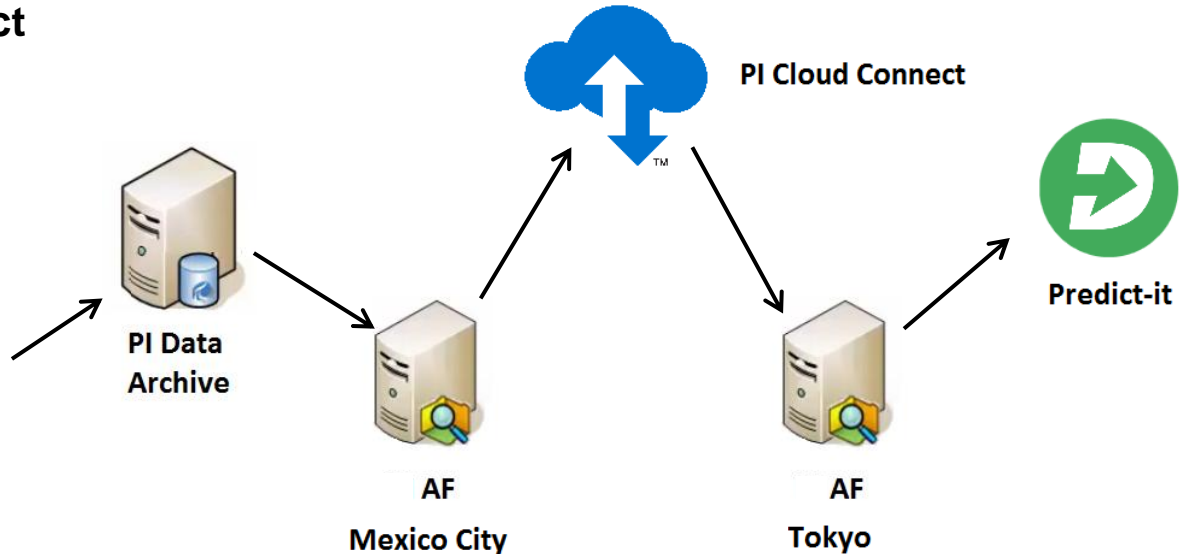
PI DataLink



# How PI System is being applied now

- In 2017, a replica of **Saltillo PI Server** was installed in the Cloud in Tokyo using **Microsoft Azure** infrastructure
- Real time data is being received from Saltillo by **PI Cloud Connect**
- **Advanced Pattern Recognition Software** was installed in the Cloud and fed with Saltillo plant data: **Predict-it of Engineering Consultants Group, Inc.**

