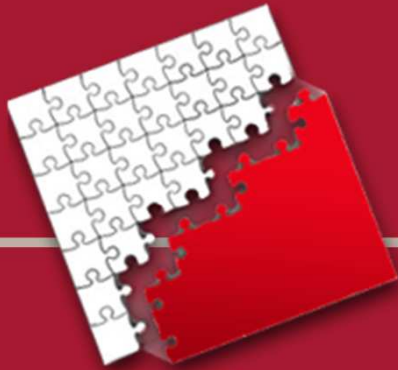




Rapid Asset Data Capture - A case study -

Rapid Capture, organisation, management and reuse of
unstructured information on brownfield Sites



Bill van Butzelaar and Greg Rohde



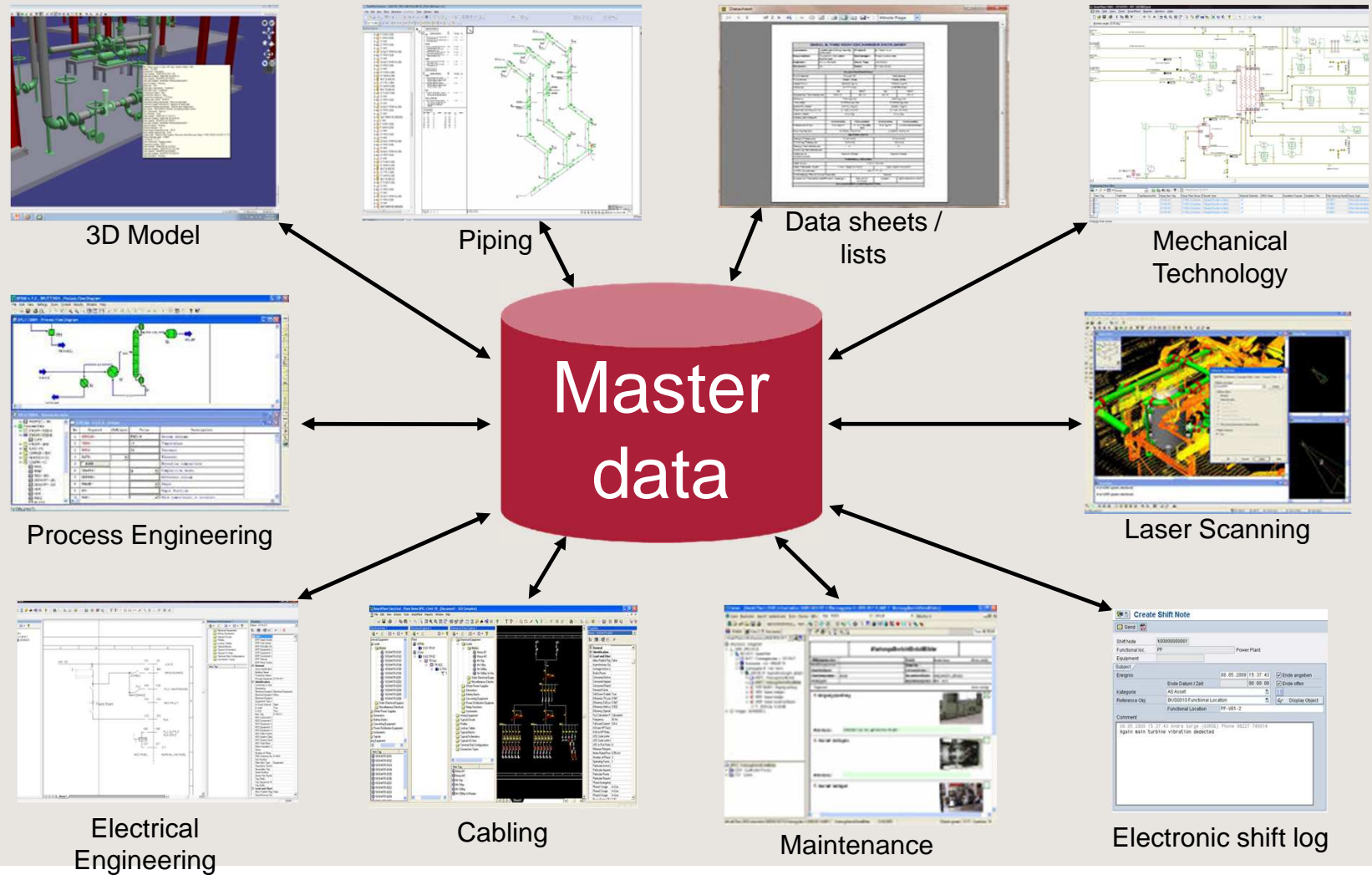
Disclaimer and important notice

This presentation contains forward looking statements that are subject to risk factors associated with oil and gas businesses. It is believed that the expectations reflected in these statements are reasonable but they may be affected by a variety of variables and changes in underlying assumptions which could cause