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# European Centre for Process Safety

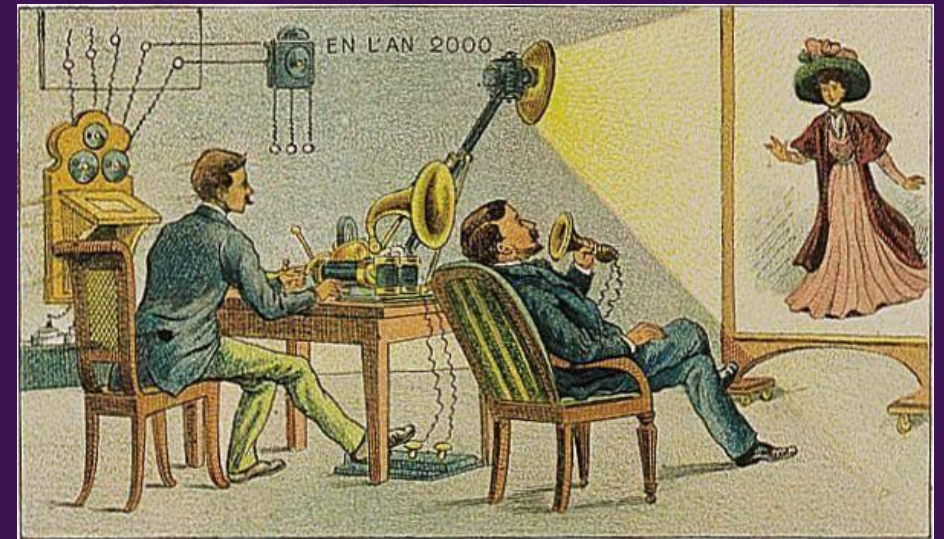
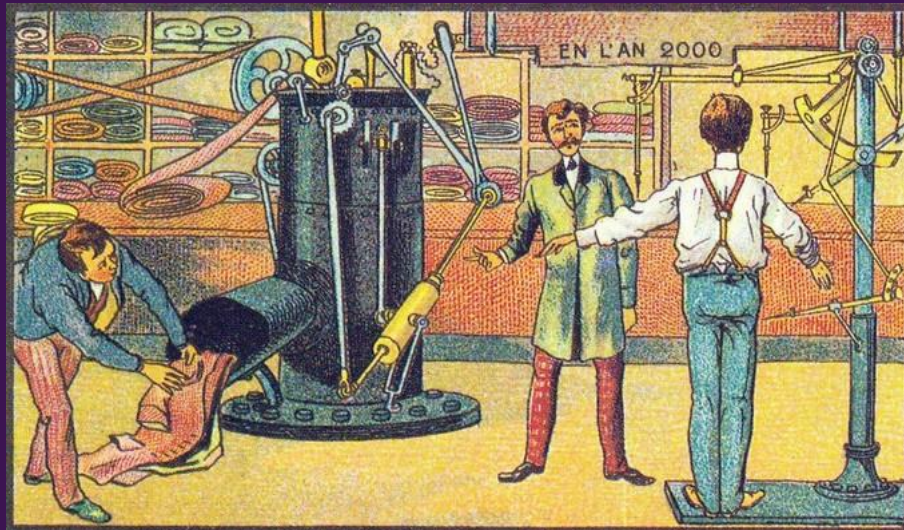
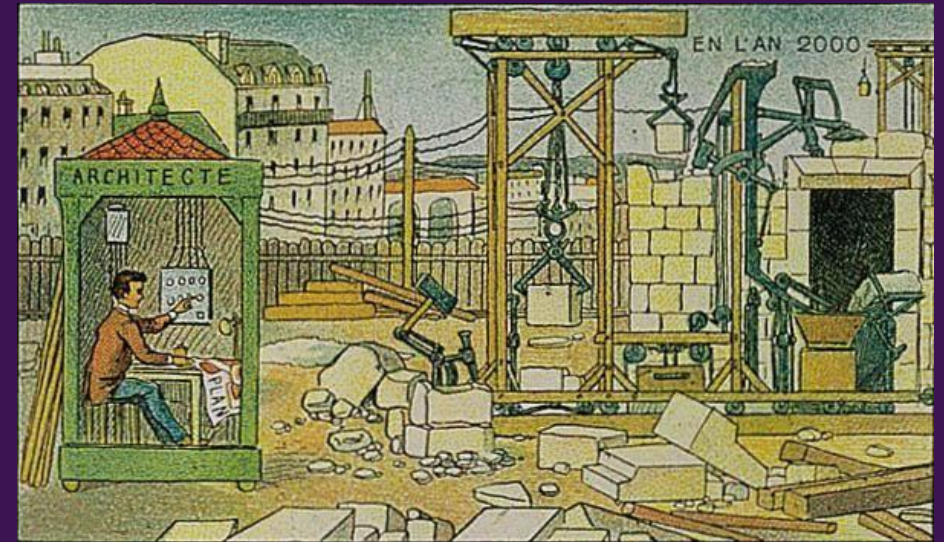
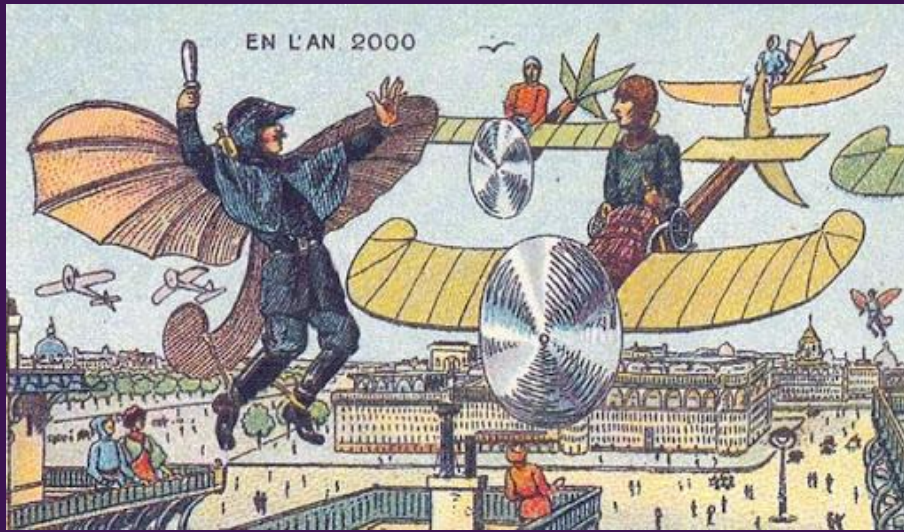
## *Digital Twin in Process Safety Context*