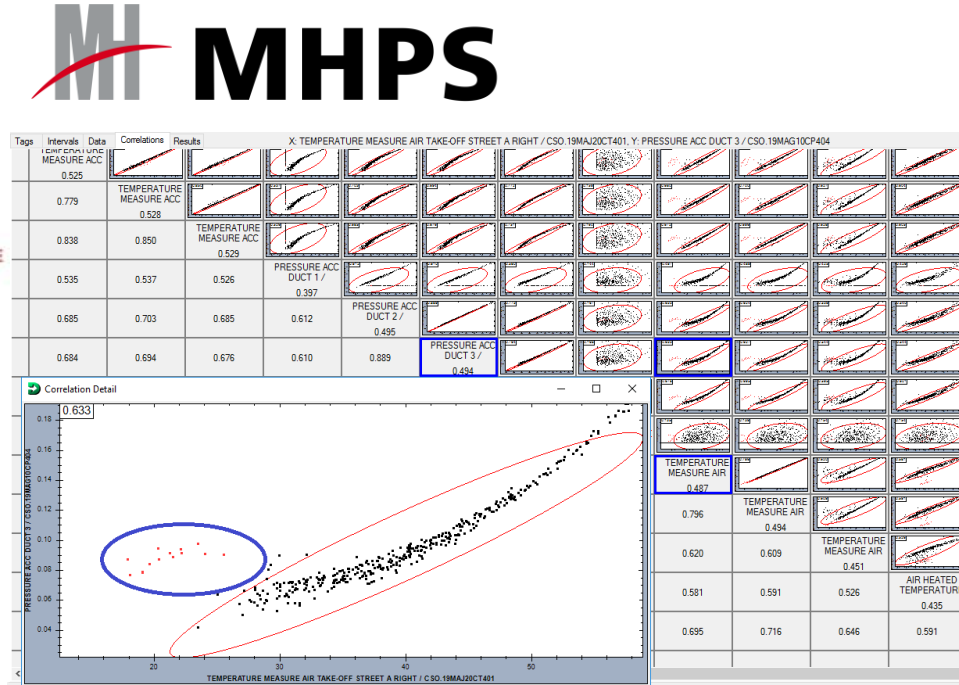
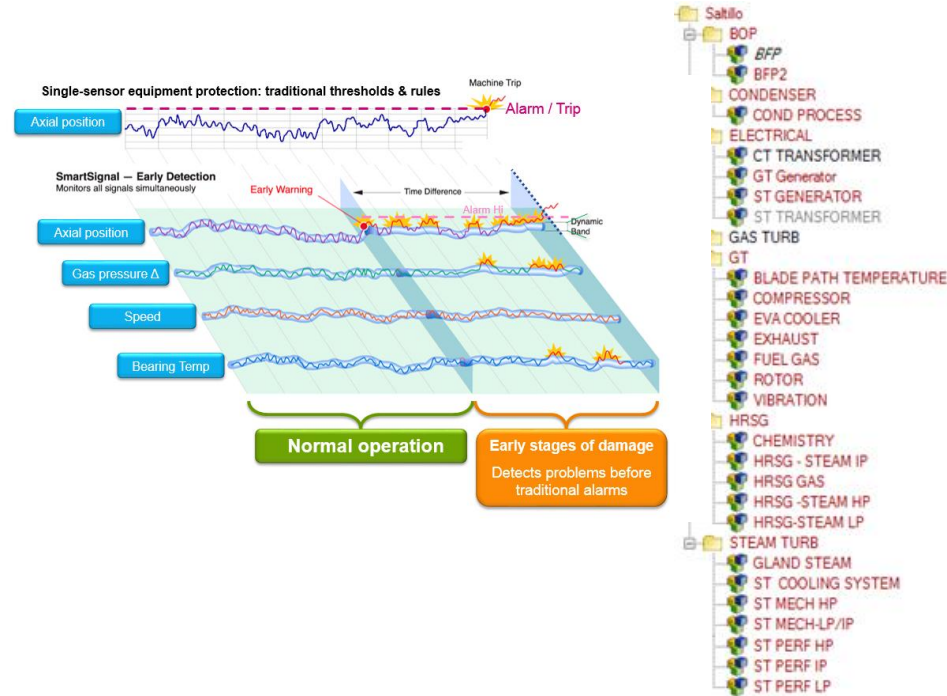
Allows sharing data from our **AF structure**, so assets and analytics can also be transferred without the necessity of a VPN



# How PI System is being applied now

## 1. Advanced Pattern Recognition Software

Early Warnings much  
before a real failure  
occurs!!

