

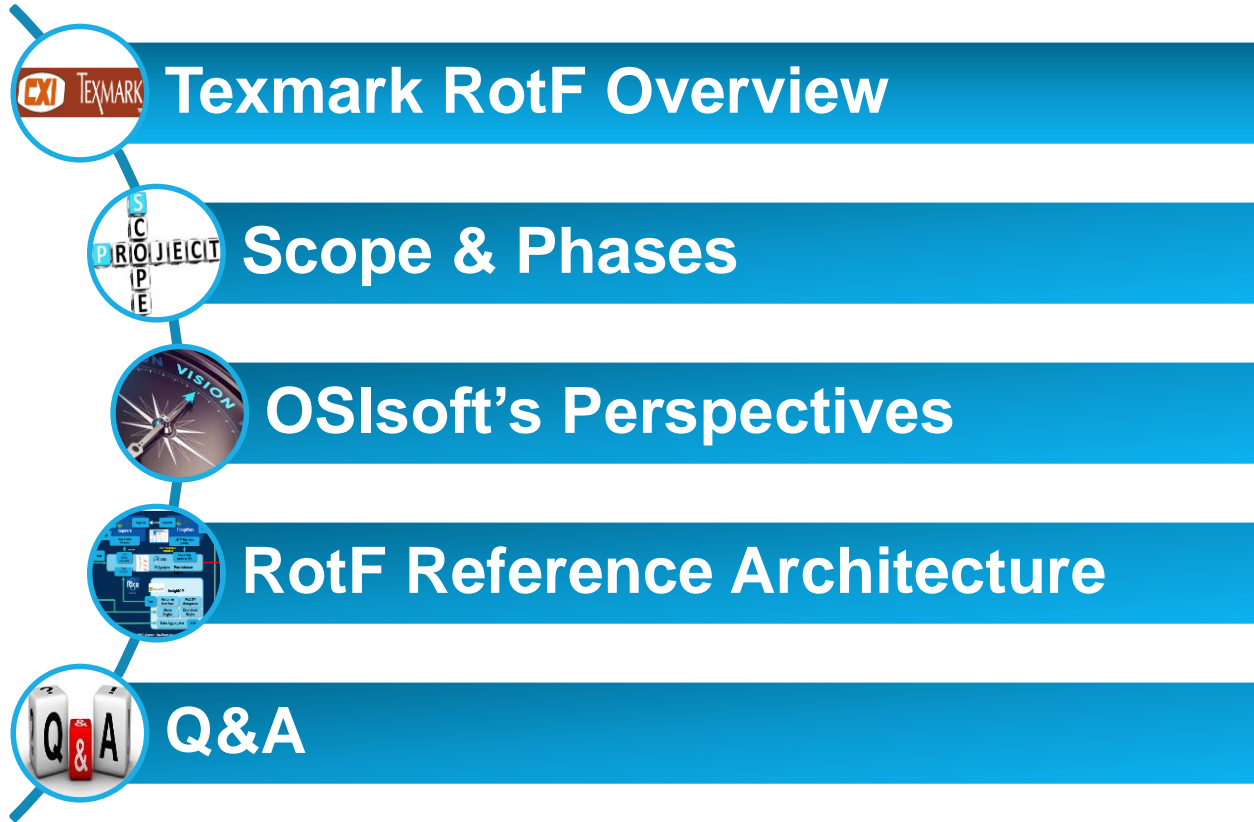
# Overview of the Texmark Refinery of the Future(RotF) “The Smart Refinery”



Presented by: **Craig Harclerode**  
**John Marriott**

**O&G Industry Principal**  
**Partner Program Manager**

# The Texmark RotF Journey – Chapter 1





Texmark Chemicals (CXI), is a Galena Park, TX-based manufacturer of DCPD, a polymer precursor for inks, bath tubs, boats, adhesives, and pesticides. Texmark has ready shipping access by rail, water, and road.

Objective: Develop the Refinery of the Future, which needs a modern infrastructure and leverages Industrial IoT solutions.

# The HPE and Texmark Partnership

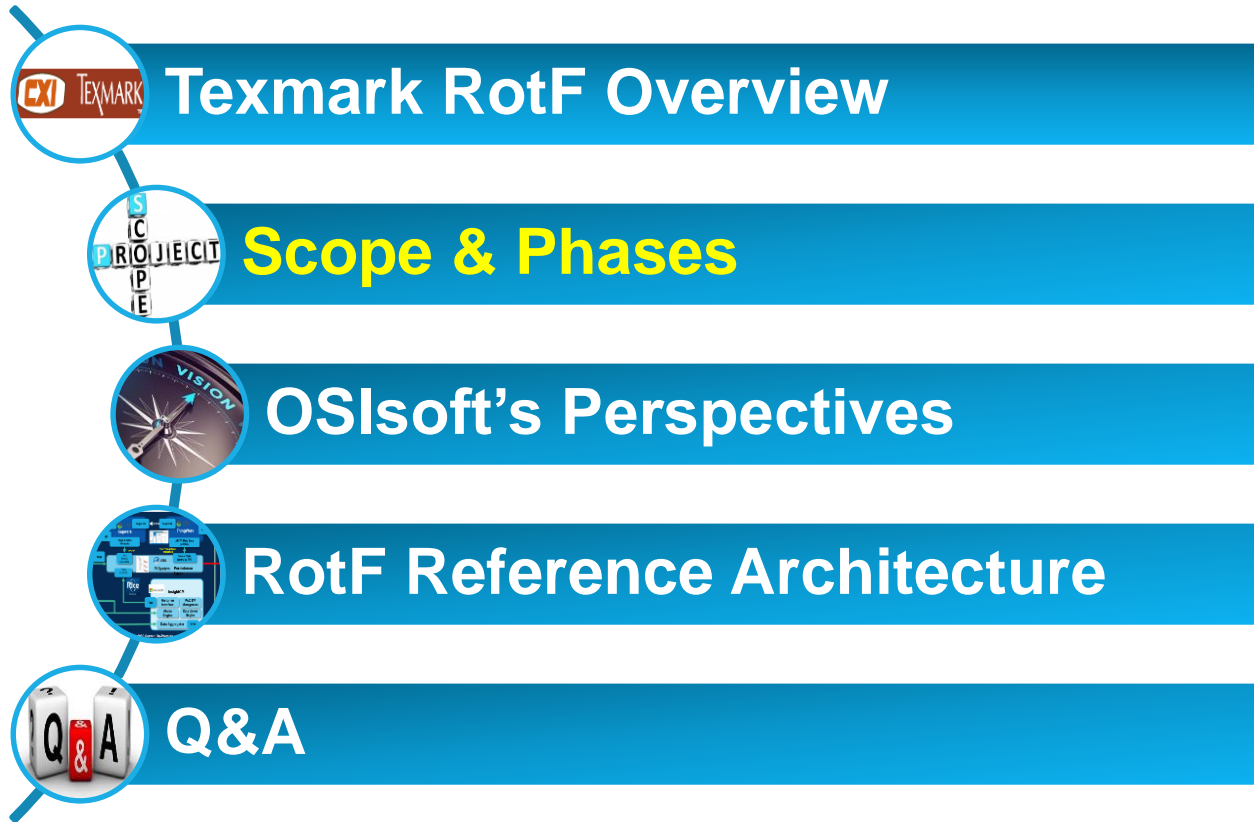


- HPE and Texmark entered into a **mutually beneficial relationship** which allows Texmark access to the **best Intelligent Edge, Mobility, and Hybrid IT solutions and a world class ecosystem of partners to implement them.**
- HPE and ecosystem of partners have the **ability to bring potential clients to Texmark to showcase these solutions** in a real-world, production environment.
- **5 year partnership** term, commercial “investment”
- Both benefit from the opportunity to **collaborate when new technologies and solutions** are introduced and **tested within the Texmark Test Bed.**

