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

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The Story Line….

Business Themes

- The Enterprise
- Situational Needs
- The Opportunity
- The Approach
- Results

Technical Themes

- Physical architecture
- Data process flow
- Business rules / logic
- PI AF SDK
- PI AF templates
- Advantage of PI AF - Future

The Sinclair Oil Enterprise

Sinclair Oil Corporation

- Privately held integrated oil enterprise
- Headquartered in Salt Lake City, Utah
- Sinclair Wyoming Refining Company
  - Location: Sinclair, Wyoming
  - Size: ~85k/bpd or ~4.7 tpa
  - Complex facility; hydrocracking, hydrotreating, delayed coking
  - 5 major products; propane, gasoline, jet, diesel, asphalt

The Situation

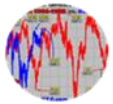
- **Vision: Achieve and sustain industry leading performance**
  - Safety
  - Reliability
  - Profitability
- **Progress: Significant advancements in past 5 years**
  - Mechanical
  - Cultural
  - Work processes and performance measurements
- **Next Step: Leverage Investments / Address Key Opportunity**
  - Information Technologies
  - Business and Operational Discipline

The Key Opportunity

- **Enviable set of marque software**
  - OSIsoft PI System
  - CMMS
  - MI
  - LIMS
  - EHS
  - AIM
  - CAD/CAE

Classic Challenge


Planning & Scheduling Data


Supply Chain & Trading Data


Targets & KPI Data


Financial & Business Data


Documents & Procedures


Inventory Data


Process and Control Data

Information is scattered in numerous 'silos' developed around specific applications within functional areas of the organization and functionally reported


EH&S Data


Operations & Personnel Data


Maintenance Data


Reliability Data

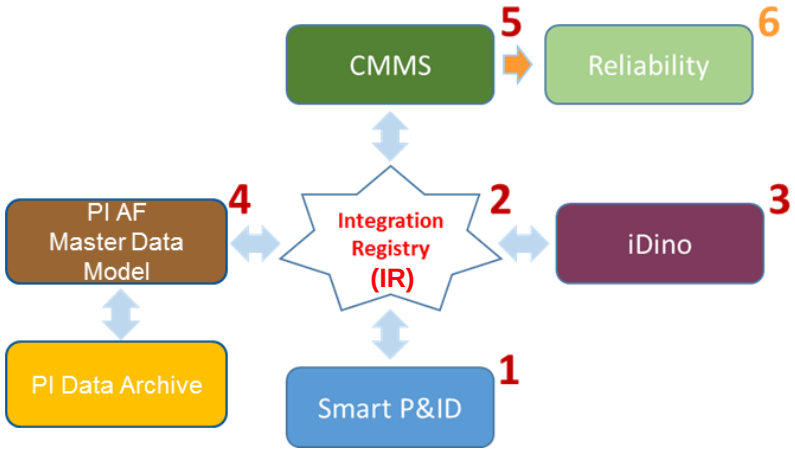

Lab/Quality Data

Approaching Digital Transformation

- **Strategy**
  - Standards
    - Creation and Sustainment of Asset Model (ISO 15926)
    - Adoption of MES/MOM methods and standards (ANSI/ISA 95)
  - Provide Operational Intelligence (OI) / Situational Awareness (SA)
  - Embracing IIoT - Implementation of site-wide Wireless Umbrella
- **Key Driver (Why is this work important)**
  - Sustaining pace of business and operations improvements requires single valid unifying master reference model; and
  - Sustaining accuracy and thoroughness is key to the model's validity