David Bleackley, Vice President Northern Europe

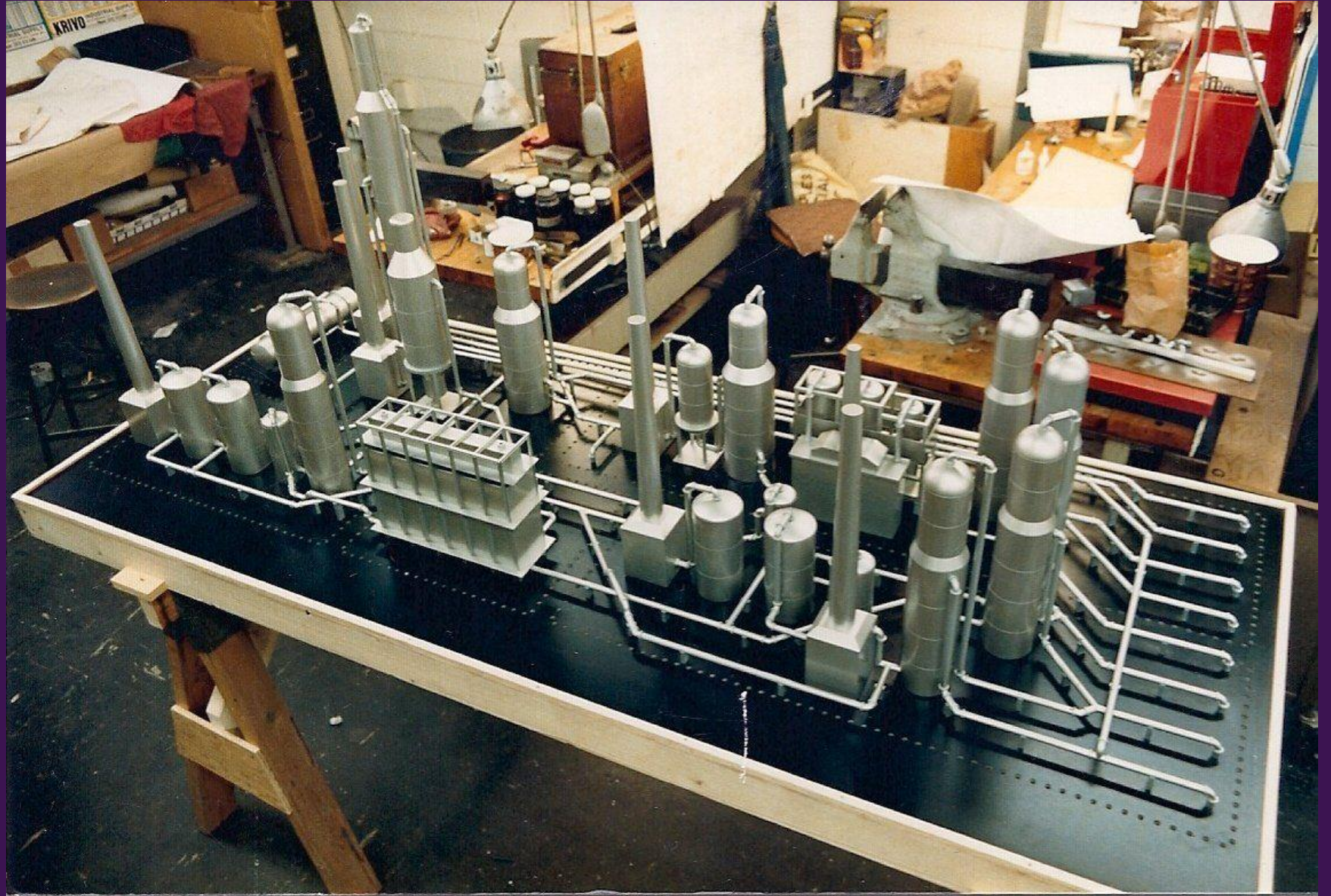
Angeline Chenu, APM Specialist Central & Southern Europe

**AVEVA**

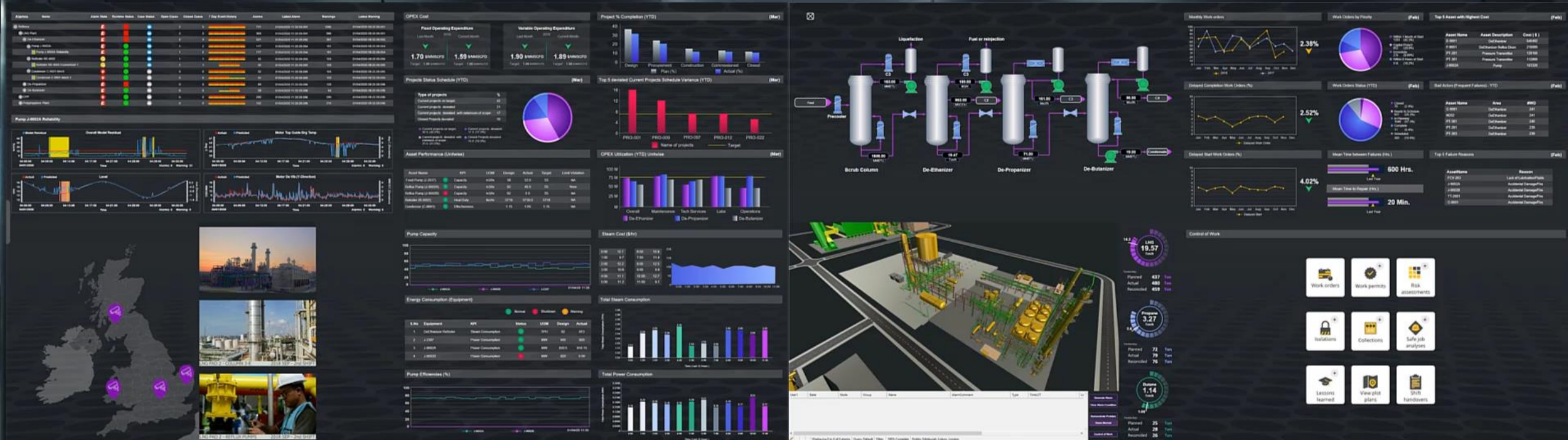
# 1910



1980



# 2020



Engineering | Operations | Performance

# Digital Twin

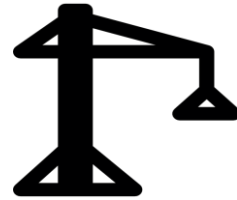
A simple concept...



