8th Chemical Process Safety Sharing (CPSS)

Crisis of CUI (corrosion under insulation) : How to become Zero Leak with best practice, Advance Integrity Assessment, Digitization & IoT?

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Working Experience: 18 years
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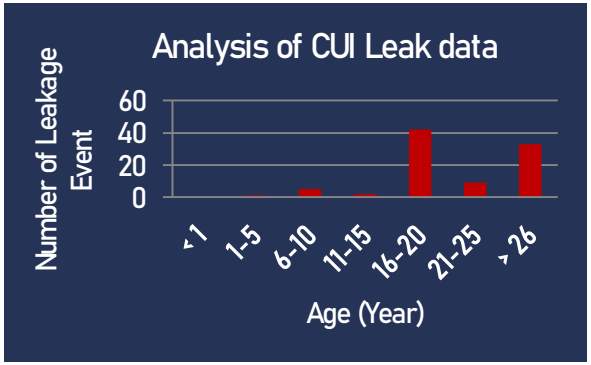
Contents

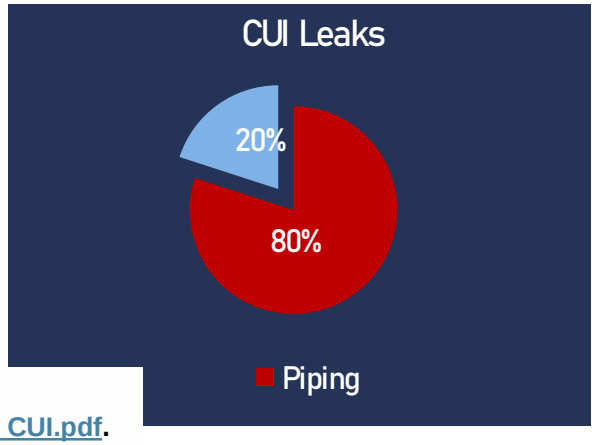
- Why CUI is a importance problem?
- **CORROSION MANAGEMENT FRAMEWORK**
  - Asset integrity data management
  - Corrosion under insulation (CUI) management
  - Early detection monitoring system by CUI sensor with the integration of IoT and Digitalization technology
- Key take away

Why CUI is a importance problem?

Reference:



Reference:
http://www.penderlo.com/doc/Dow_CUI.pdf.