actual results or trends to differ materially, including but not limited to: price fluctuations, actual demand, currency fluctuations, drilling and production results, reserve estimates, loss of market, industry competition, environmental risks, physical risks, legislative, fiscal and regulatory developments, economic and financial market conditions in various countries and regions, political risks, project delay or advancement, approvals and cost estimates.

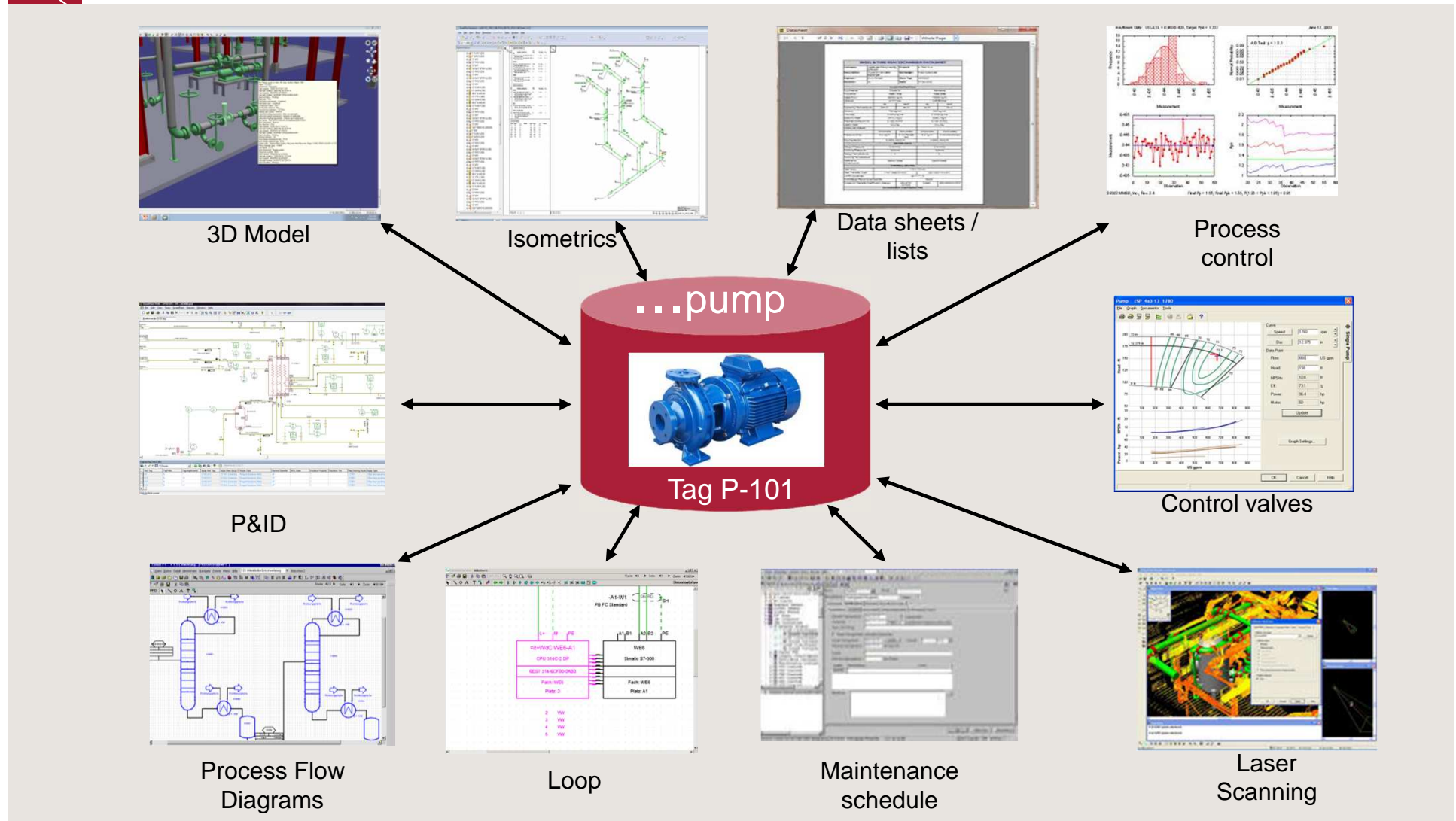
All references to dollars, cents or \$ in this presentation are to Australian currency, unless otherwise stated.