SWRC Case Study

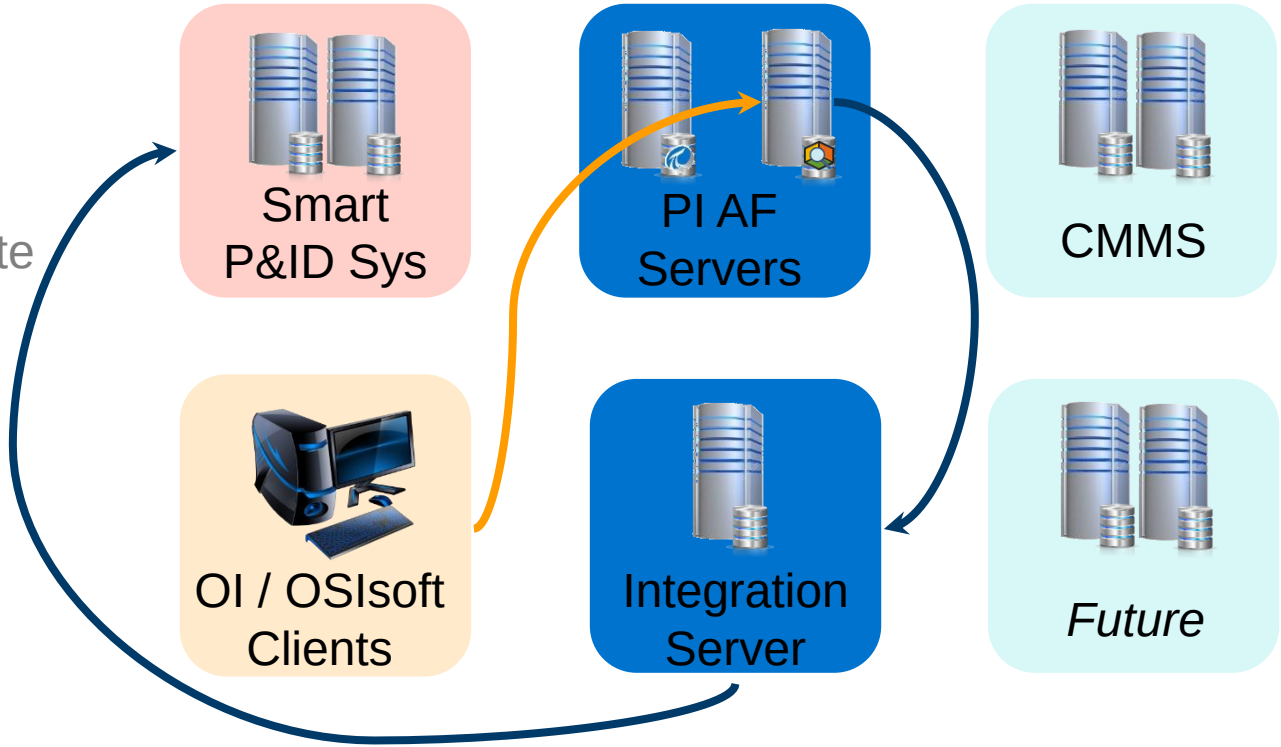
- **Asset Model Sustainment / Process Information Flow**
  - Ensure / Validate sustainment capabilities
  - Use asset information already gathered
  - Enhanced business capabilities driven by existing MOC and engineering processes



1. Changes made to drawings
2. IR registry updated
3. Review and approve changes
4. Changes update in asset model
5. Changes updated in CMMS
6. Changes updated in Reliability

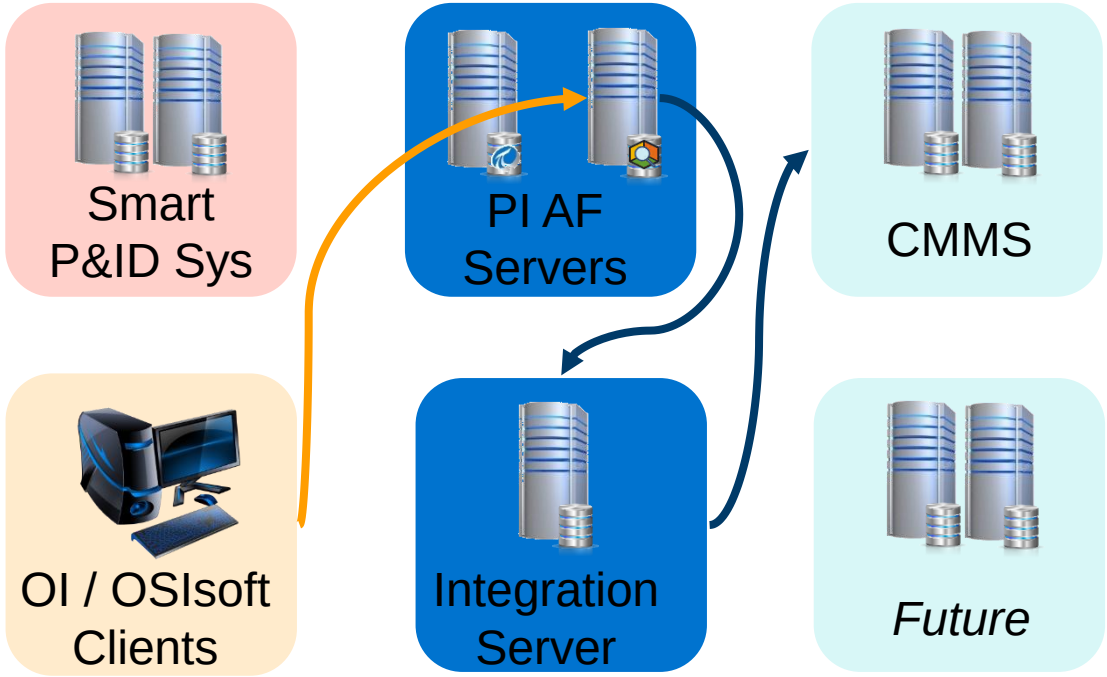
Data flow diagram (Class/Templates)