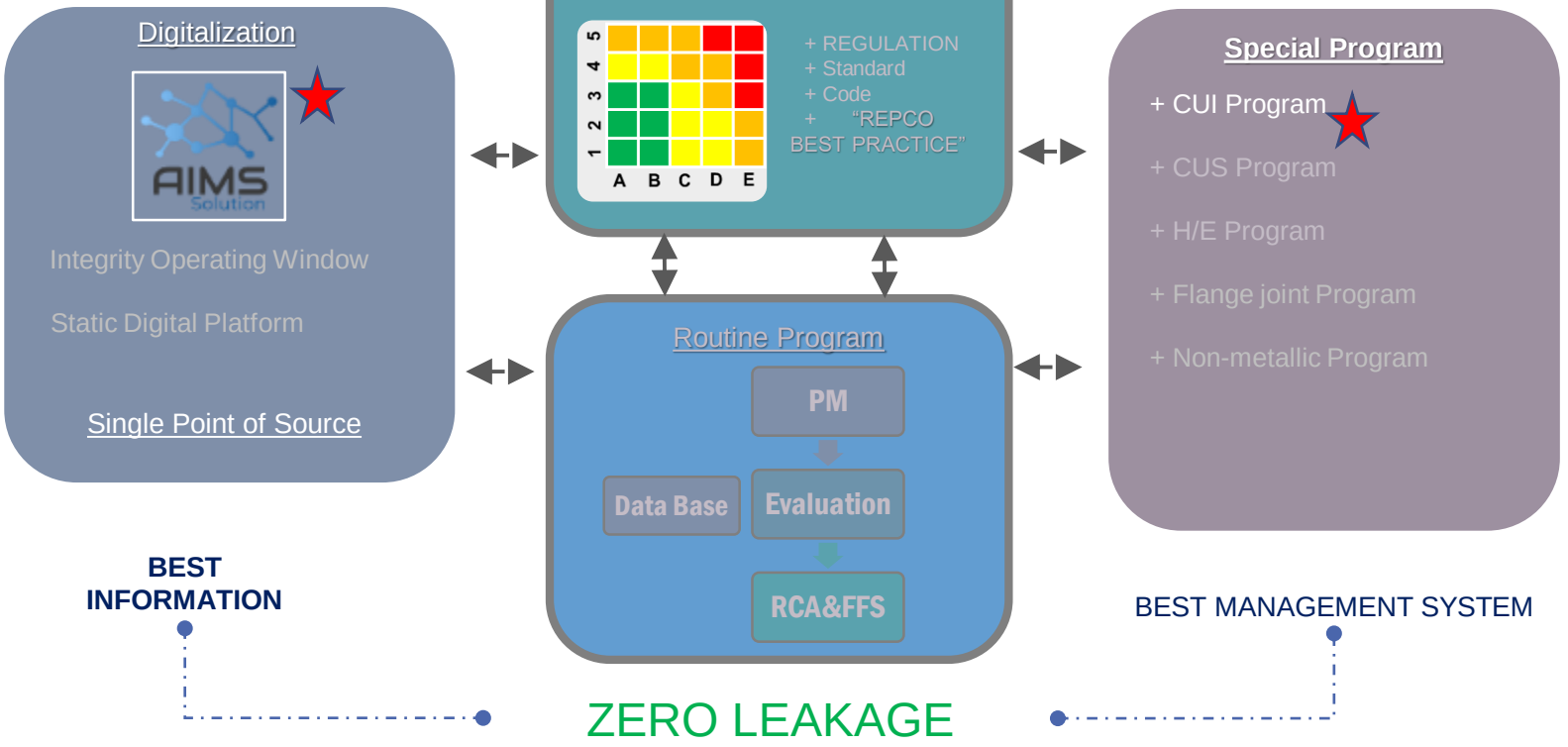
Pain Points

- CUI will be a crisis problem when the plant's life >15 years.
- The number of unpredicted case will be increased overtime.