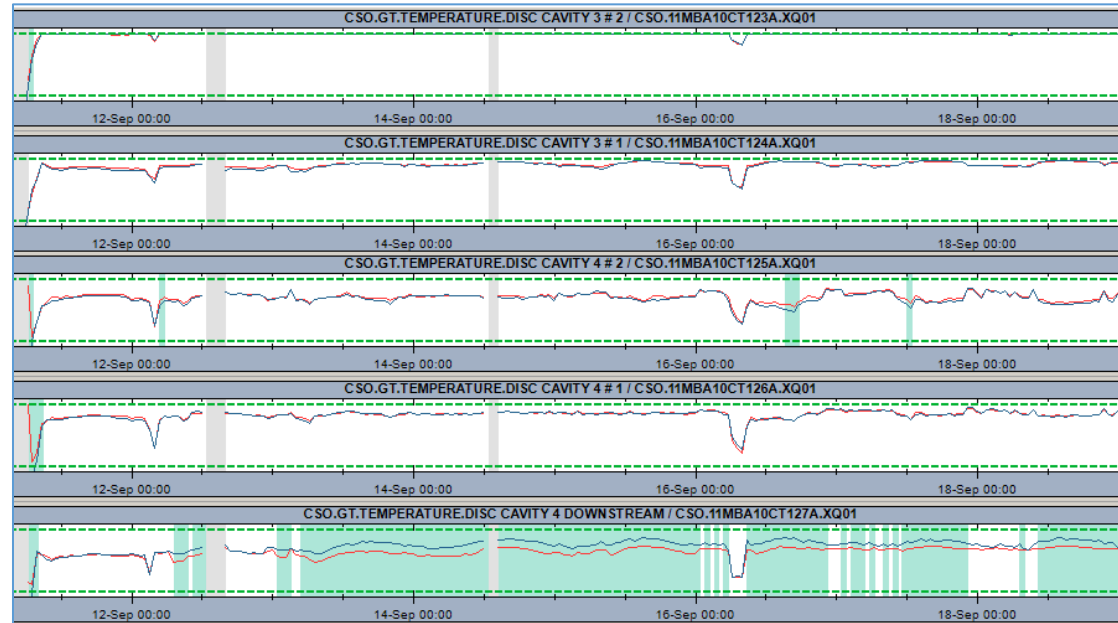


# How PI System is being applied now

## 1. Advanced Pattern Recognition Software

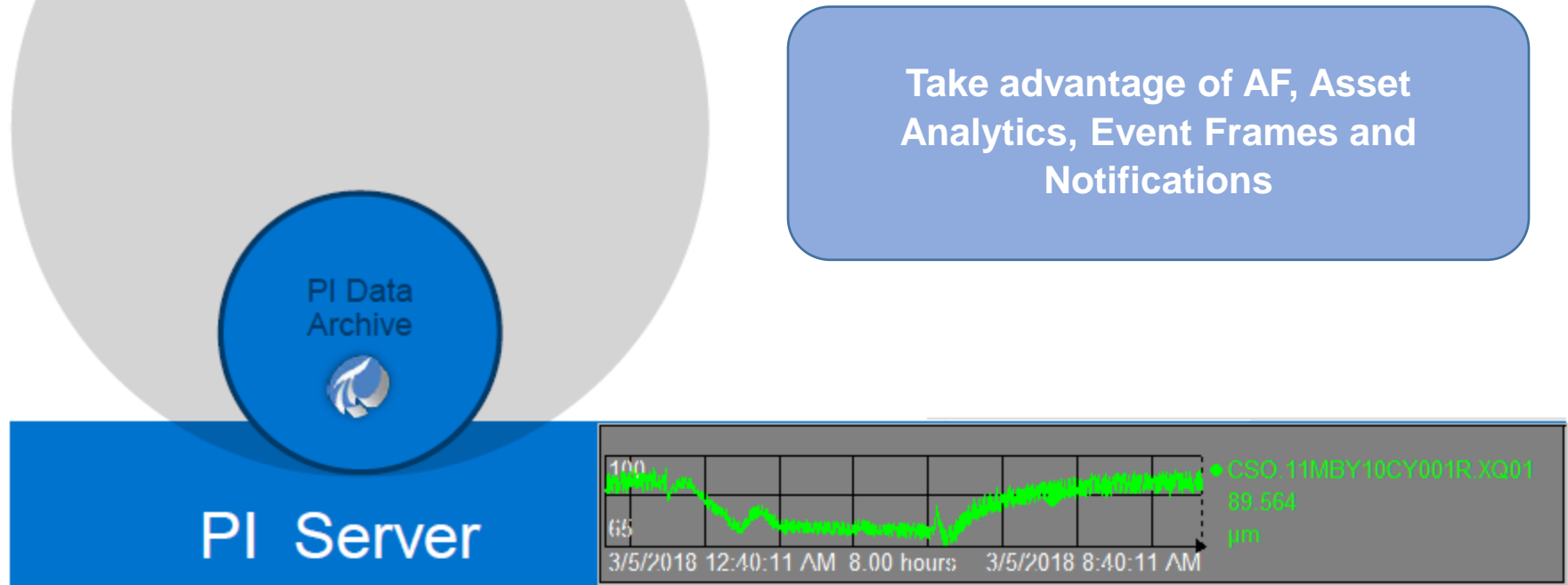


**SUCCESS EXAMPLE: CRACK FOUND IN THE COMBUSTION TURBINE!!!**



# How PI System is being applied now

## 2. Improvement of Performance Monitoring, Analysis and report



Asset  
Framework

PI Data  
Archive

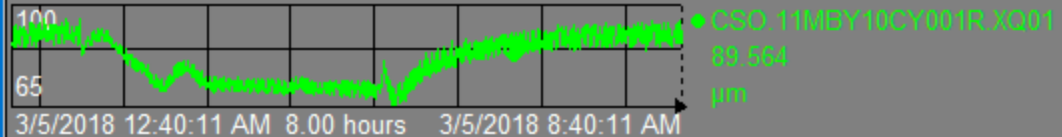
PI Server

- 00-Server Information
- Saltillo Plant