- Synchronize CAD asset template library to mirror PI AF as appropriate
- Share attribute dictionaries and other metadata standards



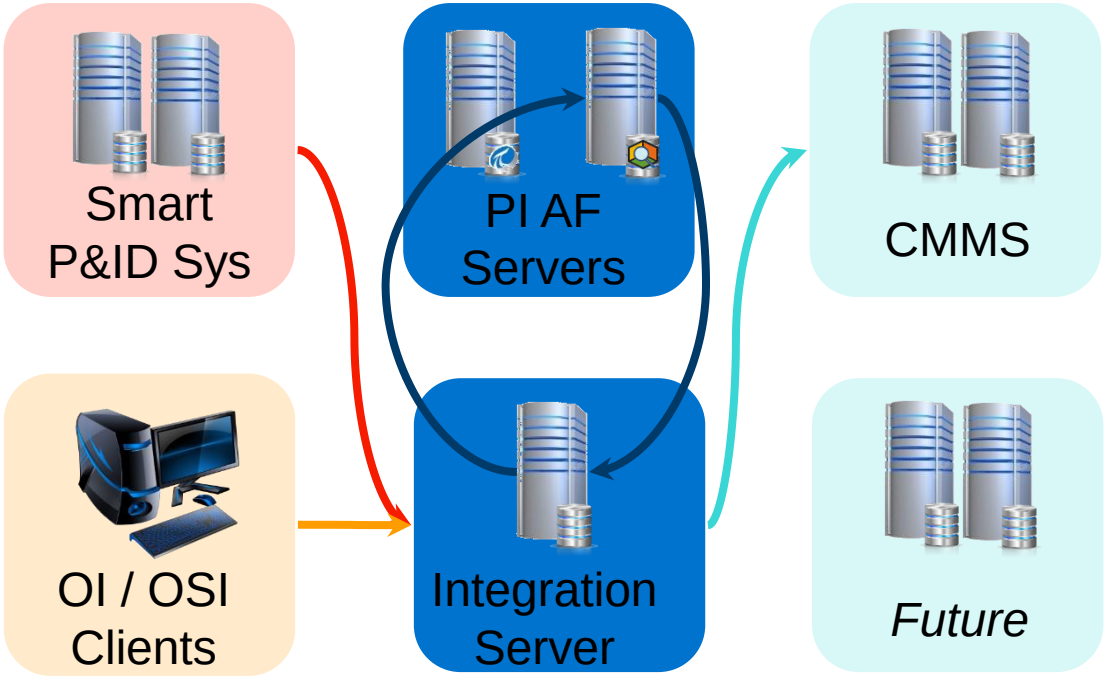
Data flow diagram (Elements & Attributes From PI AF)

- Synchronize CMMS to identify what is to be provided from the model
- Share dictionaries and metadata information



Data flow diagram (Elements From CAD)

- Delta changes identified from P&ID
- Change is processed in ‘registry’ to record change and manage / direct transaction
- Asset record is ‘pre-processed’ for target and published



SWRC Case Study

SQL integration services utilized to capture changes and synchronize

SQLQuery49.sql - S...\jbethancourt (78))* | SQLQuery48.sql - S...\jbethancourt (63))* | SQLQuery42.sql - S...\jbethancourt (73))* | Cleaning tables.sql...\jbethancourt (5

```
SELECT DWG_NAME_, ID_COUNT_, TAG_, FUNCTION_, CLASS_, TABLE_NAME, LINE_NUM_, SYSTEM_, UnitNumber, UnitName
  FROM [CADWorx].[dbo].[PID_Components_ALL_WithFlags]
```