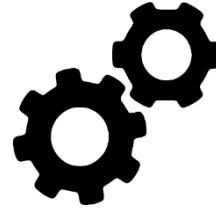
Mechanical Integrity



ENGINEER



CONSTRUCT



OPERATE



DECOMMISSION

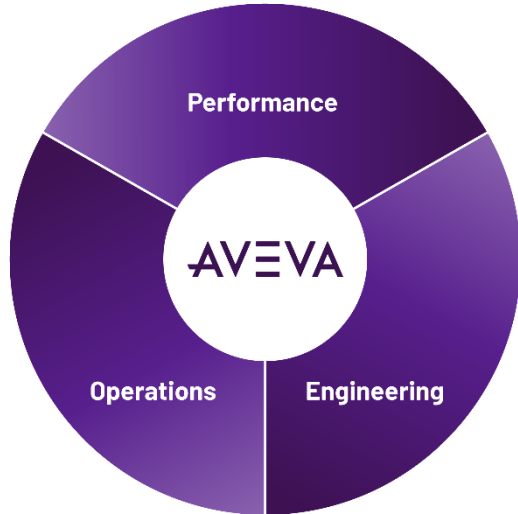


Data Integrity

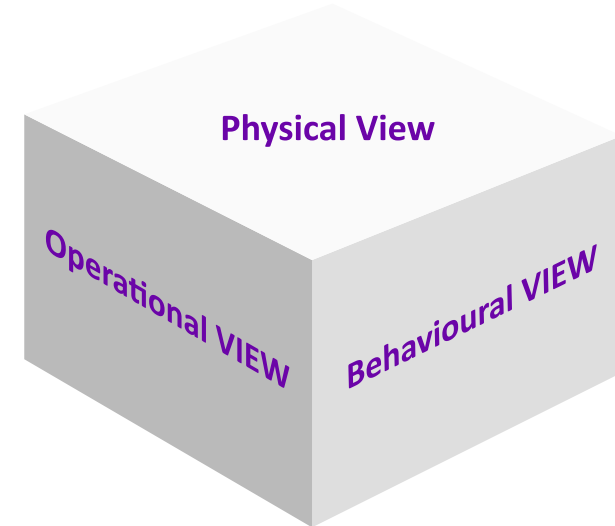
AVEVA™

# Industry Digital Twin is very similar to AVEVA's view

## AVEVA'S DEFINITION OF THE DIGITAL TWIN



## OO's DEFINITION OF THE DIGITAL TWIN



## Visualization

- Engineering — The model of the physical structure and equipment —>> Physical
- Operations — Plant context, operational status and other information gathered by sensor and real time data —>> Operational
- Performance — Analytical models and algorithms to describe plant past, expected and future behaviour —>> Behavioural

# Digital twin and the connected worker - supported by Cloud

## Cloud

Ease of deployment, low TCO, collaboration

## Artificial Intelligence

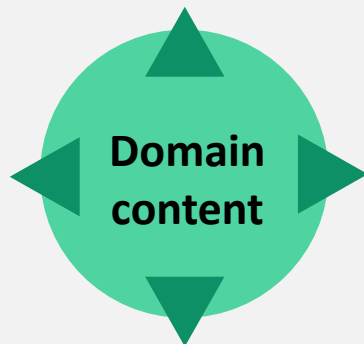
Analysis, prediction, guidance, learning

### Digital Twin

Multi-discipline  
Lifecycle  
Personas  
Scenarios



### Domain content



### Connected Worker

Safe  
Reliable  
Efficient  
Empowered

## Big Data

Abstraction, visualization, analysis

## Industrial IoT/Edge

Data sources, edge management

# Digital Twin Use Case

In the context of Process Safety Management





# Use Case: Digital representation of a Natural Gas facility



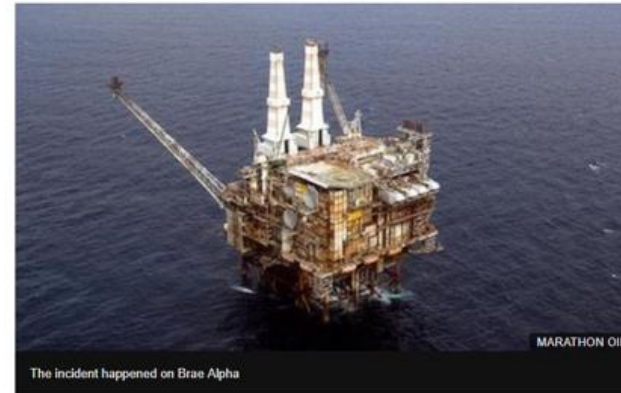
- Combines 3D models with Master Engineering & Enterprise data
- Interactive touch-screen display
- Built within 6 weeks



# Corrosion Under Insulation (CUI)

## An Industry wide Problem

(CUI) is one of the (petro)chemical processing industries worse problems, the cost associated to mitigating it astronomical



An oil firm has been fined more than £1m - one of the biggest ever fines in a case of its type - over a North Sea gas leak.



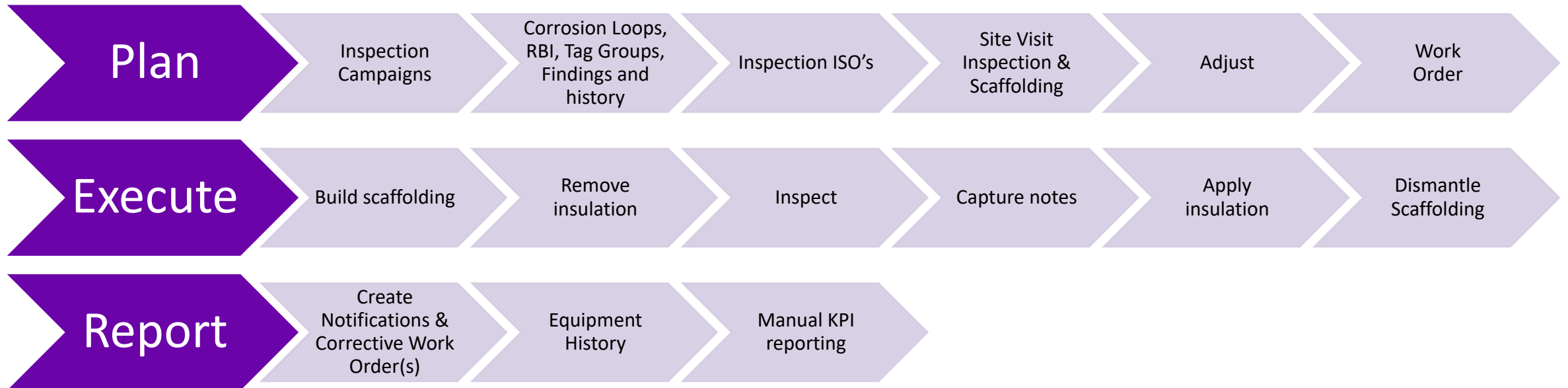
Additional £470,000 costs for investigation work