  - AIR COOLER CONDENSER
  - BOP
  - COMBUSTION TURBINE
    - BEARINGS
    - COMBUSTION CHAMBER
    - COMPRESSOR
      - HP BLEED VALVE
      - LP BLEED VALVE
  - COOLING SYSTEM
  - COUNTERS
  - DIESEL SYSTEM
  - GAS SYSTEM
  - GENERATOR
  - HYDRAULIC SYSTEM
  - KETTLE BOILER
  - LUBE OIL SYSTEM
  - PROTECTION AND CONTROL
  - STARTER MOTOR
  - TURBINE

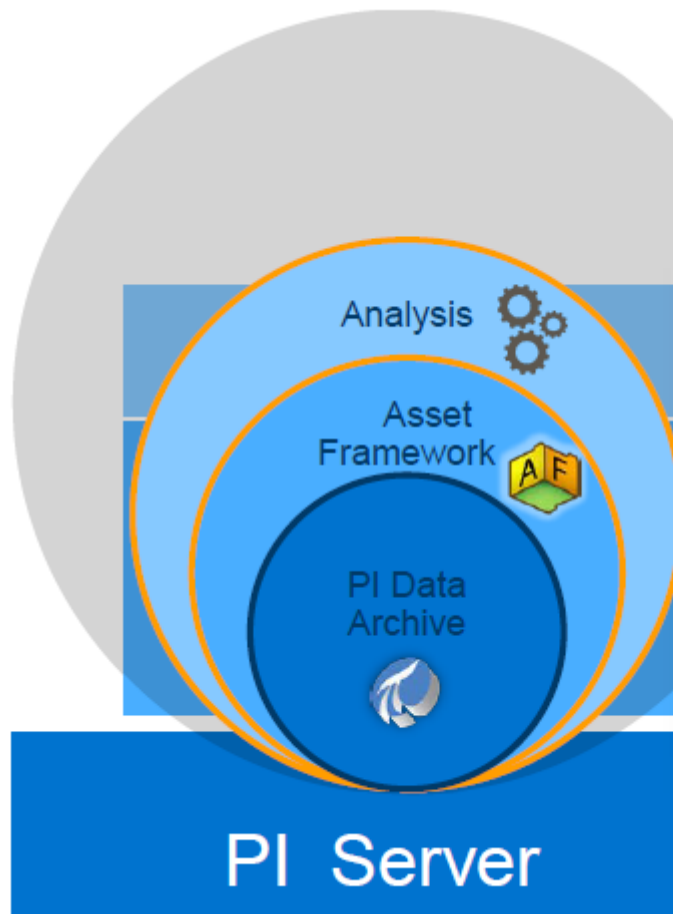
Saltillo's AF hierarchy was developed along with OSIsoft by AF Quick-start Service!