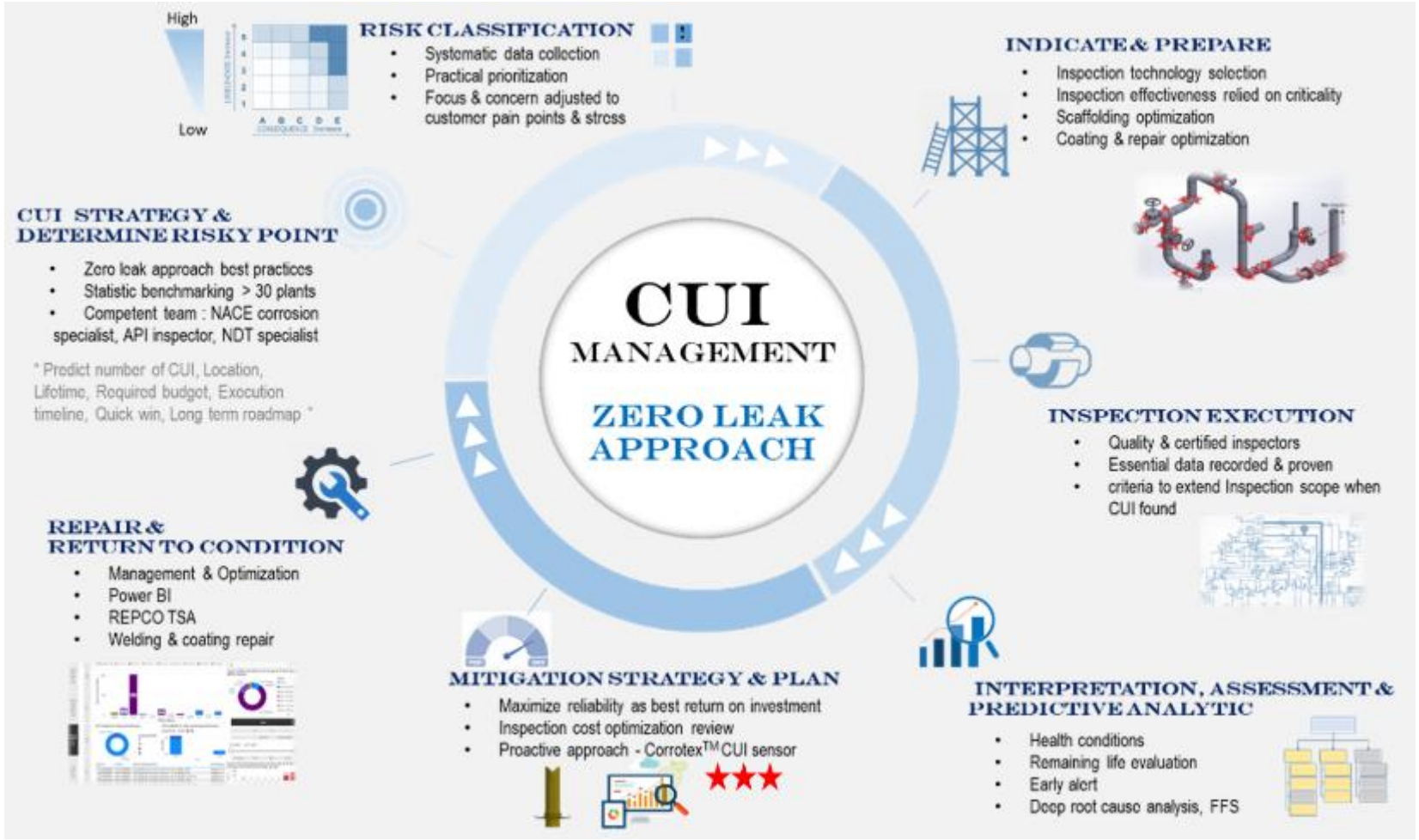
IMPACT

- LOSS >100 MB
- Safety and environment
- Insurance or Permit

Corrosion Management “BEST PRACTICES”



CUI Management approach



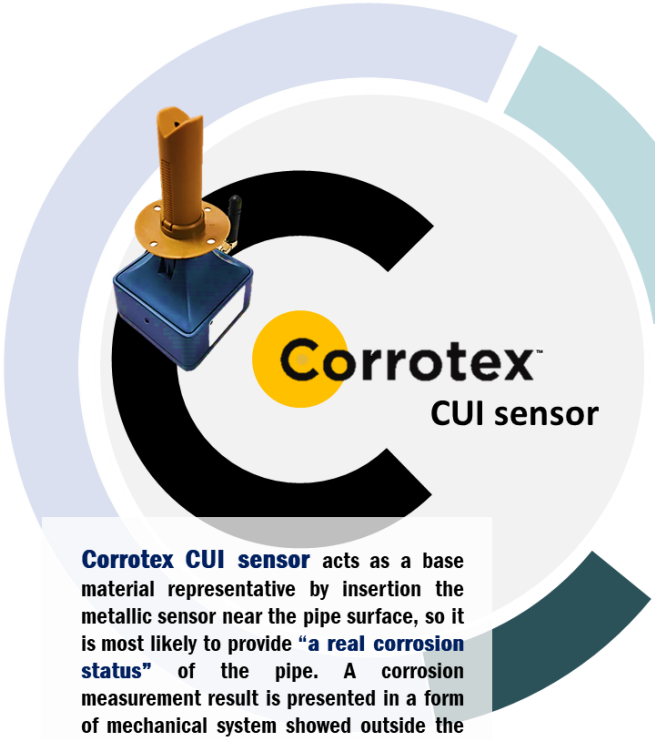


CUI Management
Conventional VS Best Practice

TOPIC	CONVENTIOANAL	BEST PRACTICE
Code & Standard	• API 583 • EFC 55 • NACE SP0198	• API 583 • EFC 55 • NACE SP0198 • Best practice
Inspection Location & Effectiveness	• Base on inspection code • Detectability: ???	• Base on inspection code • Detectability: >80% • Best practice
Repair & Maintenance	• Coating repair • Replace	• Coating repair • Replace • TSA
CUI Technology ★★★	• NO	• CUI monitoring system • CUI Digital platform



CUI Sensor and Digital Platform



Corrotex CUI sensor acts as a base material representative by insertion the metallic sensor near the pipe surface, so it is most likely to provide **"a real corrosion status"** of the pipe. A corrosion measurement result is presented in a form of mechanical system showed outside the pipe jacket, so the insulator is not required to be removed frequently, compared to conventional method (visual inspection).