Up to \$50m per day  
Production downtime

# Traditional Process

## CORROSION UNDER INSULATION (CUI)



# Leveraging the Digital Twin

## Alert Notification

Real-Time Diagnostics

Request Maintenance Activity

Plan Maintenance Activity

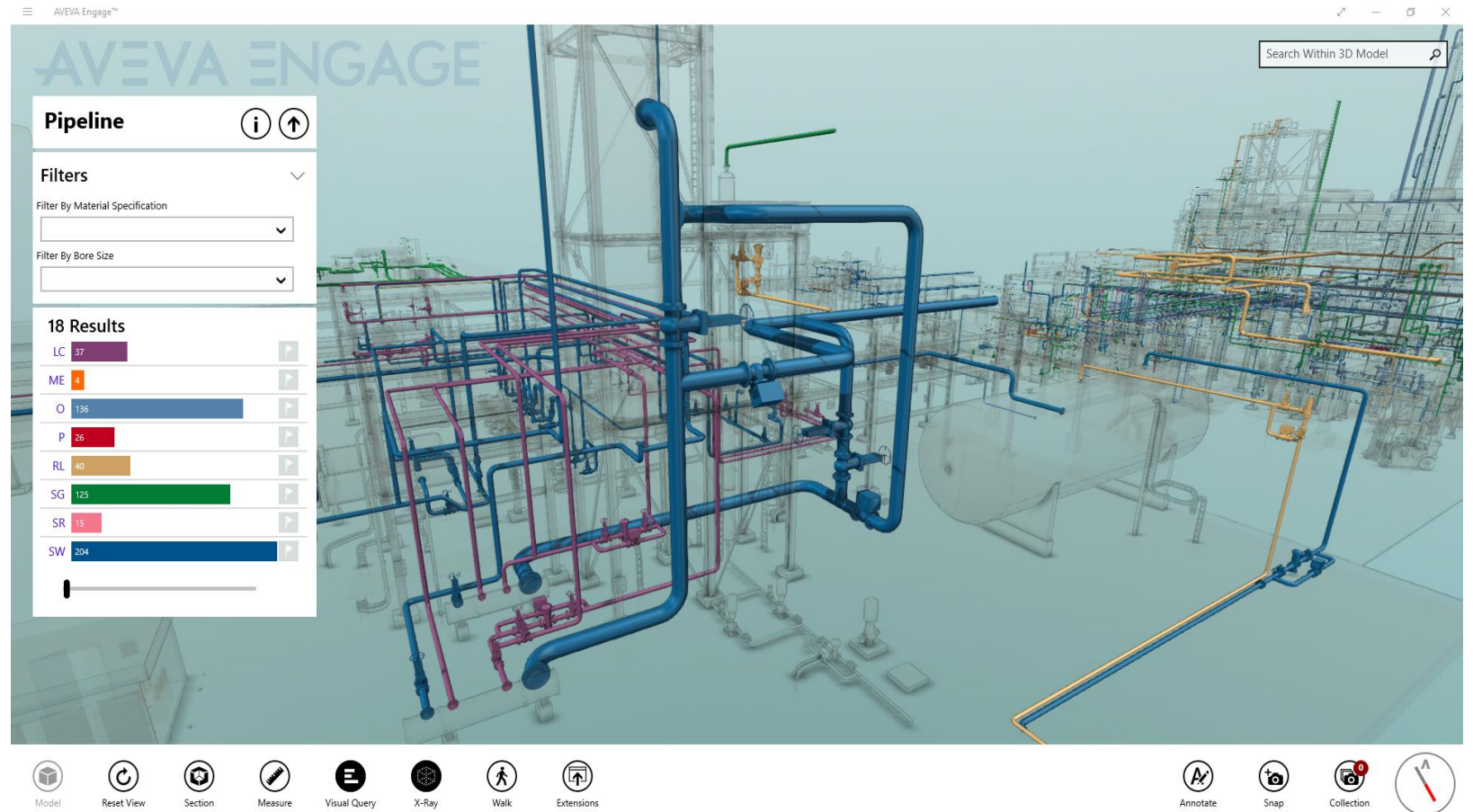
Plan Work Permit

Pre-Start Up Safety Review & Training

Execute the Permitted Maintenance

Review Report & Close Activity

Enterprise Safety Awareness



# Leveraging the Digital Twin

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Enterprise Safety Awareness



The screenshot shows the AVEVA NET Dashboard for DA-204 (DISTILLATION COLUMN). The interface includes a navigation menu on the left, a central data table, a 3D model of the distillation column, and a PI Coresight process flow diagram. The data table lists key attributes:

Key Attributes	Value
ID	DA-204
Name	Gasoline stripper
Type ID	DISTILLATION COLUMN
Aliases	/DA-204
Functional Location	C410-D205
Manufacturer	DANYUNG INDRAM HEAVY INDUSTRIES
Manufacturer Part No.	
Manufacturer Serial No.	D13115W-05-001
Model Number	
Superordinate	

The 3D model shows a tall distillation column with various components. The PI Coresight diagram shows the process flow with temperatures of 44.9°C and 38.7°C. The dashboard also includes a 'PI System' section and a 'PI Coresight' section with a 'PI System' button.

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The screenshot displays the AVEVA NET Dashboard interface. The top window shows the 'Maintenance History' for a specific asset, with a table listing details such as Name, Type, Status, and Date. The bottom window shows a detailed view of the asset 'J-9002A (PUMP)', including key information, attributes, and related documents. A 3D model of the pump assembly is visible on the right side of the dashboard, showing components like the motor (M-9002A), pump (J-9002A), and various pipes and valves.

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**Plan Maintenance Activity**