Category: Outlet

Combustor Shell Pressure A
Combustor Shell Pressure B
Combustor Shell Pressure C
Combustor Shell Pressure Sele
Combustor Shell Temperature
Combustor Shell Temperature
Combustor Shell Temperature







Name	Backfilling
✓ f00 Energy Daily Totals	
✓ f00 Energy Monthly Totals	
✓ f00 GPT 5min	
✓ f00 Real Energy Rate	
✓ f00 Theoretical Energy GI	

Name	Expression
theoreticalmonthly	If Day('*')=1 then TagTot('TheoreticalMonthly')
realmonthly	If Day('*')=1 then TagTot('RealMonthly')
GPTmonthly	100*theoreticalmonthly/realmonthly

100\*theoreticalmonthly/realmonthly

Category: <None>

- Duct Burner Gas Flow
- GPT Daily
- Plant Higher Heating Value
- Real Energy Rate (Power)
- Real Energy Total Daily

Category: KPI

- CTUN
- CTUNG
- PCI
- Power
- Theoretical Energy 5min
- Theoretical Energy Total Daily
- Theoretical Energy Total Monthly

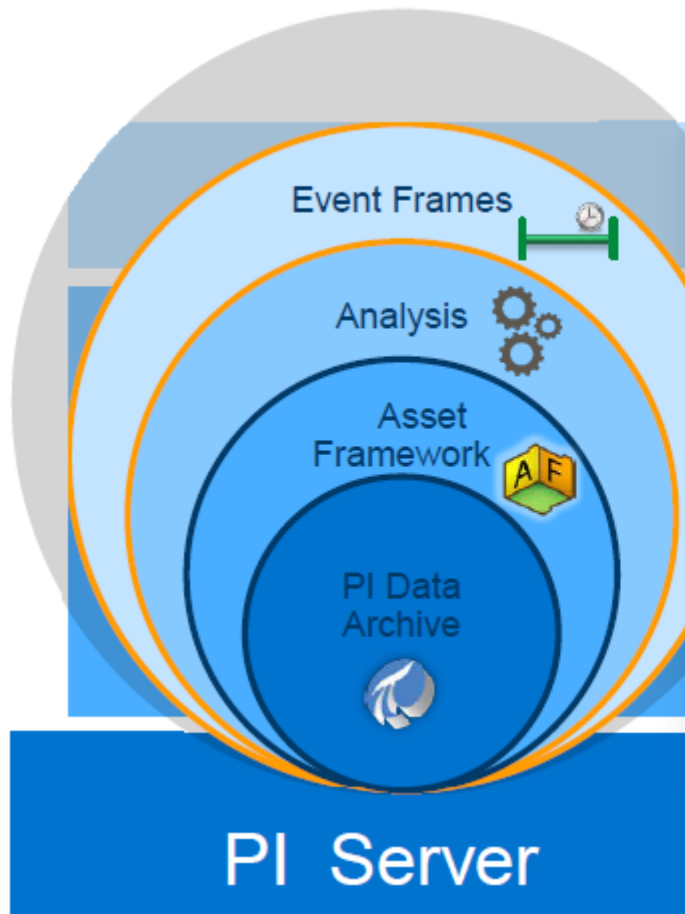
  

100  
65

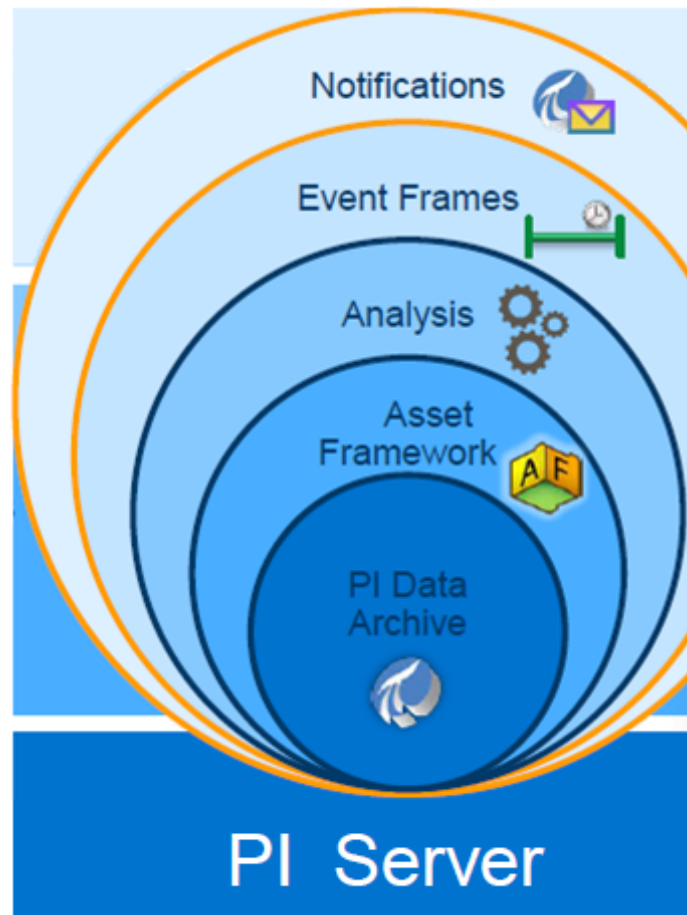
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Name	Expression	V <sub>i</sub>	V <sub>o</sub>	O
CT Trip Indicator	IF 'Flame Detector Right Status On'="Off" an			M <sub>i</sub> ⊗
CT Trips Per Month	IF 'Flame Detector Right Status On'="Off" and 'Flame Detector Left Status On'="Off" And 'Status Trip'="ON" and 'Speed' > 10 THEN 1 ELSE 0			