“At the end of the day this relationship is about People and what we can achieve together” – Doug Smith, CEO, Texmark



# The Texmark RotF Journey – Chapter 1



# Project Scope - Aruba / Edgeline / IoT with Partners

## The project is divided into 3 phases:

- Phase I – Aruba / Networking Infrastructure- Class 1/ Div 1 (complete)
- Phase II – HPE Edgeline / Compute upgrade/Microdata center (complete)
- Phase III – 3-5 IoT Proof Solutions with Ecosystem partners (IP)



## ROTF integrated with 2 sister projects:

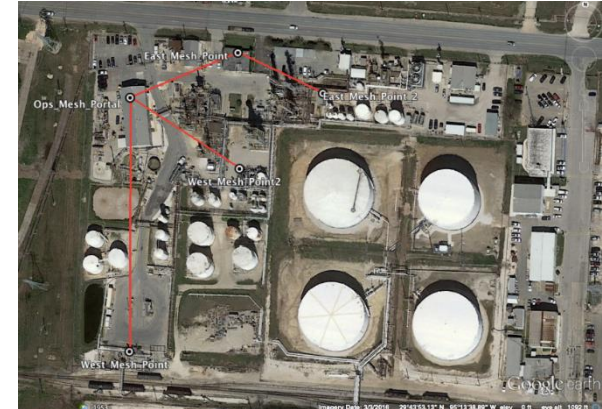
- 3D Scan - Mechanical Integrity/Digital Twin (ENIOS) (complete)
- DCS upgrade / replacement (selection in progress)



# Project Scope Phase I – Aruba Content

## Secure wireless field communications mesh:

- Six AP-274 access points housed in Class 1 Division 1 explosion proof enclosures
- Mounted at a height of approximately 25 feet on the top of steel & concrete poles
- First access point is a mesh portal for the remaining five units
- Seven AP-325 access points in the buildings
- Airwave and ClearPass installed on EL4000
- Beacons and the Meridian infrastructure to support turn-by-turn and way-finding bluedot navigation throughout the plant



# Project Scope Phase II – Edgeline Content

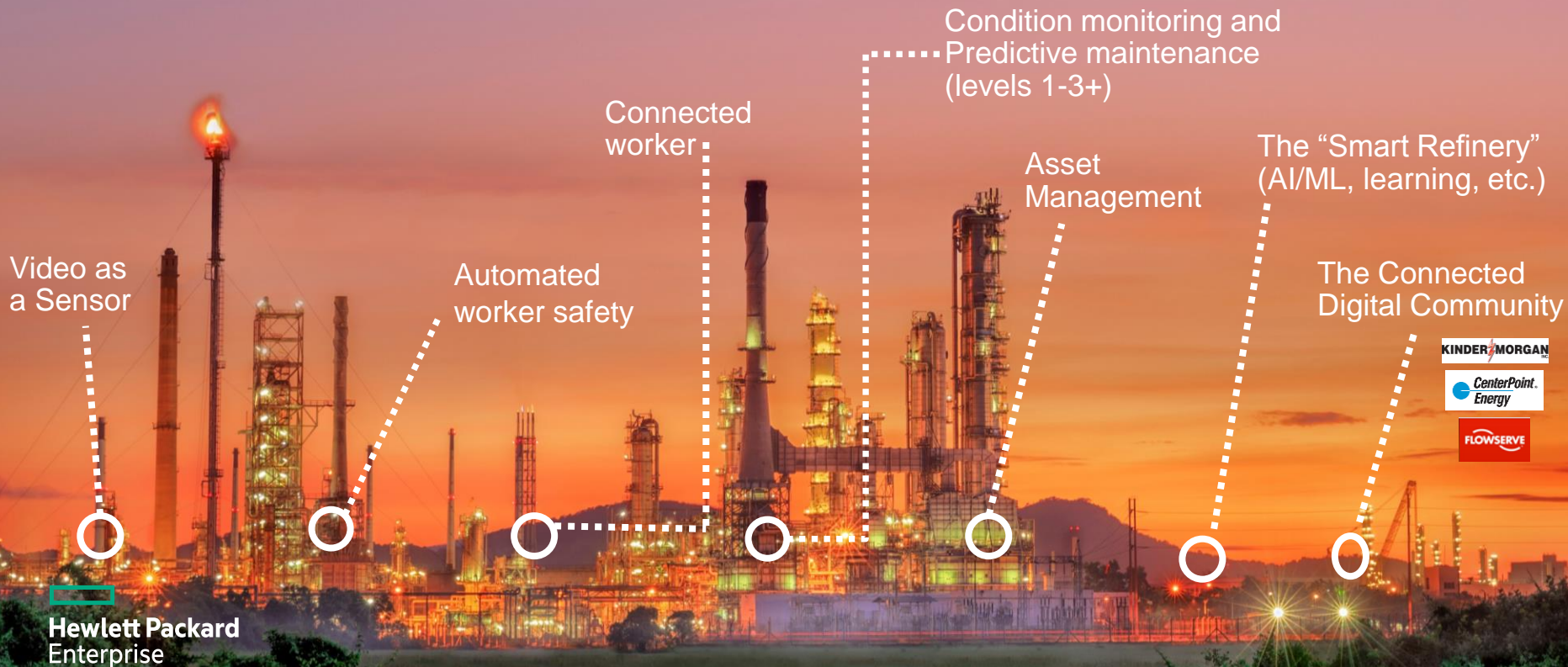
## EL4000 compute:

- HPE Micro Datacenter
- Two EL4000 10Gb switched chassis
- Six ProLiant m510 (8-core) server cartridge
- One EL4000 mounted on the wall in the Operations Center
- One EL4000 mounted on the wall in the PLC control Center
- Connection to the customer's NAS
- Hybrid bare metal and virtualized system
- Serves as compute infrastructure for the DCS system and the IoT proof solutions