100 %

Results | Messages

	DWG_NAME_	ID_COUNT_	TAG_	FUNCTION_	CLASS_	TABLE_NAME	LINE_NUM_	SYSTEM_	UnitNumber	UnitName
1	SW0082-FF-0022.DWG	3201075	22-3"-H-0162-P62A	NULL	PIPE	Process Lines	STEAM	STEAM	22	HYDROGEN1
2	SW0082-FF-0022A.DWG	3700559	22-3"-H-0162-P62A	NULL	PIPE	Process Lines	STEAM	STEAM	22	HYDROGEN1
3	SW0082-FF-0022A.DWG	3700848	VA01022	NULL	VAGF	Valves	22-3"-H-0162-P62A	STEAM	22	HYDROGEN1

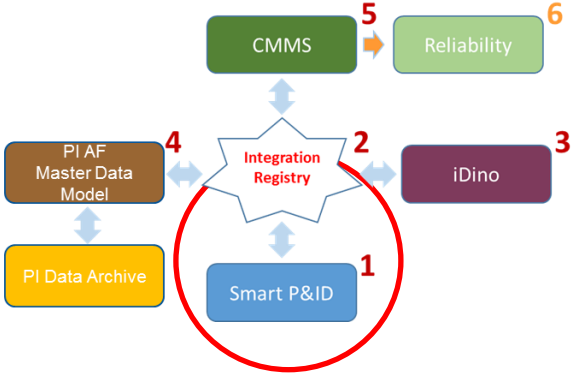
SQLQuery49.sql - S...\jbethancourt (78))* | SQLQuery48.sql - S...\jbethancourt (63))* | SQLQuery42.sql - S...\jb

```
Select SystemName, SystemTypeName, Name, EntityTypeName --, (Select e.Name from Ent
  FROM [IntegrationRegistry].[dbo].[EntityEx] e
  where (EntityTypeName = 'PIAF_ELEMENT' or EntityTypeName = 'CADWORX_COMPONENT')
  AND NAME= RTRIM(LTRIM('22-3"-H-0162-P62A')) or ParentID = '3CD58B81-F8EA-49FE-88
  order by Name
```