Trip event	BadVal('Flame Detector Left Status On') or B			M <sub>i</sub> ⊗
Trip counter	if 'Trip Indicator' = "pt created" or 'Trip			M <sub>i</sub> ⊗
Start-up success test	if Badcheck then NoOutput() else if TripInicialization = 1 then 0 else if Trip =1 and PrevVal('Trip Indicator','*')			Tri ⊗
Start-up report				



	Name
✓	CT Trip Indicator
✓	CT Trips Per Month
✓	Trip event
✓	GT Start up

Trip event

Trip counter

Start-up success test

Start-up report

↑ ↓ Evaluate

Name	Expression	V <sub>i</sub>	V <sub>e</sub>	O <sub>i</sub>	
Trip	IF 'Flame Detector Right Status On'="Off" an				M <sub>i</sub> ⊗
IF 'Flame Detector Right Status On'="Off" and 'Flame Detector Left Status On'="Off" And 'Status Trip'="ON" and 'Speed' > 10 THEN 1 ELSE 0					
BadCheck	BadVal('Flame Detector Left Status On') or B				M <sub>i</sub> ⊗
TripInicIALIZation	if 'Trip Indicator' = "pt created" or 'Trip				M <sub>i</sub> ⊗
Variable2	if Badcheck then NoOutput() else if TripInicIALIZation = 1 then 0 else if Trip =1 and PrevVal('Trip Indicator','*')				Tri ⊗

# Next steps

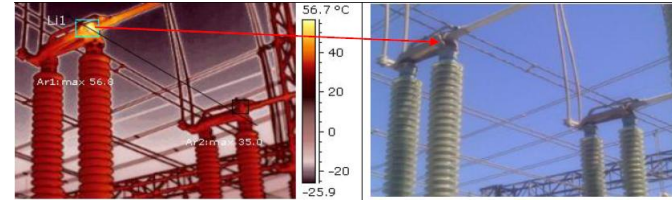
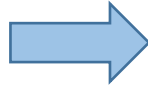
## Plant Information from other sources