References to “Woodside” may be references to Woodside Petroleum Ltd. or its applicable subsidiaries.

The Deliverables



Consistency, Re-use & Correlation of Plant Items



The Brownfield site





The Scenario

- Operational plant purchased “as is, where is”.
- Significant engineering scope being prepared for execution.
- Multiple versions of drawings and documents from multiple sources, or even from the same source.
- Data and documents managed differently at several international locations.
- Multiple document and data formats used.
- Unknown volume of documents and data missing.
- Unknown “as built” status of documents.

| | |
|----------------------|--------------------------|
| DATA SOURCES | 11 (and still receiving) |
| DRAWINGS / DOCUMENTS | 328,000 + |
| DATA FIELDS | 85,375,056 + |



To bridge this gap we need.....

STRUCTURED | INTEGRATED | OPERATIONAL INFORMATION | ONE SOURCE

Re-purpose (Re-use)

QA/QC (Improve)

Link and cross-reference

Identify Masters

Rapid capture

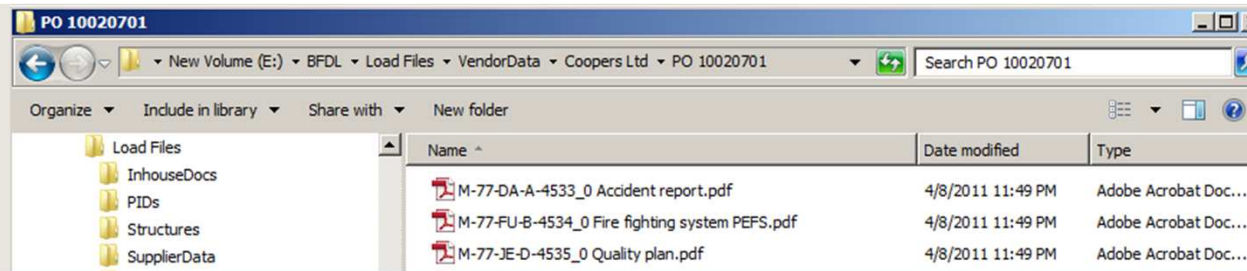
MULTIPLE SOURCES | UNSTRUCTURED | NON-INTEGRATED INFORMATION



The process

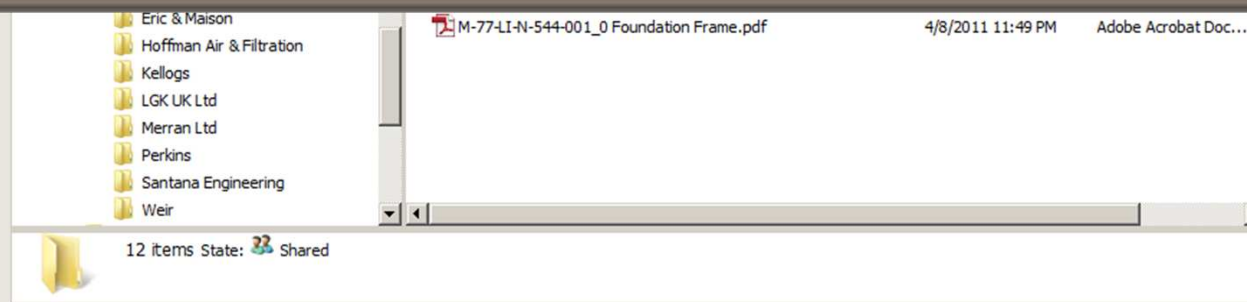
- 360,000 documents Loaded @ 1000 docs/hour (7 critical doc types loaded first)
- Extracted and associated metadata (Doc Type, Discipline other related items) from file names and BDO database.
- Documents loaded “in-place” – SPF points to the files in original stored location.
- Analyse to find the set of master versions
- Development of a Portal to allow navigation and viewing of documents
- Developed Workflow so Woodside Technical authority could view candidates and decide on the master
- Process the Master set and extract Tags
- Automatically make associations – Tag-Document relationships with aliasing.
- Deliver controlled documents into portals to a business criticality schedule using simplified business processes
- As building

Unstructured data loading ...