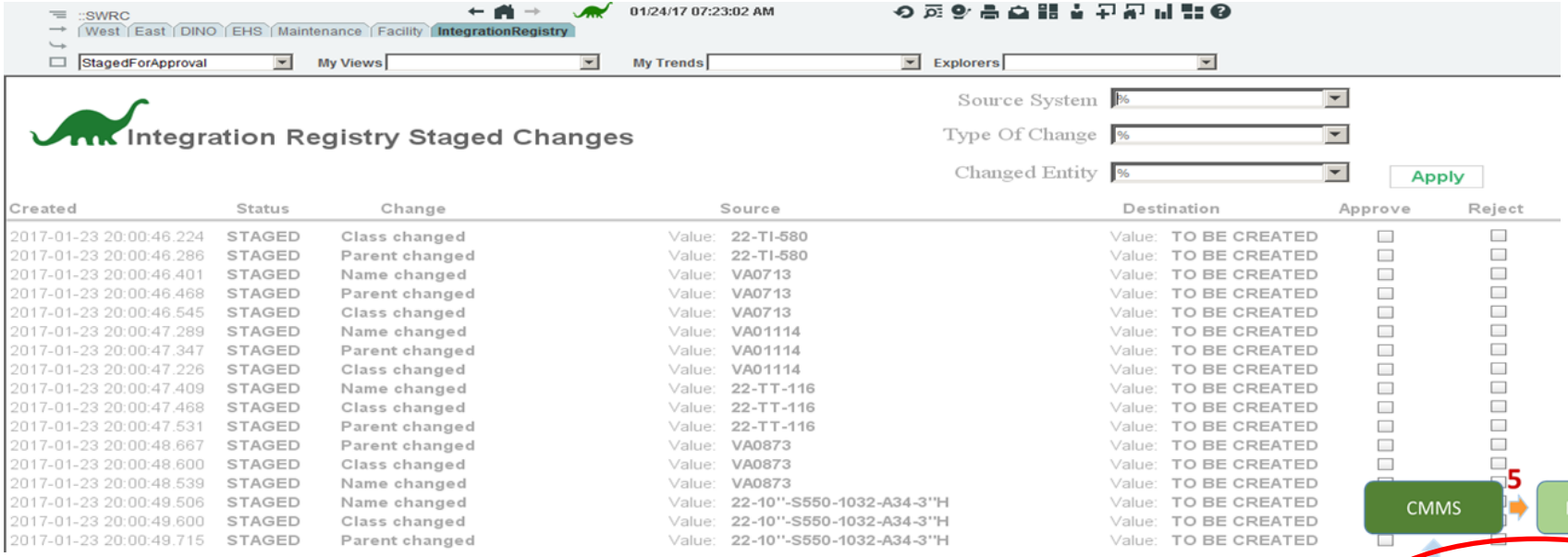
100 %

Results | Messages

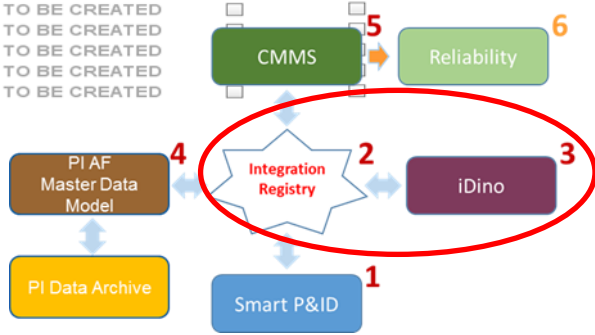
	SystemName	SystemTypeName	Name	EntityTypeName
1	CADWORX DB	CADWORX	22-3"-H-0162-P62A	CADWORX_COMPONENT
2	PI AF Production	PIAF	22-3"-H-0162-P62A	PIAF_ELEMENT
3	CADWORX DB	CADWORX	VA01022	CADWORX_COMPONENT
4	PI AF Production	PIAF	VA01022	PIAF_ELEMENT



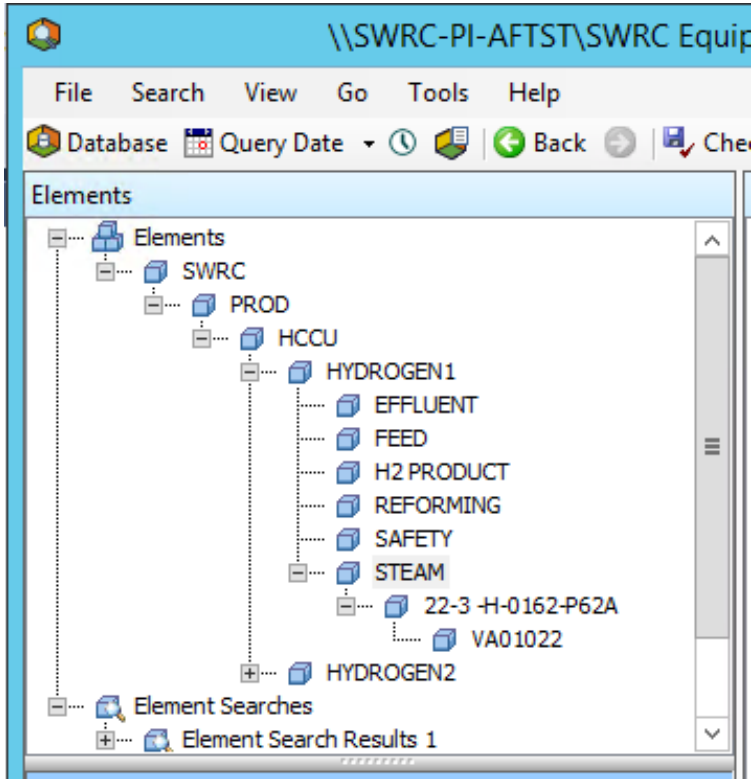
SWRC Case Study



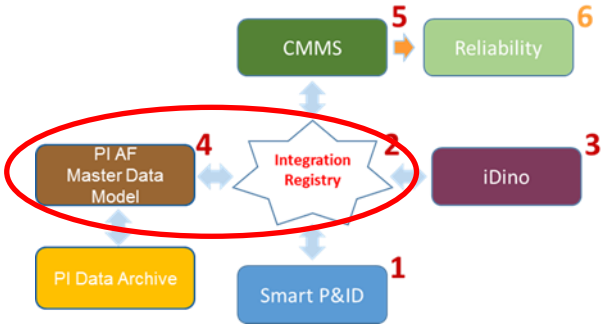
Changes captured for approval before being propagated