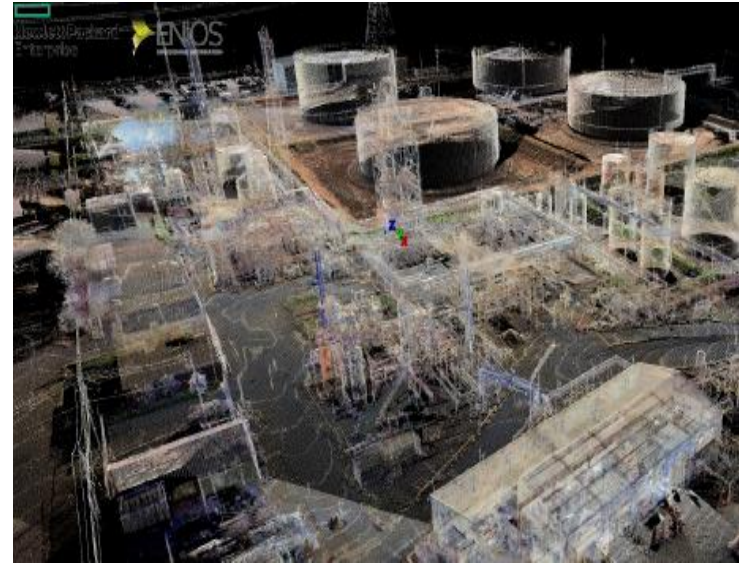
# Project Scope Phase III IoT solutions



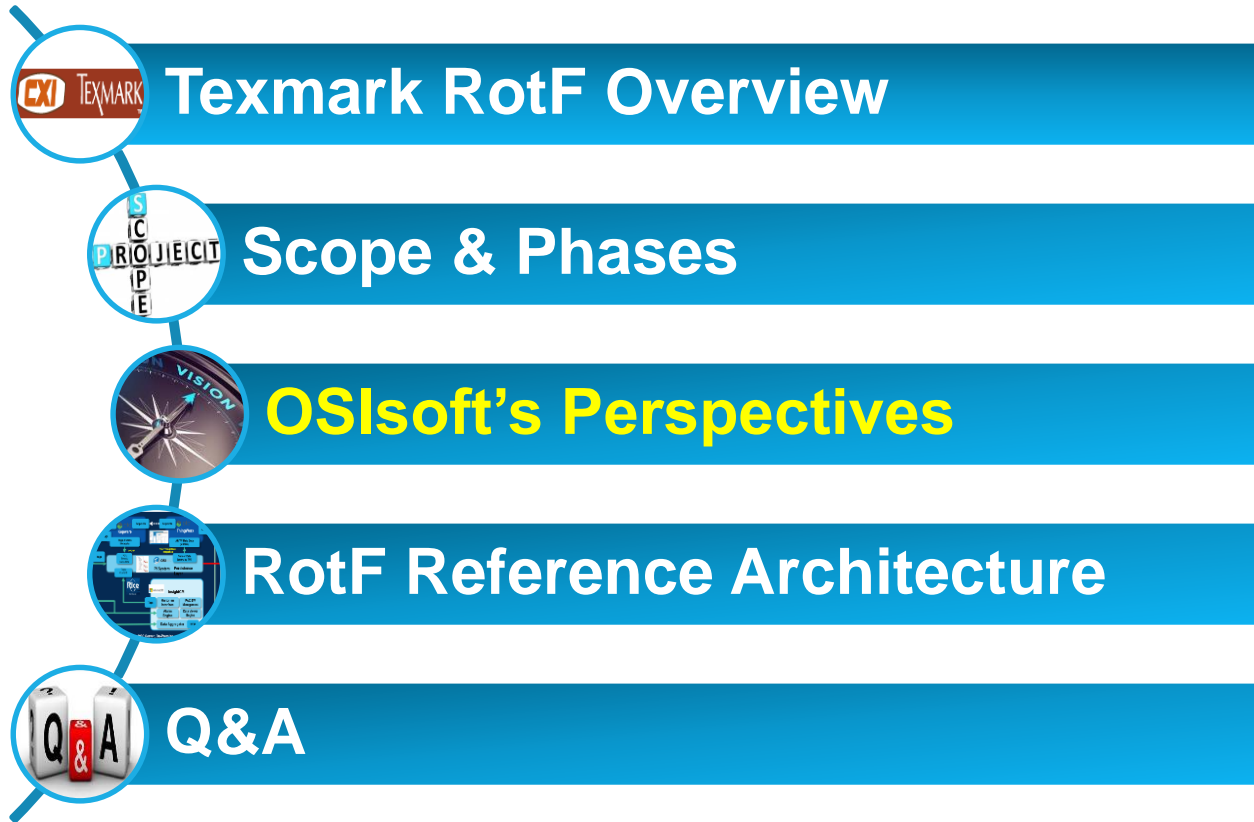
# Sister Project – Mechanical Integrity / Digital Twin

## ENIOS Laser Scan & Palladio:

- Laser scan of facility provides 3D point cloud
- P&ID information synchronized with 3D point cloud by Palladio
- Inspection information used by Palladio to provide a digital twin to show the current, as-is state of the facility
- Integrated into RotF in Asset Management Project Statement.



# The Texmark RotF Journey – Chapter 1



# OSIsoft Perspectives- Areas to Be Addressed in the RotF Initiative



**IOT Enablement and Monetization – It is about business - EBITDA**



**Power of choice - Ecosystem of technology and companies**



**Master Data Management- Multiple “Digital Twins” & Asset Models**



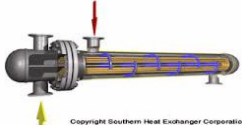
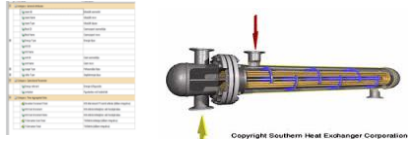
**Analytical Framework & Layers of Analytics from the edge to the cloud**



**Data Flow optimization - in motion & persistence**

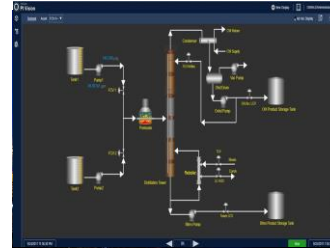


# Smart Asset Objects – Configuring the Texmark OT Infrastructure



Copyright Southern Heat Exchanger Corporation

## Exchanger Template



## Physical Texmark RotF Program

- [-] Ozone
  - [-] Acid gas Removal
  - [-] Dehydration
  - [-] Fractionation Train
  - [-] Gathering Systems
  - [-] Mercury Removal
  - [-] Meter stations
  - [-] Nitrogen Reinjection
  - [-] Sulfur Unit
  - [-] Sweetening Unit
  - [-] Tail gas Treating

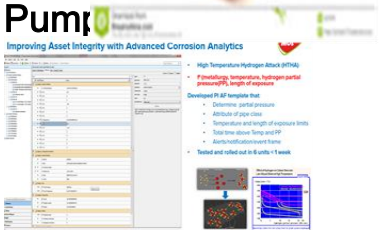
## System View



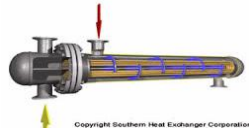
## Digital Texmark RotF Program



## Tow



## Application Template (eg. HTHA Corrosion)



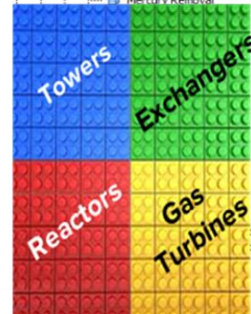
## Physical Texmark Enterprise

- [-] Ozone
  - [-] Acid gas Removal
  - [-] Dehydration
  - [-] Fractionation Train
  - [-] Gathering Systems
  - [-] Mercury Removal
  - [-] Meter stations
  - [-] Nitrogen Reinjection
  - [-] Sulfur Unit
  - [-] Sweetening Unit
  - [-] Tail gas Treating