In-place Loading

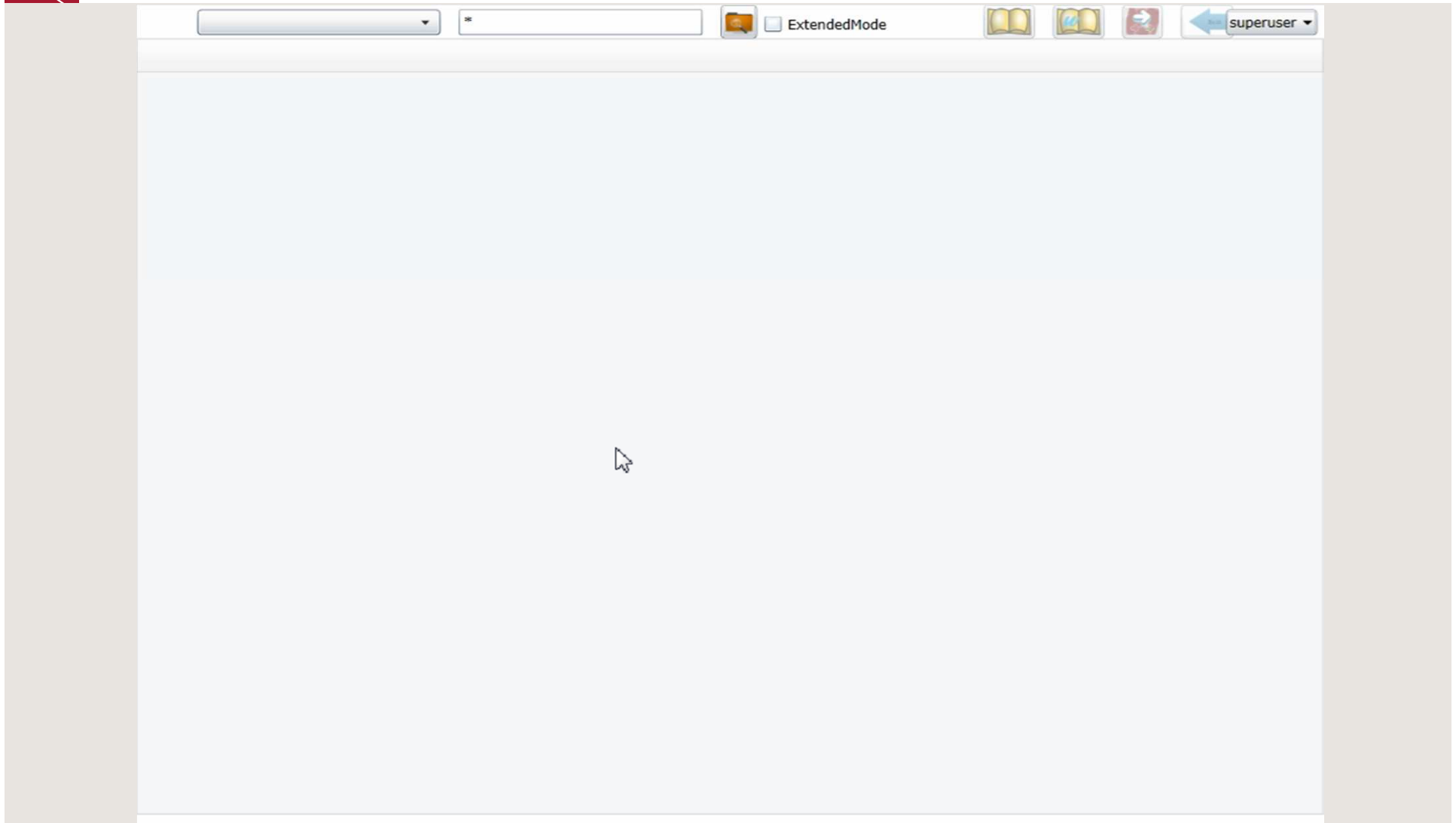
- Information loaded into a single source with “links” original to files
 - Allows Extremely quick loading time