PI Manual Logger



Transformer DGA

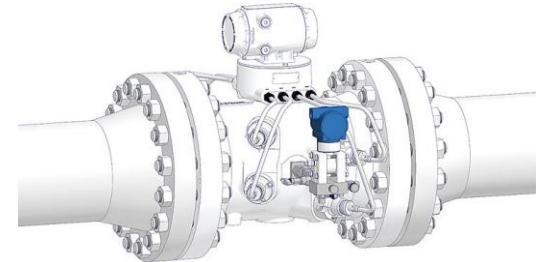


Thermography

Oil Analysis

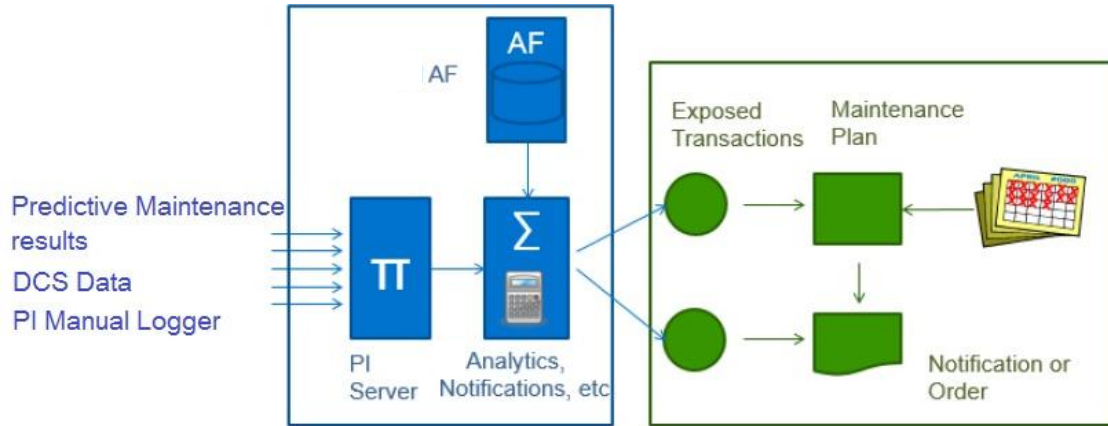


Ultrasound detection



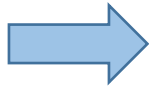
# Next steps

## Integration of PI with our CMMS (SAP PM)



- Creating rules (**Asset Analytics**) to active warning notifications in SAP PM → Condition Based Maintenance
- Incorporate plant data to optimize Preventive Maintenance

**Expected Results**



- Reduction of unavailability
- Optimization of maintenance scheme to reduce cost & risk
- Work load reduction
- Learned lesson in the entire organization

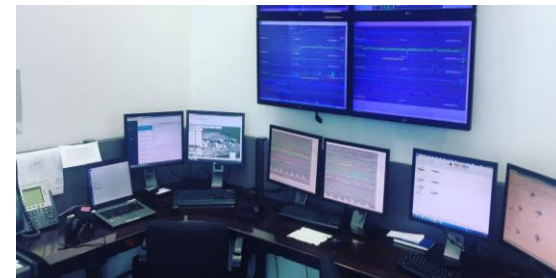
# DT Initiatives for Power Generation



Mitsui & Co. Power Development  
and Management Americas

## MPA AS A CENTER OF EXCELLENCE

MPA provides O&M services in a increasingly competitive Mexican Electric Market. In addition, there is a need to increase the number of assets under this service.



### CHALLENGE

Provide high-quality service of O&M Monitoring with the current resources in a competitive liberalized Electric Market

- Reliability and Efficiency of the plants are key to stand out
- Provide similar service to other Mitsui & Co. generation assets

### SOLUTION

Start using cutting-edge PI System functionalities for optimization of time and resources

- AF hierarchy development
- Asset Analytics for efficiency calculations and automatic reports
- Condition based Maintenance: PREDICT-IT (ECG)

### RESULTS

There are already some important results despite it is still “work in progress”

- **80% reduction of time** consumed in Condition Monitoring
- Events are captured **20% earlier** than before
- Availability improvement is estimated in 2%\*

\* Hard to estimate due to many factors involved

# Contact Information



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- O&M Supervision Subdirector
- Mitsui & Co. Power Americas



# Questions

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

State your **name & company**



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Merci

谢谢

Спасибо

Danke

Gracias

Thank You

감사합니다

ありがとう

Grazie

Obrigado