## Digital Texmark Enterprise



- [-] Offshore
- [-] Permian
  - [-] Frac Plants
    - [-] Ozone
      - [-] Acid gas Removal
      - [-] Dehydration
      - [-] Fractionation Train
      - [-] Gathering Systems
      - [-] Mercury Removal



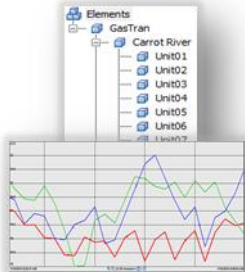
## Texmark OT Chart of Accounts



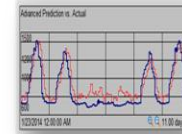
# Hybrid “Data Lake”- Leveraging Fit for Design Technologies



**Tabular & Unstructured +**



**Linear/Time, Event, Asset Context**

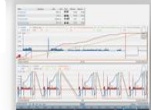


**Predictive Statistical Modeling ML/AI**



**Dashboards Geospatial & multi-dimensional assessment**

$$Q = \frac{\Delta P_{DD} * kh}{141.2 \mu B_0 \left\{ \ln \frac{r_e}{r_w} - \frac{3}{4} + S \right\}}$$



**Prescriptive, Empirical, & Physics based Streaming Analytics**



New Sensor Technology

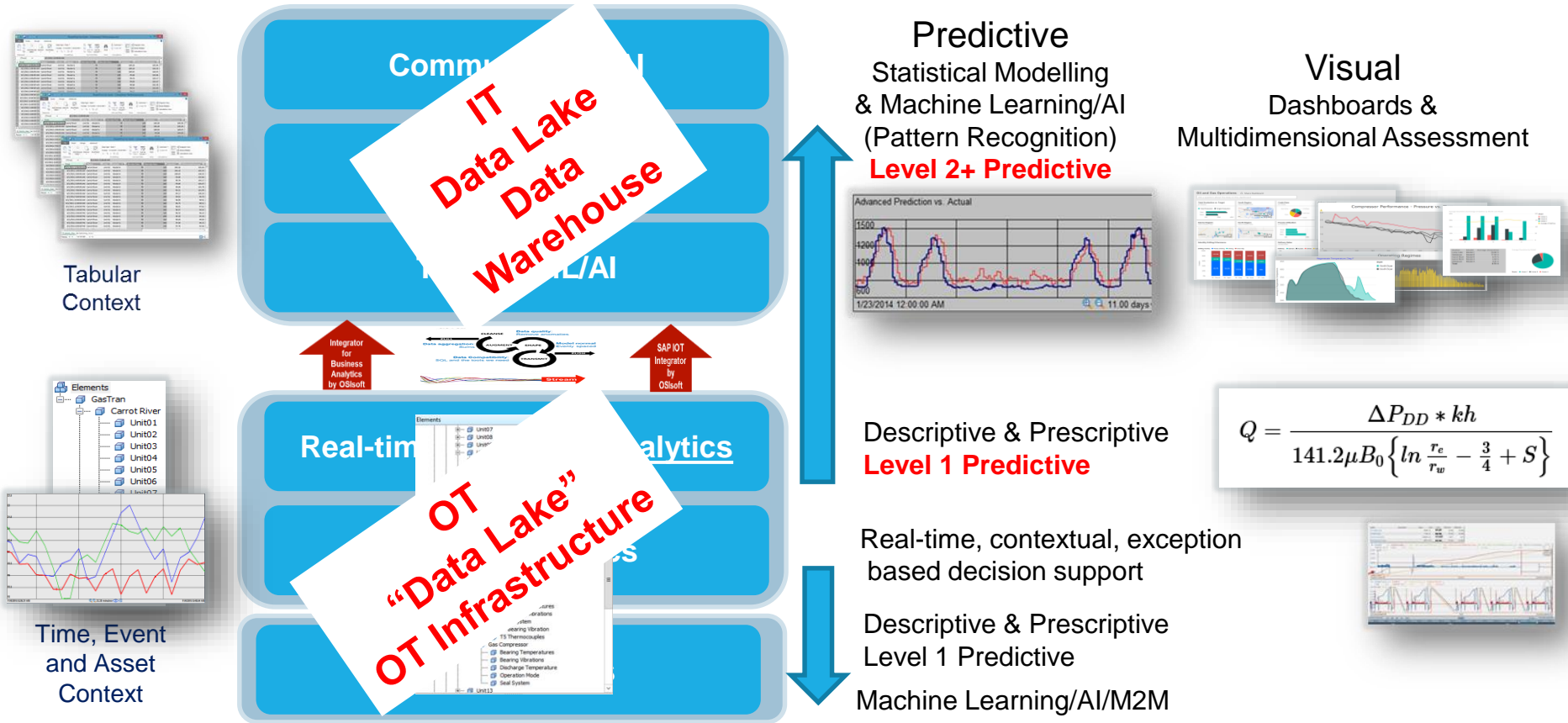


DCS, SCADA, PLCs, & other OT data sources

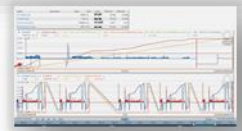


Remote & Mobile Assets

# An Evolutionary Approach to Analytics



$$Q = \frac{\Delta P_{DD} * kh}{141.2 \mu B_0 \left\{ \ln \frac{r_c}{r_w} - \frac{3}{4} + S \right\}}$$



# Natural Gas Consumption Prediction



## BackGround

- Huge saving possibilities in the decrease of contracted natural gas daily maximum amount

## Problem

- High penalty on daily amount exceedance
- Alerting system was needed

## Solution

- Consumption prediction calculations in PI Analysis
- Detailed information on PI Vision display (about consumption, prediction, contacts of decision makers)
- E-mail alerting system in Notifications

The screenshot shows the PI Analysis tree on the left and a table on the right. The tree is expanded to 'MOLHU NatGas Cons' and includes items like 'DF C3 compressor stop', 'DF Fuel Oil Increase', 'DF Fuel Oil Burning in BoilerPlant', 'DF GFR, PB Blow-Down Increase', 'DF PB Own Burning AV2', 'DF PB Own Burning AV3', 'TVK GasTurbine Stop', and 'TVK Oil Burning Increase'. The table on the right has columns for Name and Value, and is categorized into:

Category	Name	Value
<None>	CoreSight Link	http://molzhibicore/CoreSight/#/PBD...
Auxiliary Calculations		
Consumption Calculations		
	Cumulated Daily Consumption	18723164 MJ
	Current Consumption	1991855,5 MJ/h
	Predicted Daily Consumption	49276016 MJ
Exceedance Calculations		
	Alert State	4
	HI Limit Exceedance	0 MJ
Limits		
	HI Alert	59500000 MJ
	HHI Alert	61000000 MJ
	LO Alert	0 MJ
	LOLO Alert	0 MJ

The screenshot shows the PI Analysis table and the expression editor. The table has columns for Name, Configuration, Schedule, Output(s), and Backfilling. The expression editor shows the following expressions:

Name	Expression
SecondsToNextGasDayTurn	$\text{Int}(\text{Bod}(* * - 6\text{h}^*) + * + 30\text{h}^* - **)$
PredictedDailyConsumption	$\text{Cumulated Daily Consumption} + \text{Current Consumption} * \text{SecondsToNextGasDayTurn} / 3600$