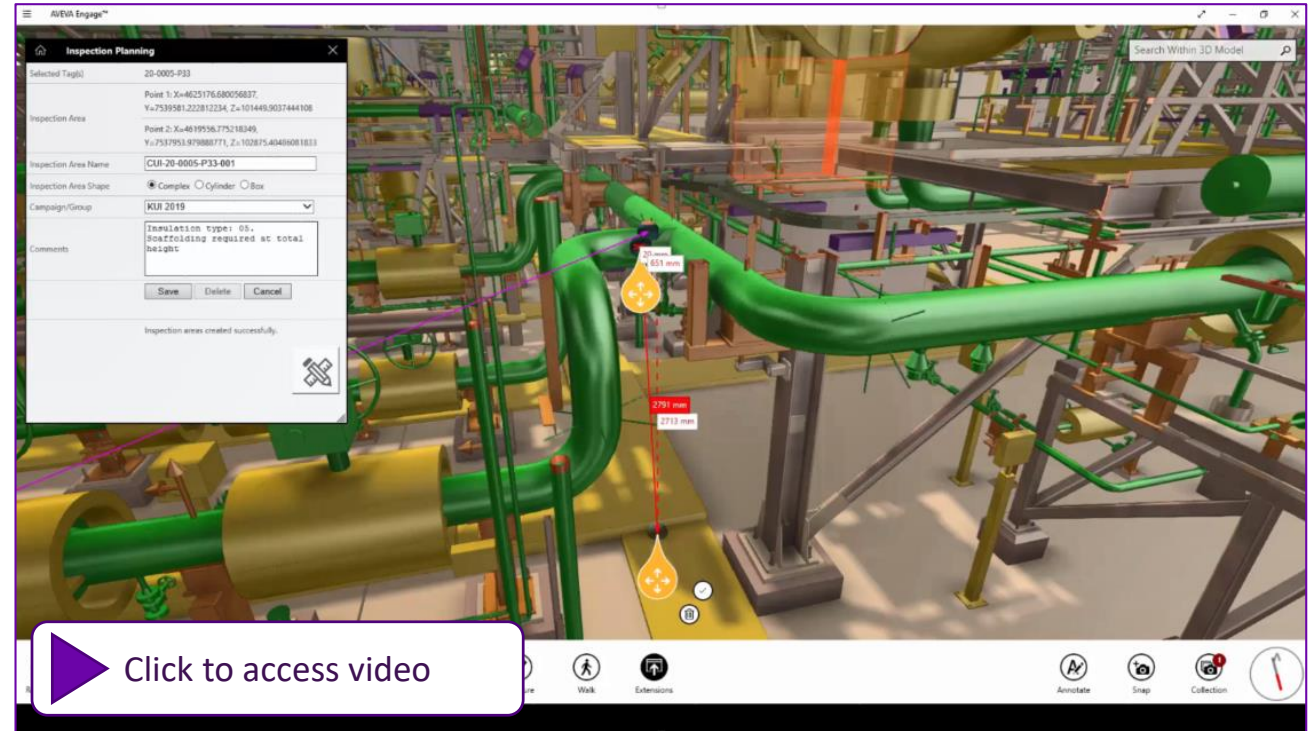
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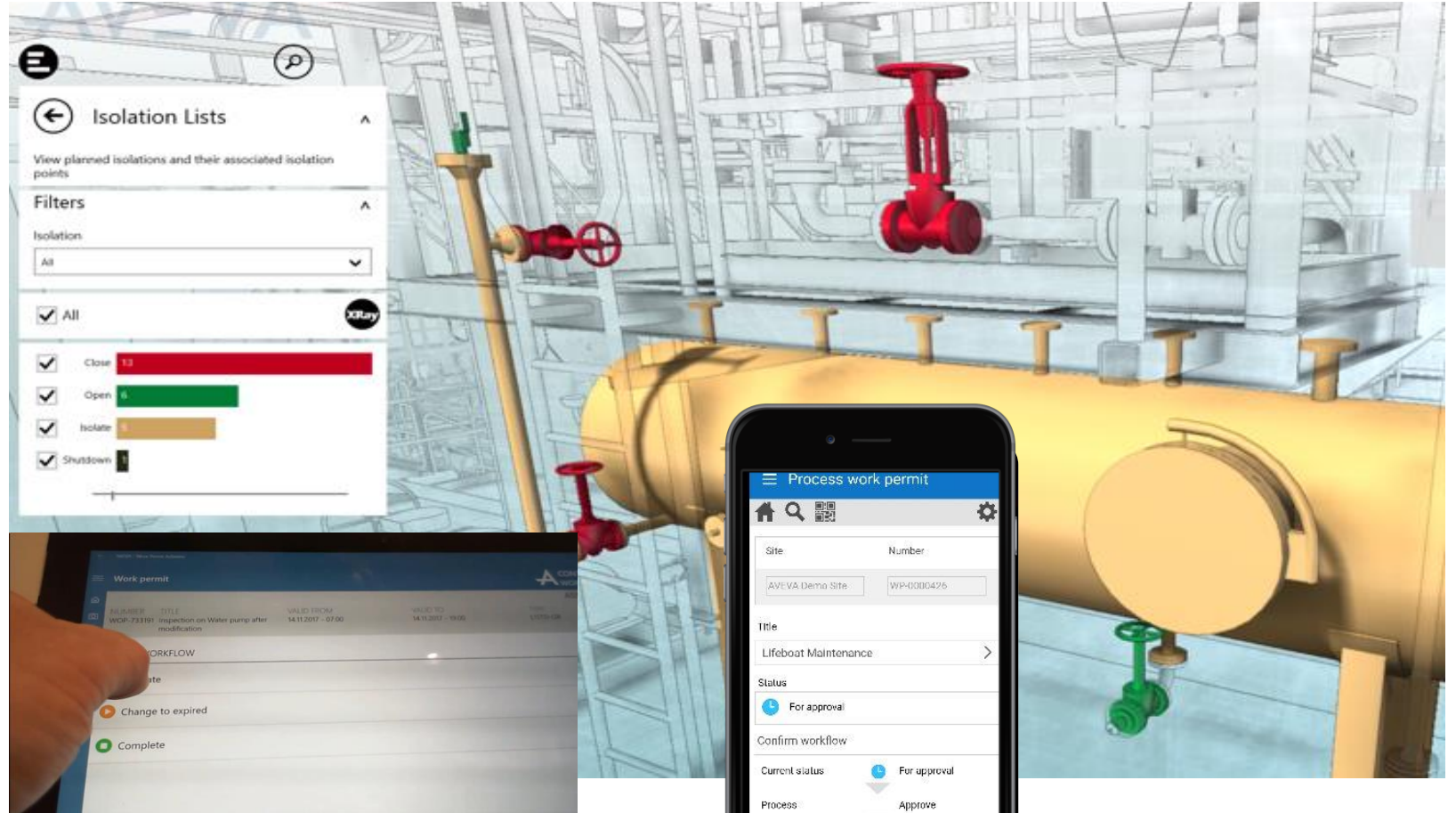
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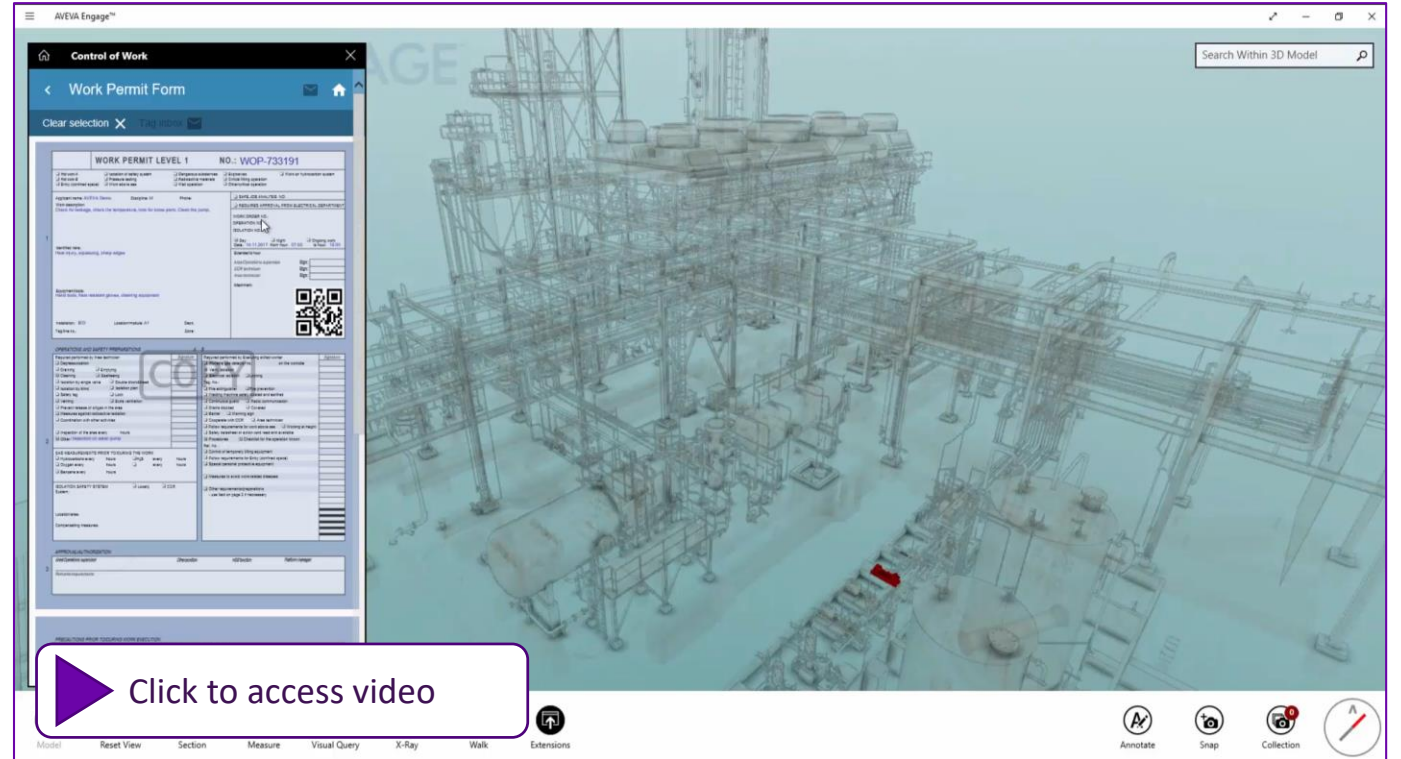
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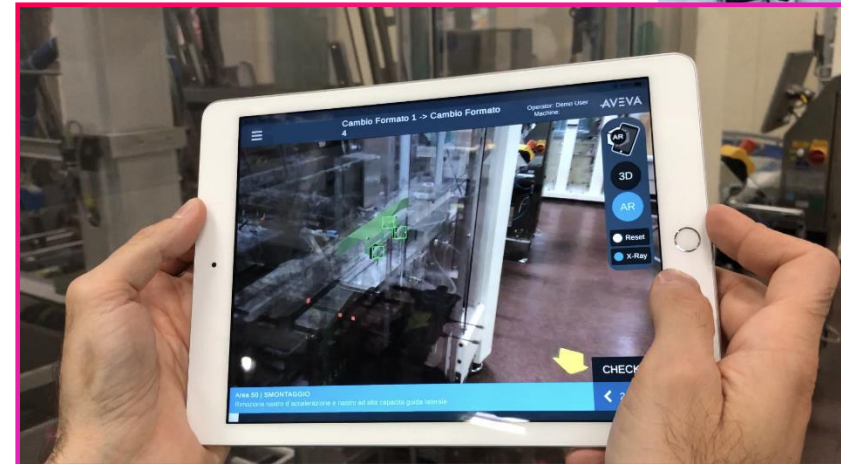
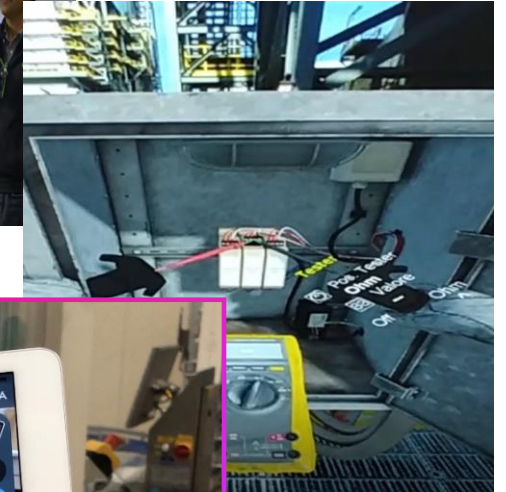
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Enterprise Safety Awareness