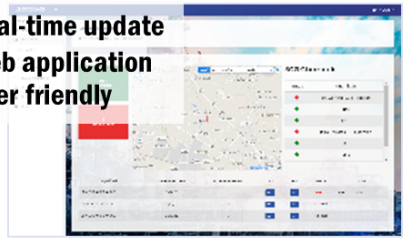
Field device

- Applicable for carbon & low alloy steel
- Represent equipment surface
- Duct & water protection (IP65 minimum)
- 10+ year life time
- Explosion protection certified

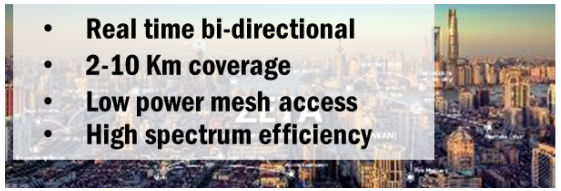
Probe Transmitter Gateway Mote

Monitoring system

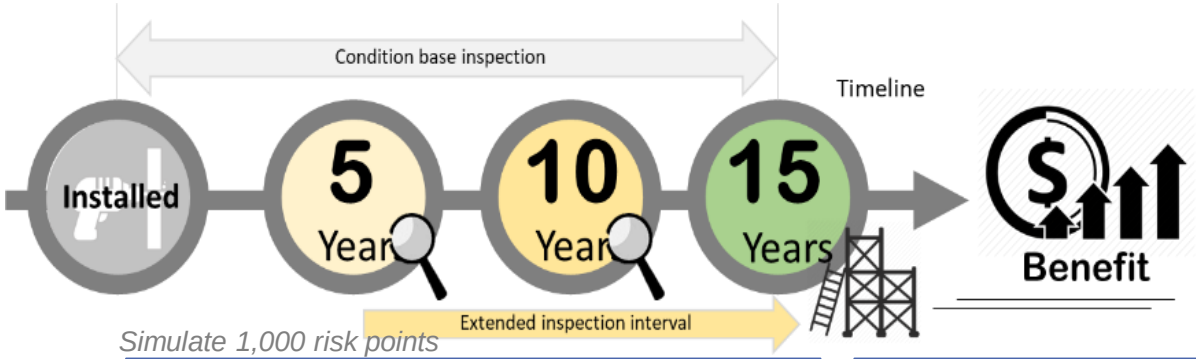
- Real-time update
- Web application
- User friendly