# Advanced CBM with the PI System

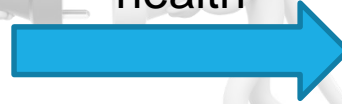


## PI Server

- Process database
- Online analysis of process information
- Calculation of asset health
  - Asset condition
  - Running hours
  - Performance
- User Interface
  - PI Coresight/Vision
  - PI DataLink

## Connection (WebLogic)

Calculated asset  
health



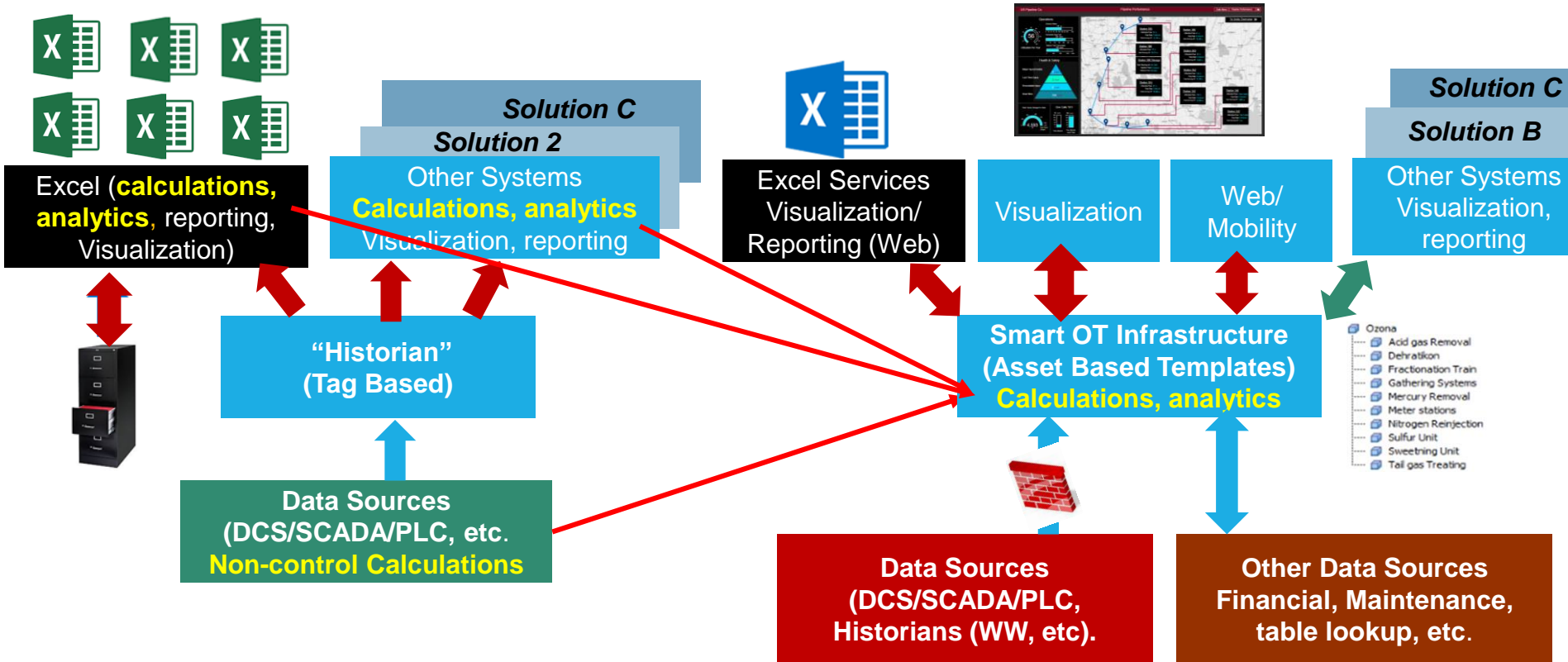
Maintenance  
related information



## SAP PM/Maximo

- Technical database
- Management of maintenance processes
- Creation of work orders or notifications
- Trigger maintenance strategies based on asset health

# Standardizing Calculations & Analytics

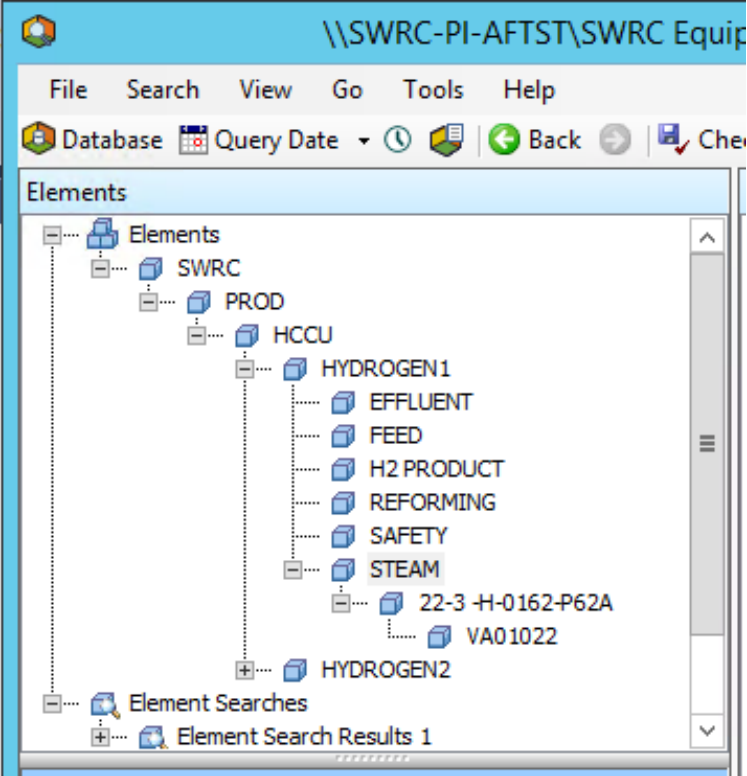




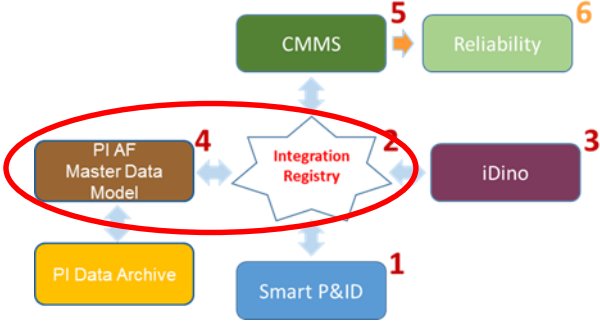
# Leveraging PI AF as the Master Asset Model in Sinclair Oil's Digital Transformation Journey

Presented by Bruce Taylor, Manager, Business Process Integration  
Supported by: Mario Brenes, CTO IT Vision Inc.