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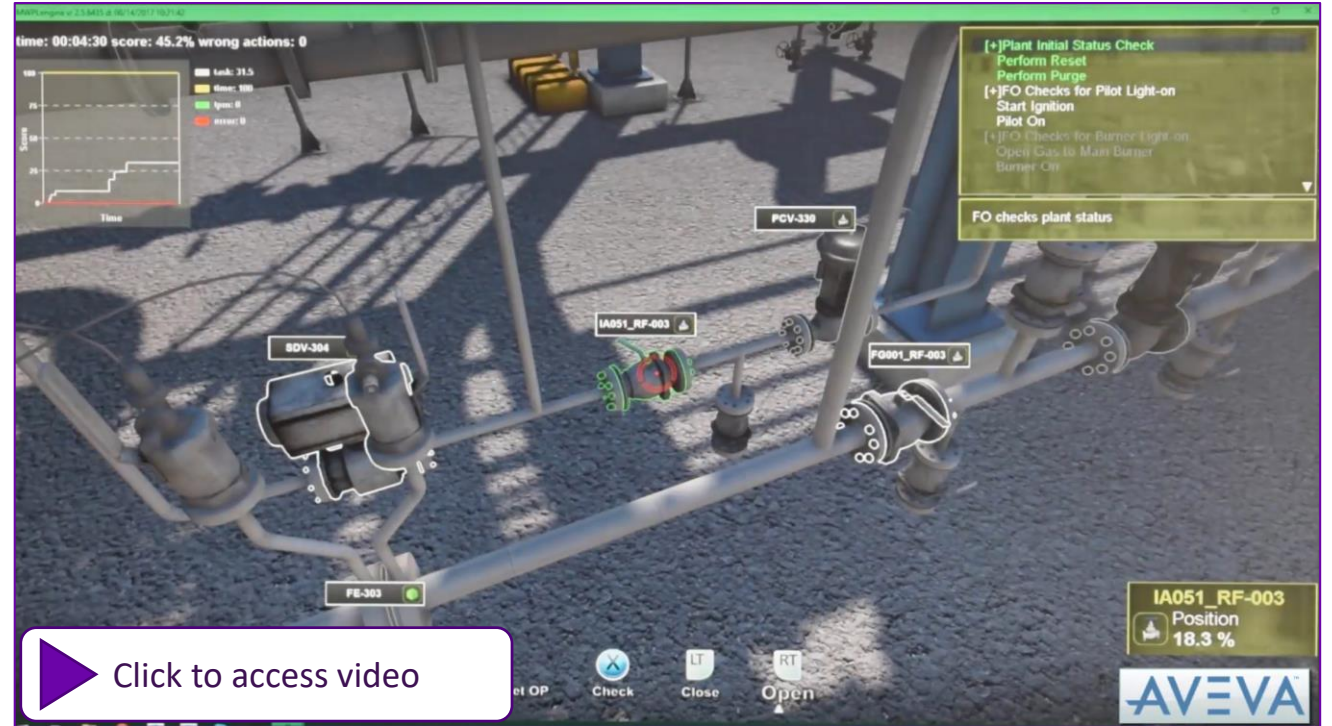
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Execute the Permitted Maintenance