UNSTRUCTURED information in a variety of formats and from multiple sources

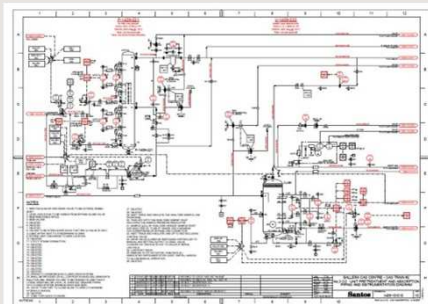
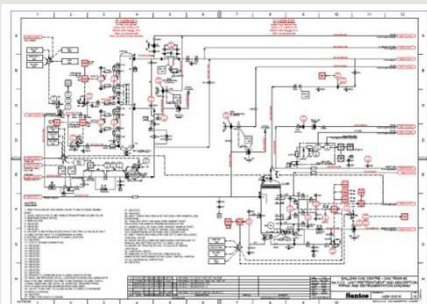
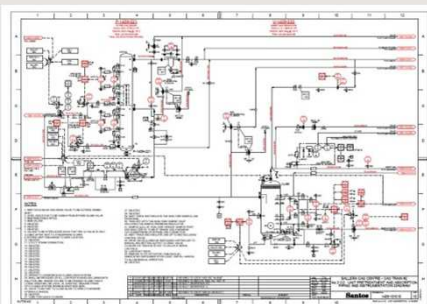
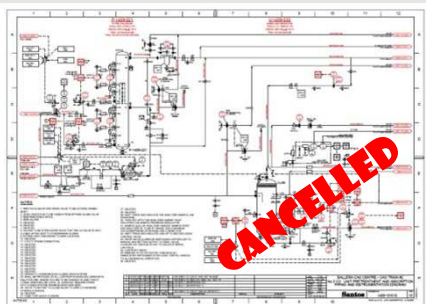
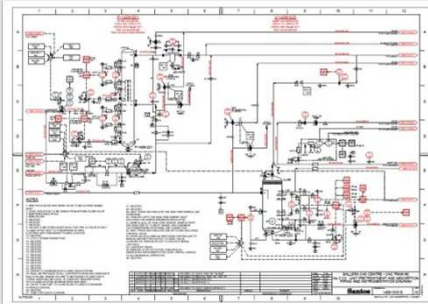
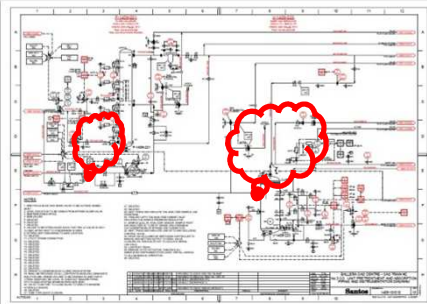
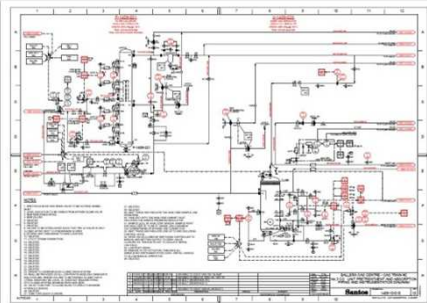
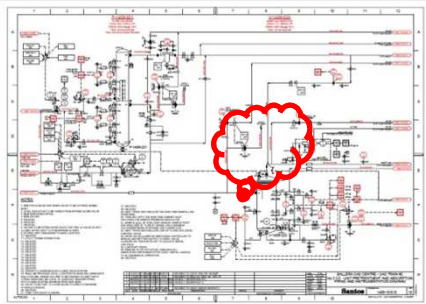
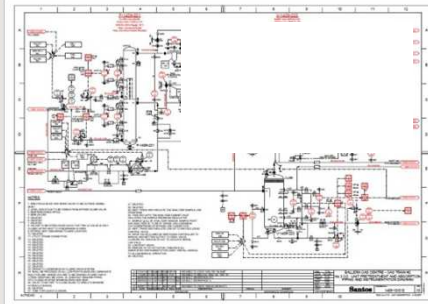
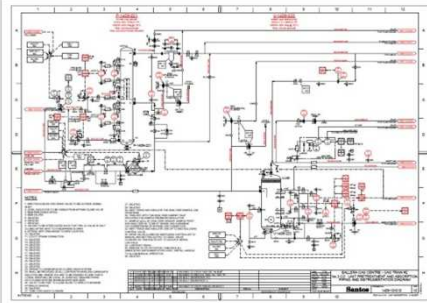
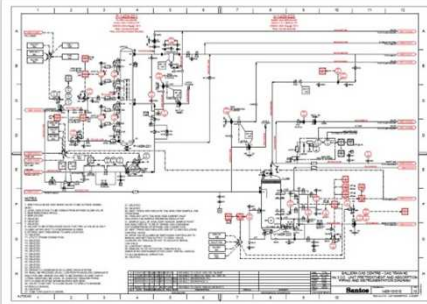
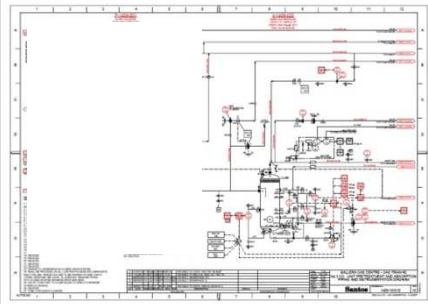