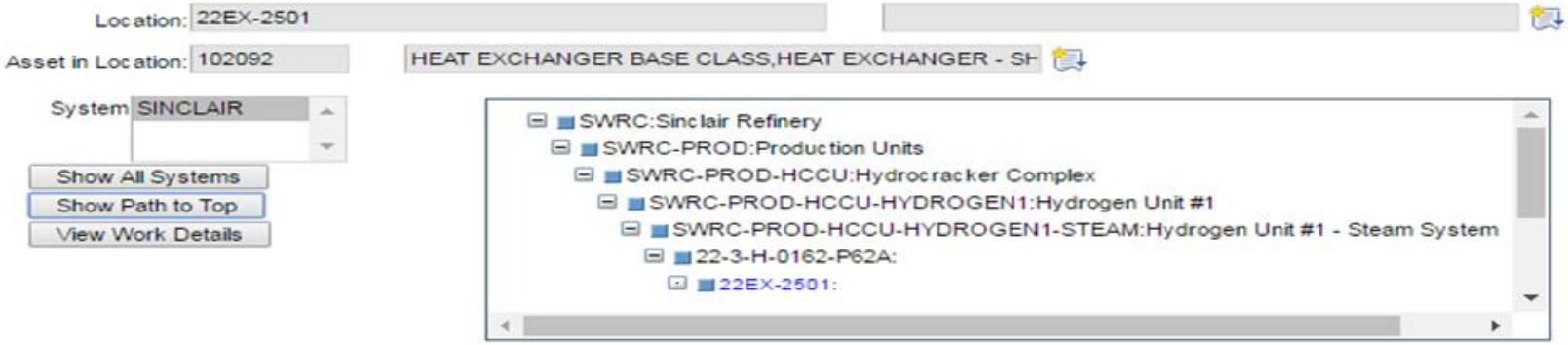
SWRC Case Study



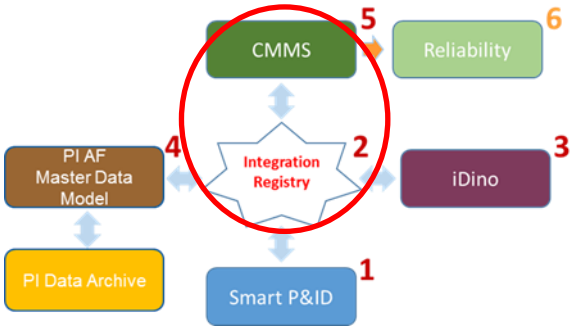
Asset / Component created in PI AF with associated attributes and metadata



SWRC Case Study



Asset / Component propagated from PI AF to CMMS with associated attributes and metadata



Phase 1 challenges

- **Technical Challenges**
  - Use of Audit trail causes too much overhead and not efficient
    - Disk space
    - Possible functional limitations
  - PI OLE DB
    - Provided capability to meet needs of project
    - Exposed hierarchy in an efficient manner
  - PI AF SDK provided basic capability to meet the needs of the project
- **Business Challenges**
  - Management of change
  - Identifying the datum
  - Recommended Approach: Start small, single unit, learn and grow…

Phase 2 Roadmap

- **Expand the PI Asset Framework**
  - Dynamically drive model into any/all associated applications
  - Extend model synchronization beyond CMMS
    - Reliability (MI)
    - Process Safety Management (PSM)
    - Environmental, Health and Safety (EHS)
    - Asset Information/Document Management (AIM)
    - Financial Performance (ERP)
- **Leverage Additional Value**
  - Enhanced Analytics
    - Risk Management
    - Cost Management
    - Operation performance; i.e. Key Performance/Operational Indicators for Energy, Availability, Asset Utilization, etc.
  - Industrial Internet of Things (IIoT)

Leveraging PI AF as the Master Asset Model

COMPANY and GOAL

Sinclair Oil relentlessly pursues a safe, reliable, environmentally responsible and a profitable operation, ensuring a sustainable future for our owners and employees and the communities where we operate

CHALLENGE

Information scattered in silos, developed around specific applications and functions

- No unifying asset hierarchy
- Burden of manual model sync'
- Potential for inconsistency
- Information delay
- Loss of business value

SOLUTION

Digital Transformation program with PI AF as the master data model / broker

- Apply Industry standards
- Embrace IIoT
- Balance data and people Judgment
- Tag and meta data abstraction

RESULTS

Simplified business process and more informed decision support

- Sustainable and scalable model for operational technology (OT) and information technology (IT) data resulting in sustainable transformative business value

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Questions

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

State your **name & company**

Please remember to…

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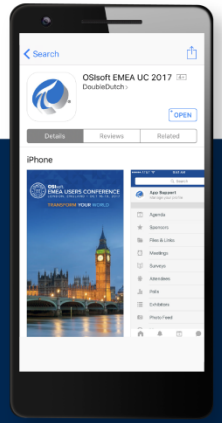

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Danke

谢谢

Merci

Gracias

Thank You

ありがとう

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Obrigado

Design and craft with sustainability as a key deliverable…