Infrastructure LPWAN



CUI Sensor and Digital Platform BENEFIT

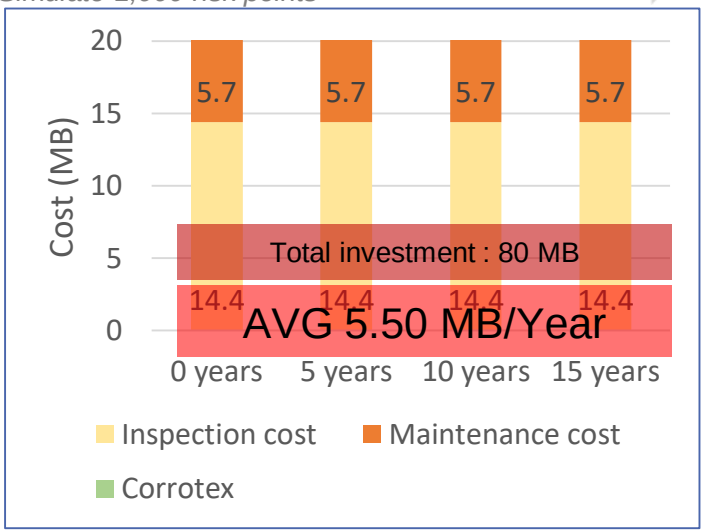


Corrotex

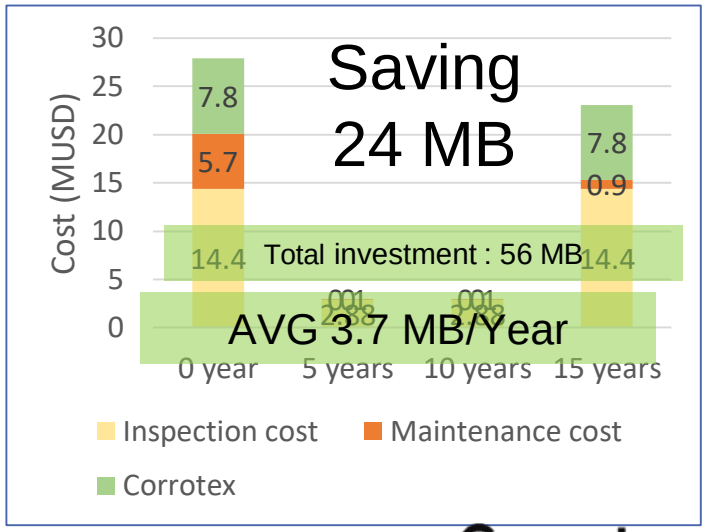
Benefits

1) Safety Protection
No CUI leak during operation
2) Cost Saving
Reduce unnecessary inspection
(scaffolding , contractor)

Simulate 1,000 risk points



Conventional



Corrotex

**Maintenance cost from PPA
Maintenance cost 14,000 /location (Scaffolding + Repainting), 30% of total risk point (10% Severe + 20% Slightly)

CUI Crisis in Olefin Plant (25 years)

After REPCO propose a solution, This plant found amount 100 points need to suddenly clamp.

Pain Point	AFTER
UNPREDICTED CASE 5 times/yrs. • LOSS 100 MB	UNPREDICTED CASE ZERO • SAVING 100 MB
% DETECTABILITY < n/a (very low)	INCREASE %Detectability to 90% 100 points need to clamp
NO CUI PROGRAM • No risk classification • Random inspection with a poorly effectiveness	QUICK WIN APPROACH RISK CLASSIFICATION WORK PRIORITZATION
NO APPROACH to handle CUI in LONG-TERM	AN EFFECTIVENESS ROAD MAP • Execution plan • Resource/Budgets • Organization/Manpower

CUI Crisis in Polymer (30 years)

After Implement CUI Program, Polyolefin plant found >80 points of small bore and drain need to Clamp

Pain Point	After
UNPREDICT CASE 2 Times/yrs • LOSS >50 MB	UNPREDICT CASE ZERO
CUI PROGRAM NOT COMPLY WITH STANDARD • No risk classification • Inspect only damage area • Poorly Effectiveness	RISK CLASSIFICATION WORK PRIORITIZATION COMPLY WITH STANDARD WITH HIGH EFFECTIVENESS INSPECTION
LOW DETECTABILITY	INCREASE DETECTABILITY TO 90% (80% small bore need to Clamp)
NO APPROACH TO HANDLE CUI IN LONG-TERM	AN EFFECTIVENESS ROAD MAP • Execution plan • Resource/Budgets • Organization/Manpower



Asset Information Management

Asset Information Management Solution (AIMS) is a Single Source of Truth throughout Asset Life Cycle, a foundation of Engineering Data Management System which enables Process Safety Information as a part of Process Safety Management to create the greater Value for Operation, Maintenance, Technology and SHE.

AIMS-Portal :

- ❑ Single source of truth of information management.
- ❑ Searching/Viewing of Tag & latest reversion of Document.
- ❑ Work Package development

AIMS-DMS :

- ❑PSI and Engineering Document Management System
- ❑Concurrent Engineering/Project package/Working Copy
- ❑Consolidate/update Workflow/Review/Comment/Annotation
- ❑Maintenance document history record

AIMS-DAR :

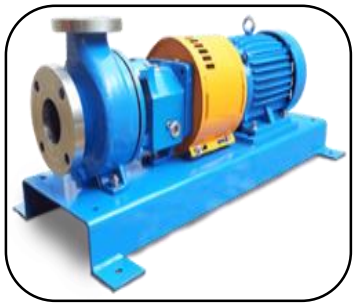
- ❑ Integrated document action request for Process Safety Management (PSI and MoC)
- ❑ Register Document on AIMS Registration workflow
- ❑ Digitizing Service for 2D Drawing by AutoCAD or Intelligent Design tools , Document Scanning/ Indexing/ Metadata filling and OCR.