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Enterprise Safety Awareness



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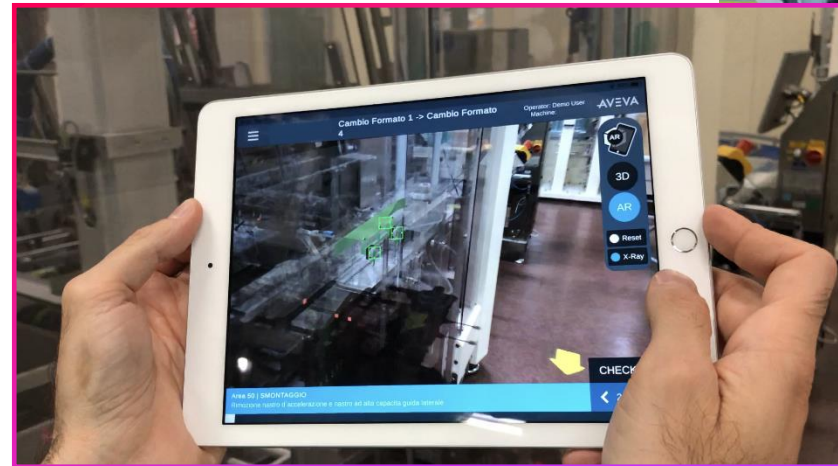
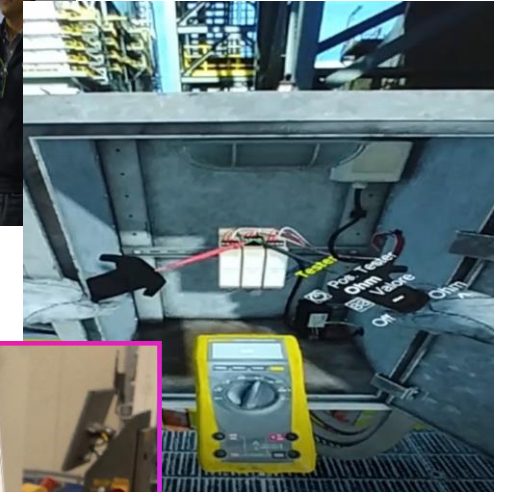
Plan Work Permit

Pre-Start Up Safety Review & Training

**Execute the Permitted Maintenance**

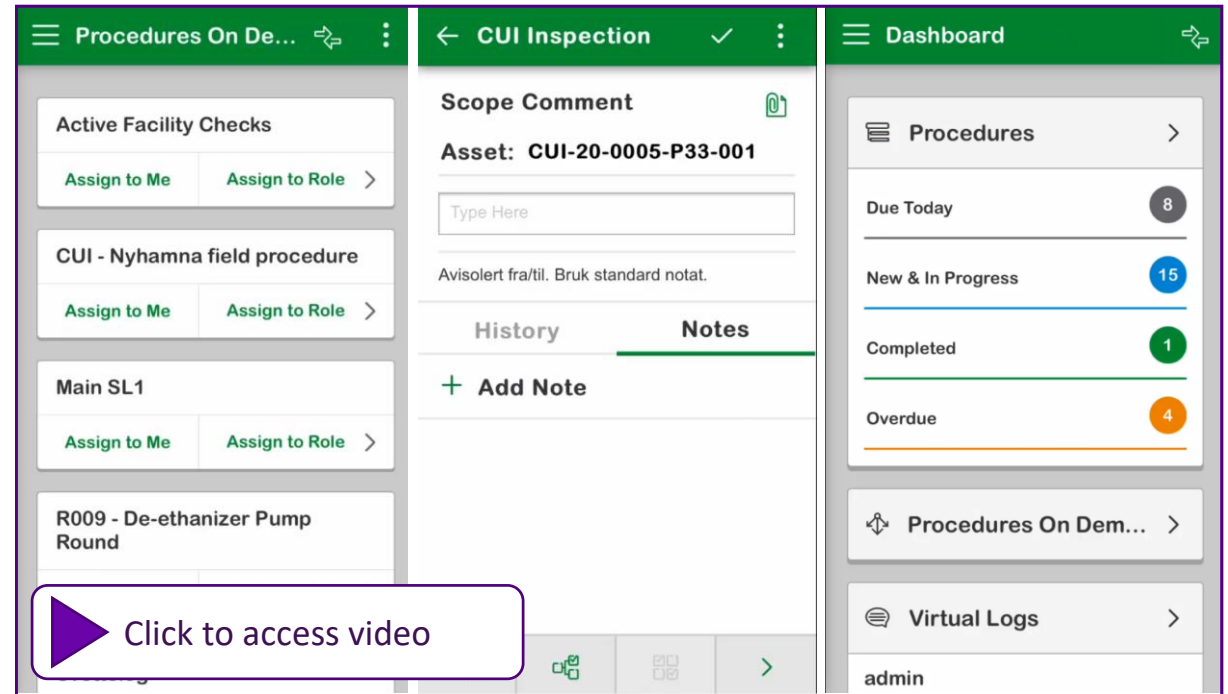
Review Report & Close Activity

Enterprise Safety Awareness



# Leveraging the Digital Twin

- Alert Notification
- Real-Time Diagnostics
- Request Maintenance Activity
- Plan Maintenance Activity
- Plan Work Permit
- Pre-Start Up Safety Review & Training
- Execute the Permitted Maintenance**
- Review Report & Close Activity
- Enterprise Safety Awareness



# Leveraging the Digital Twin

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Real-Time Diagnostics

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Enterprise Safety Awareness

The screenshot displays the AVEVA NET Dashboard interface. At the top, there's a browser window showing the URL 'win2016-tse:18500/#/item/IED%7CJ-9002A'. Below this, the dashboard is divided into several sections:

- Attributes:** A table showing data for 'J-9002A (PUMP)'. The table includes columns for ID, Calculated Hours, Delivery Date, and Duration. The 'J-9002A SAP Data' is highlighted.
- Details:** A section for 'DA-204 (DISTILLATION COLUMN)'. It lists details such as ID (DA-204), Name (Gasoline stripper), Type ID (DISTILLATION COLUMN), and Aliases (DA-204).
- Key Attributes:** A section listing functional location (C410-D205), manufacturer (DANKYUNG INDRA HEAVY INDUSTRIES), manufacturer part no., manufacturer serial no., model number, and superordinate.
- Related Document/Drawing:** A list of documents and drawings related to the equipment, including 3D models, arrangement drawings, and calculation sheets.
- 3D Model:** A 3D visualization of the distillation column.
- PI Coresight:** A real-time monitoring interface showing a process flow diagram with temperature readings (44.9 °C and 38.7 °C) and a timestamp of 9/16/2018 2:36:22 AM.