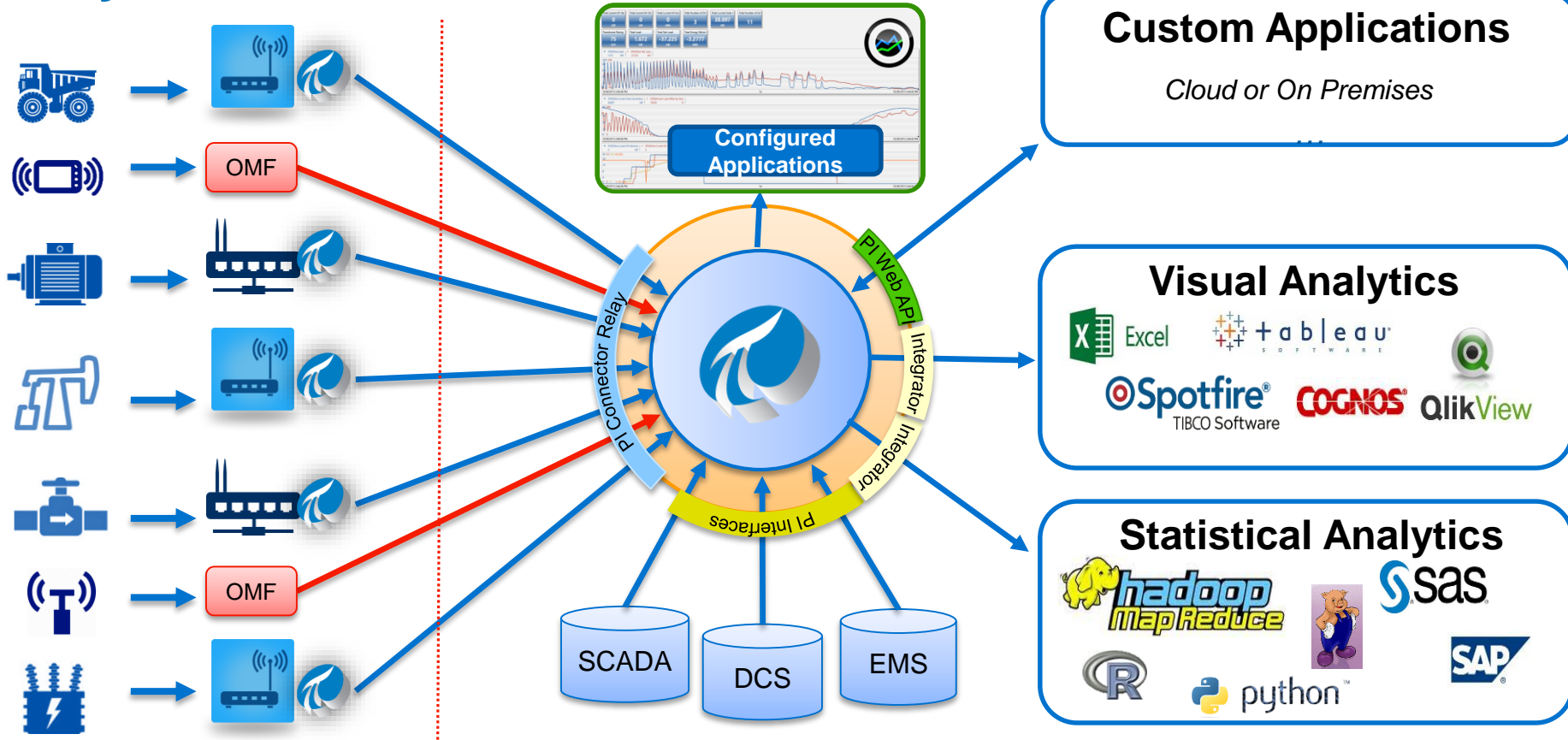
# SWRC Case Study



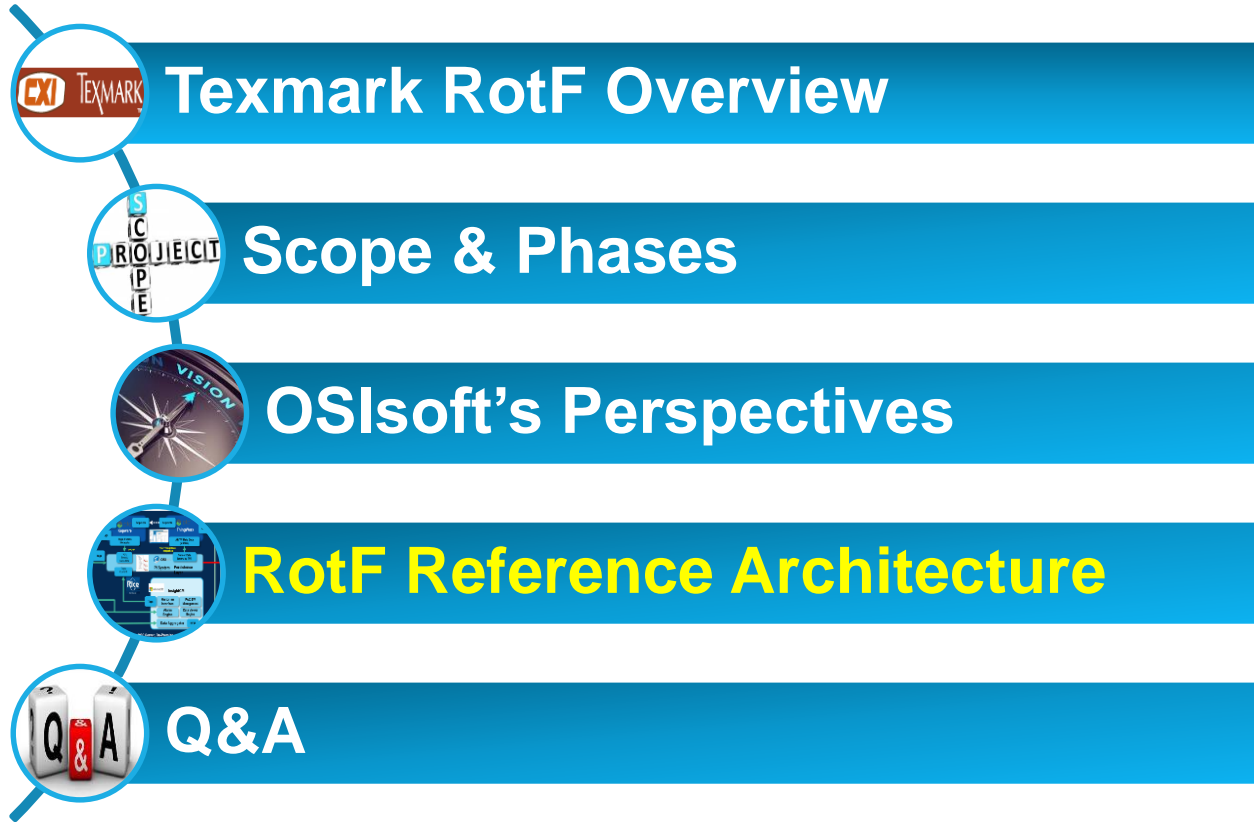
Asset / Component created in PI AF with associated attributes and metadata