Asset Information

What is the Asset Information?

The Asset Information are the Asset and all information related to particular asset.

Physical Asset



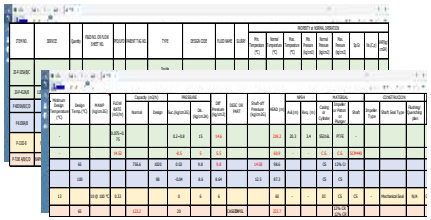
P-100

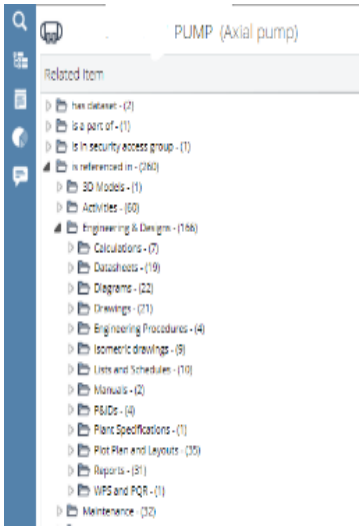
Information Asset

1D Data: Tag Master, Engineering list, Engineering specification or maintenance history of particular asset in the plant

2D Data: Engineering Document related to particular asset such as General Arrangement, Detail Drawing, Diagram Drawing, Inspection Record, Maintenance Record, Turnaround Record….

3D Data: 3D model, Intelligent 3D Model, 3D laser Scan

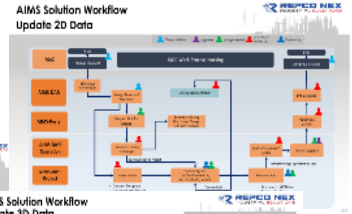




Asset Information Management for corrosion - Example of CUI



AIMS Solution



AIMS Portal

AIMS AI

AIMS TAG

- Design Data (Line No./ Temp/Pressure/Type of coating/Material/Fluid/Type of insulation)
- Operating (Temp/Pressure
- ISO metric drawing/3D Model
- Inspection Point/Scaffolding cost
- IOW

Asset Information Management

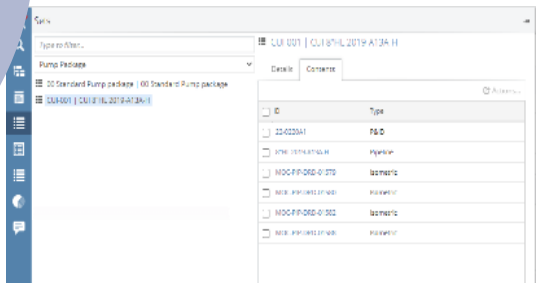
Package Development

Inspection

Repair

AIMS DMS

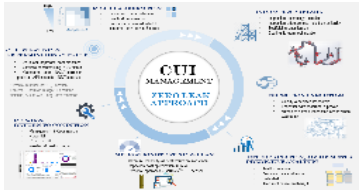
- CUI Repaired Maintenance History recorded in AIMS-DMS



Key take away

1. AIMS is the most importance system to support the information and manage data for CUI management program
2. Ensure CUI can be found and eliminate by Plant assessment program.
3. The CUI Best Practice can lead to ZERO Leak.
4. CUI monitoring system embedded by digitalization is the most powerful to achieved CUI leakage and reducing maintenance cost.

BEST INFORMATION



BEST MANAGEMENT SYSTEM

ZERO LEAKAGE

Thank you for your attention

Date & Theme for 8th CPSS

Date: 29 Oct.2021, 09:00-16:00

Theme: Assets Integrity for Process Safety Management (AI PSM)

: means to

- **Corrosion Loop (CUI, Cathodic Protection, Erosion, etc.)**
- **Static, Vital, Rotating Equipment monitoring (Vibration, Wear & Tear)**
- **Instrument Safe Guarding (Life Cycle Management)**
- **Power supply electrical**
- **Electrostatic (Dust explosion, HC transfer line)**