# Leveraging the Digital Twin

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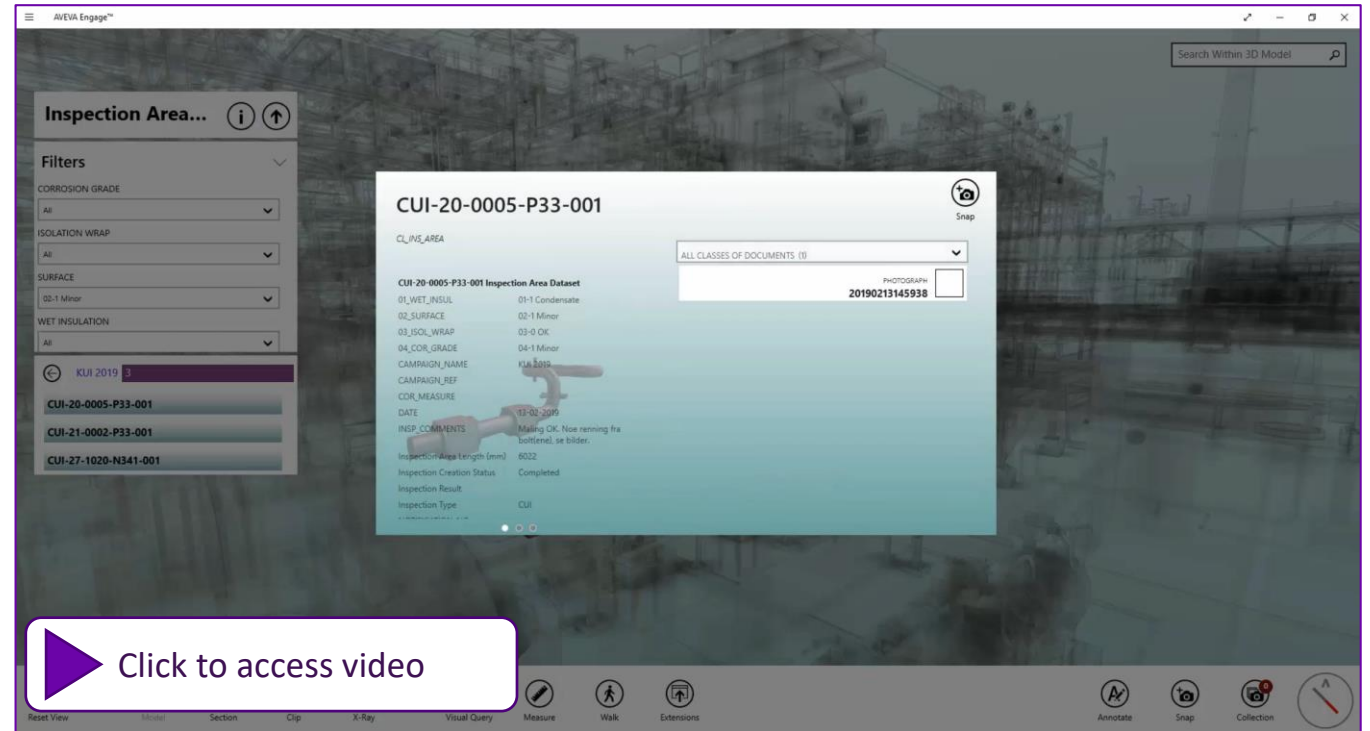
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Enterprise Safety Awareness



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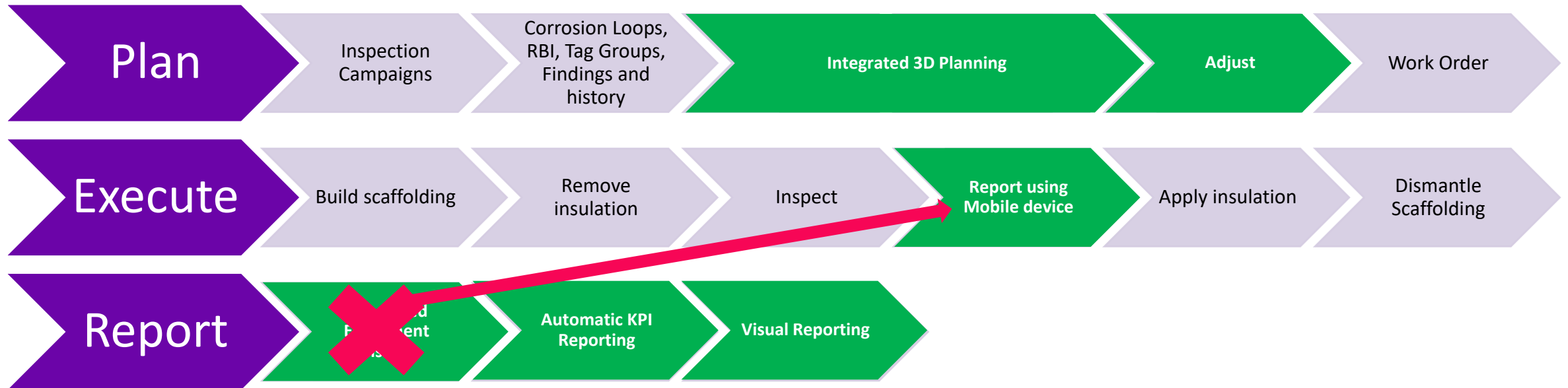
Enterprise Safety Awareness





# Digital Process

## CORROSION UNDER INSULATION (CUI)



# Digital Twin Process Safety Use Cases

## Information Management

- **Training & Competence**
- **Pre- Start Up Safety Reviews**
- **Employee Participation**
- **Mechanical Integrity**
- **(Hot) Work Permits**
- **Emergency Planning & Response**

## Situational Awareness

## Procedures

## Simulation

## Analytics

- Process Safety Information
- Process Hazard Analysis
- Operating Procedures
- Contractors
- Management of Change
- Incident Investigation
- Compliance Audit
- Trade Secrets

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# Q&A

Thank You

## CONTACTS

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**AVEVA**

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We'll take you there™