# PI System IIoT Architecture

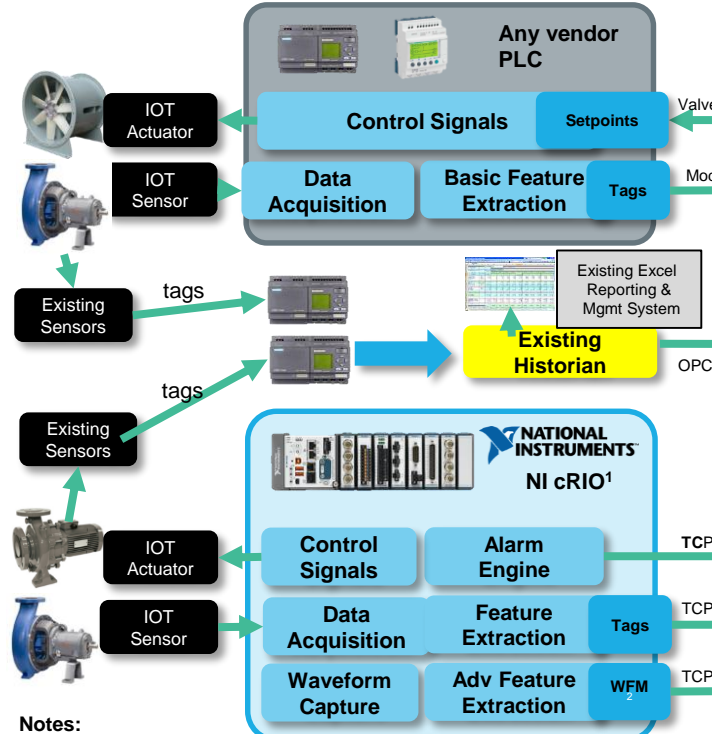


# The Texmark RotF Journey – Chapter 1





# Refinery of the Future Reference Architecture

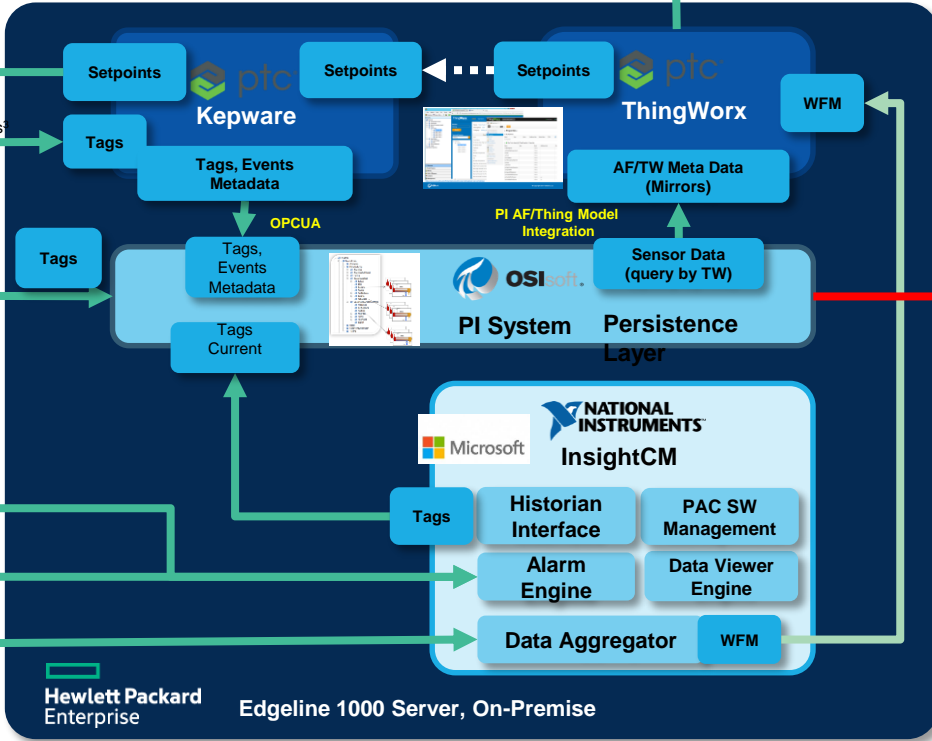


- Notes:**
1. NI cRIO is a Programmable Automation Controller (PAC)
  2. Waveform
  3. Modbus or any other protocol supported by Kepware

### Role Based Contextual Displays

ThingWorx Studio

AR, Hololens, Realwear, Aegex, PI Vision



# Texmark PI AF Structure - Illustrative

\\OSIBIAles\Texmark - PI System Explorer (Administrator)

File Search View Go Tools Help

Database Query Date Back Check In Refresh New Element New Attribute

Elements

- Elements
  - Texmark
    - Btms Product Storage Tank
    - Btms Pump
    - Condenser
    - Distillation Tower
    - FCV-1
    - FCV-2
    - FCV-Reflux
    - LC-1833
    - OH Acc LCV
    - OH Product Storage Tank
    - Ohd Drum
    - Ovhd Pump
    - Preheater
    - Pump1
    - Pump2
    - Reboiler
    - Tank1
    - Tank2
    - TCV
    - Tower LCV
    - Vac Pump
  - Element Searches

Pump1

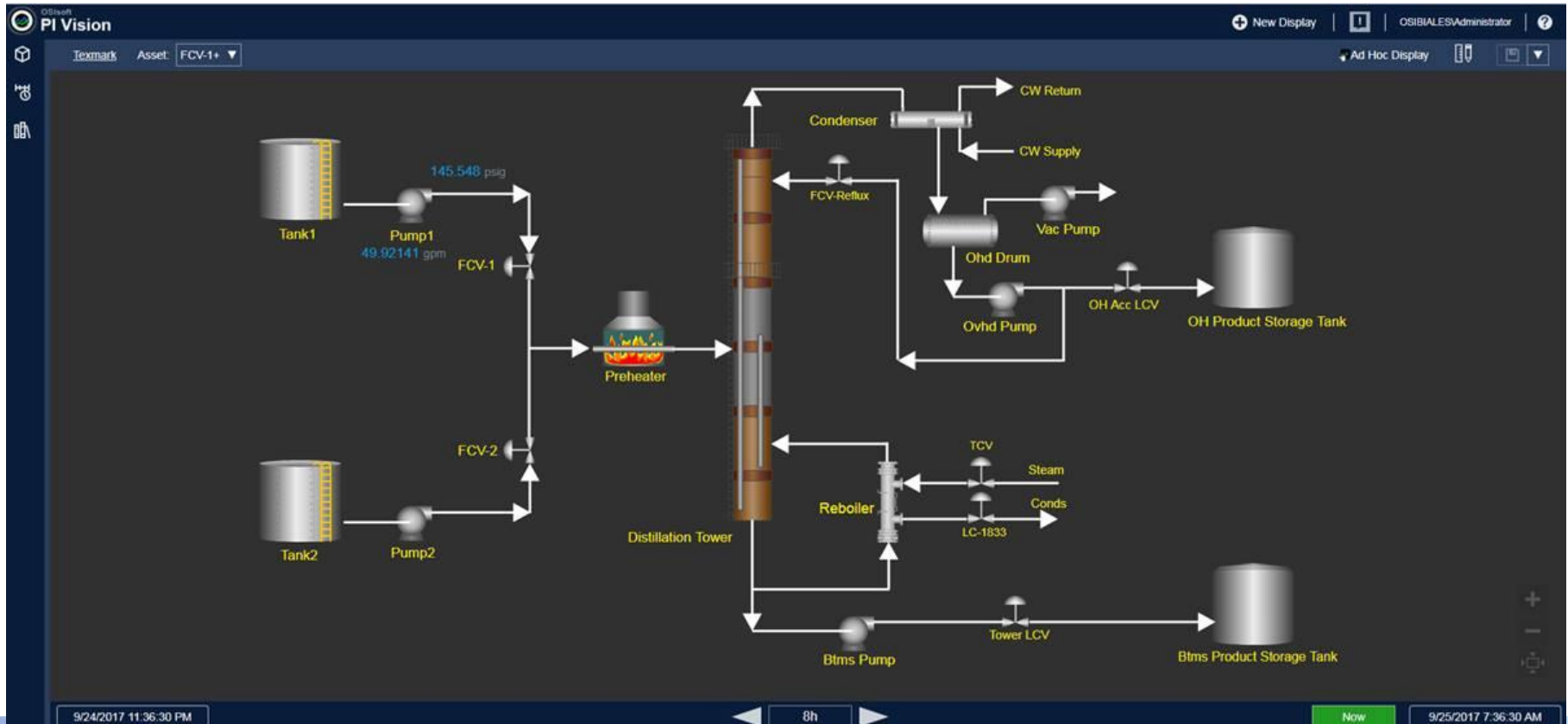
General Child Elements Attributes Ports Analyses Notification Rules Version

Filter

Name	Value	Time Stamp	Settings...
Category: <None>			
Discharge Pressure	150.576766967773 psig	9/25/2017 7:38:23 AM	\\OSIBIAles\cldt158
Tag	cldt158	1/1/1970 12:00:00 AM	
Flow	50.2996215820313 gpm	9/25/2017 7:38:23 AM	\\OSIBIAles\ales.test2
Tag	Ales.test2	1/1/1970 12:00:00 AM	
Name	Pump1	1/1/1970 12:00:00 AM	">%Element%"
Suction Pressure	60.5307846069336 psig	9/25/2017 7:38:23 AM	\\OSIBIAles\ales.test3
Tag	ales.test3	1/1/1970 12:00:00 AM	



# Texmark RotF PI Vision Overview



# PI Vision – PI AF/ National Instrument Pump 2.0 Demo

## Pump Real-Time Condition Monitoring

[Go to Insight CM](#)

### Vibration

Accelerometer (g's) True Peak

Bearing-X 0.51 ●

Bearing-Y 0.29 ●

Impeller-9X 0.000 ●

### Motor

Efficiency (%) 86 ●

Voltage (V) 123.1 ●

Amperage (A) 3.5 ●

Speed (rpm) 1777 ●

Load (%) 39.4 ●

[Go to Pump Curve](#)

### Pump

Running Status ■

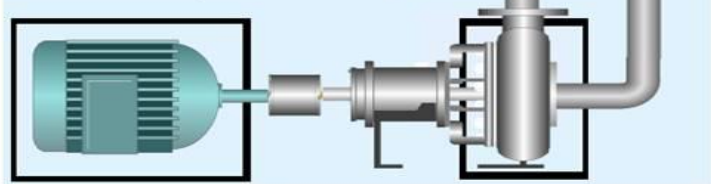
Alert Status **Running** ●

Efficiency (%) 7.8 ●

Head (psi) 35.4 ●

Flow (gpm) 18.5 ●

Seal Temp. (°F) -102754.3 ●



[Go to Alerts Watch List](#)

### Suction

Valve Position (%) Open 45

Pressure (psi) 2.4 ●

### Discharge

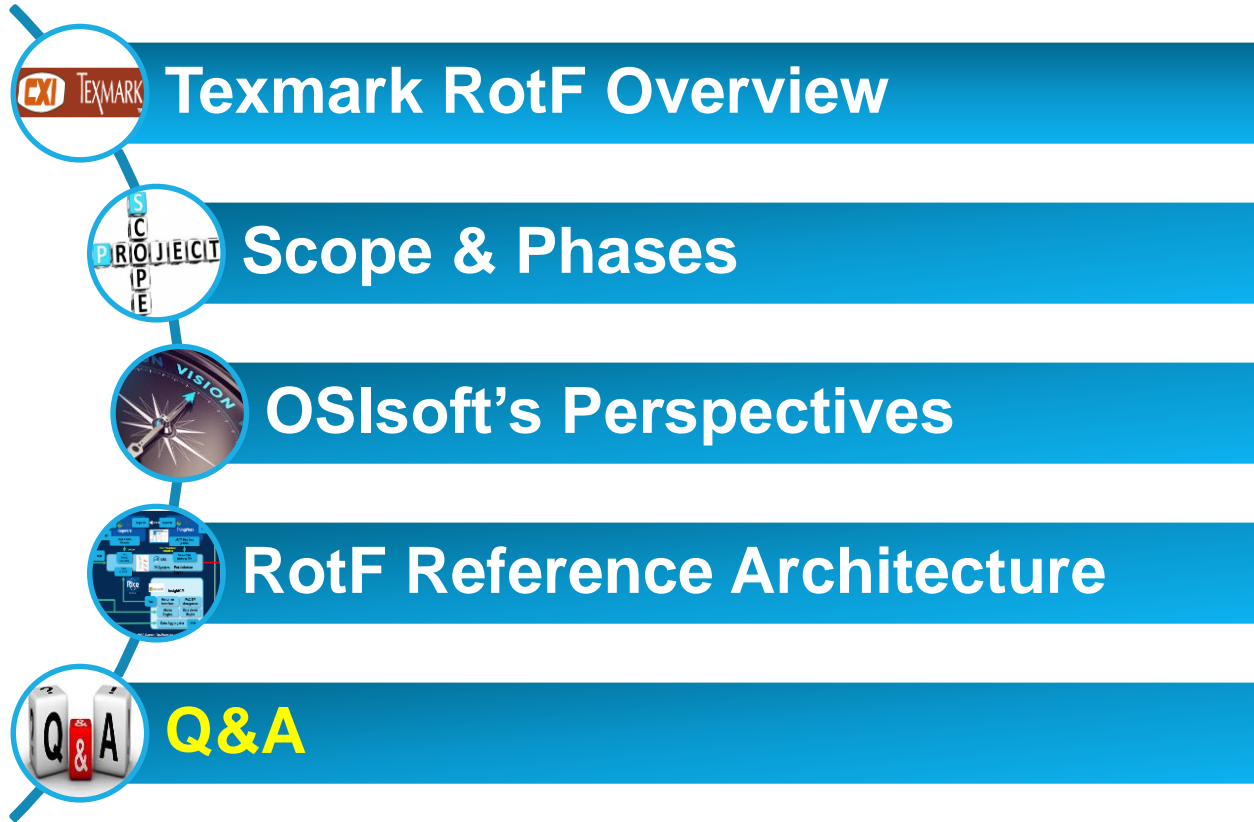
Valve Position (%) Open 68

Pressure (psi) 17.2 ●

### Delta P

Pressure Differential (psi) 14.8 ●

# The Texmark RotF Journey – Chapter 1



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Partner Program Manager

OSIsoft



## Questions

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



Please state your **name & company**

## Please don't forget to...

complete the Post  
Event Survey