Capture – Post Processing

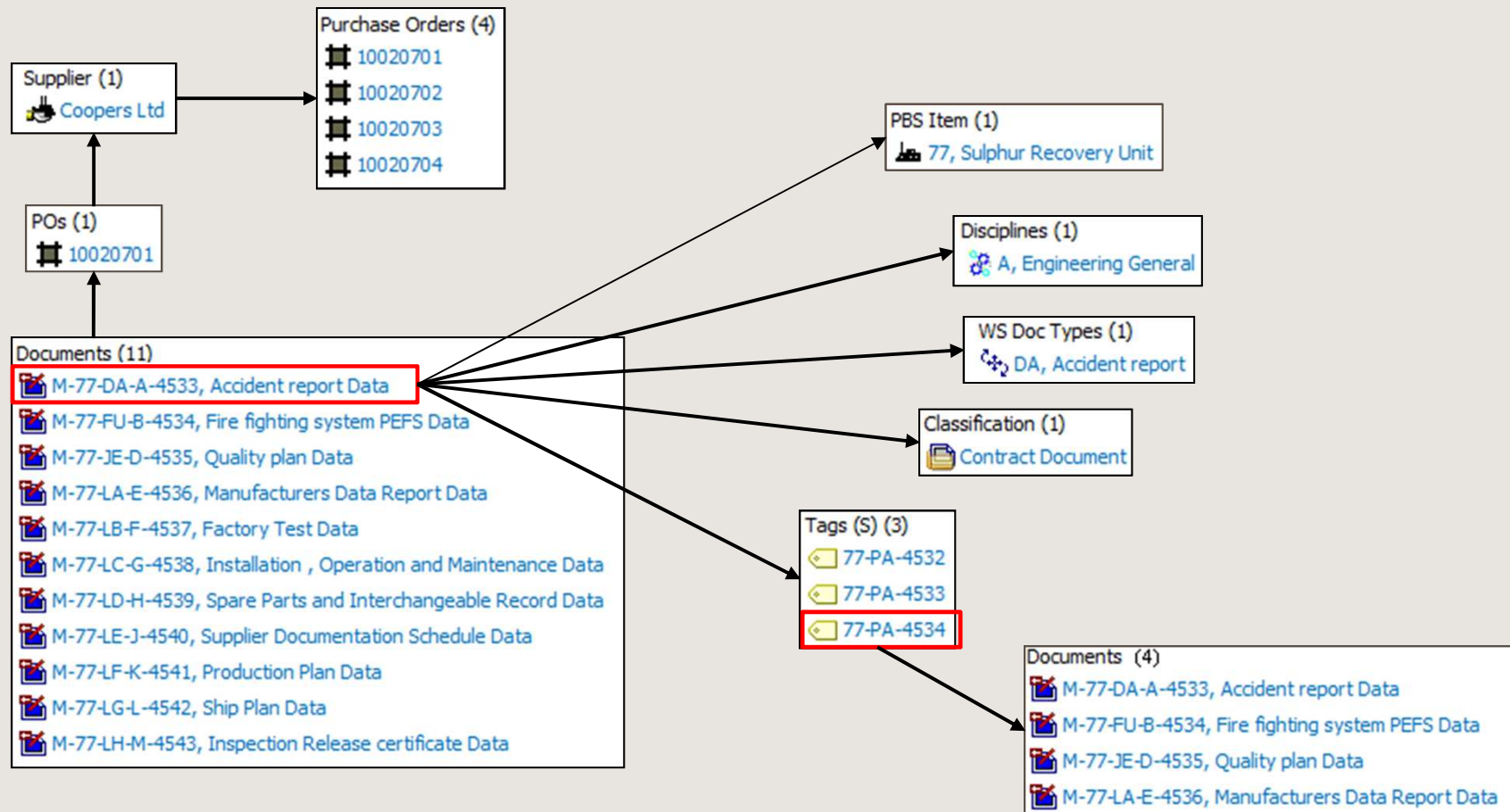




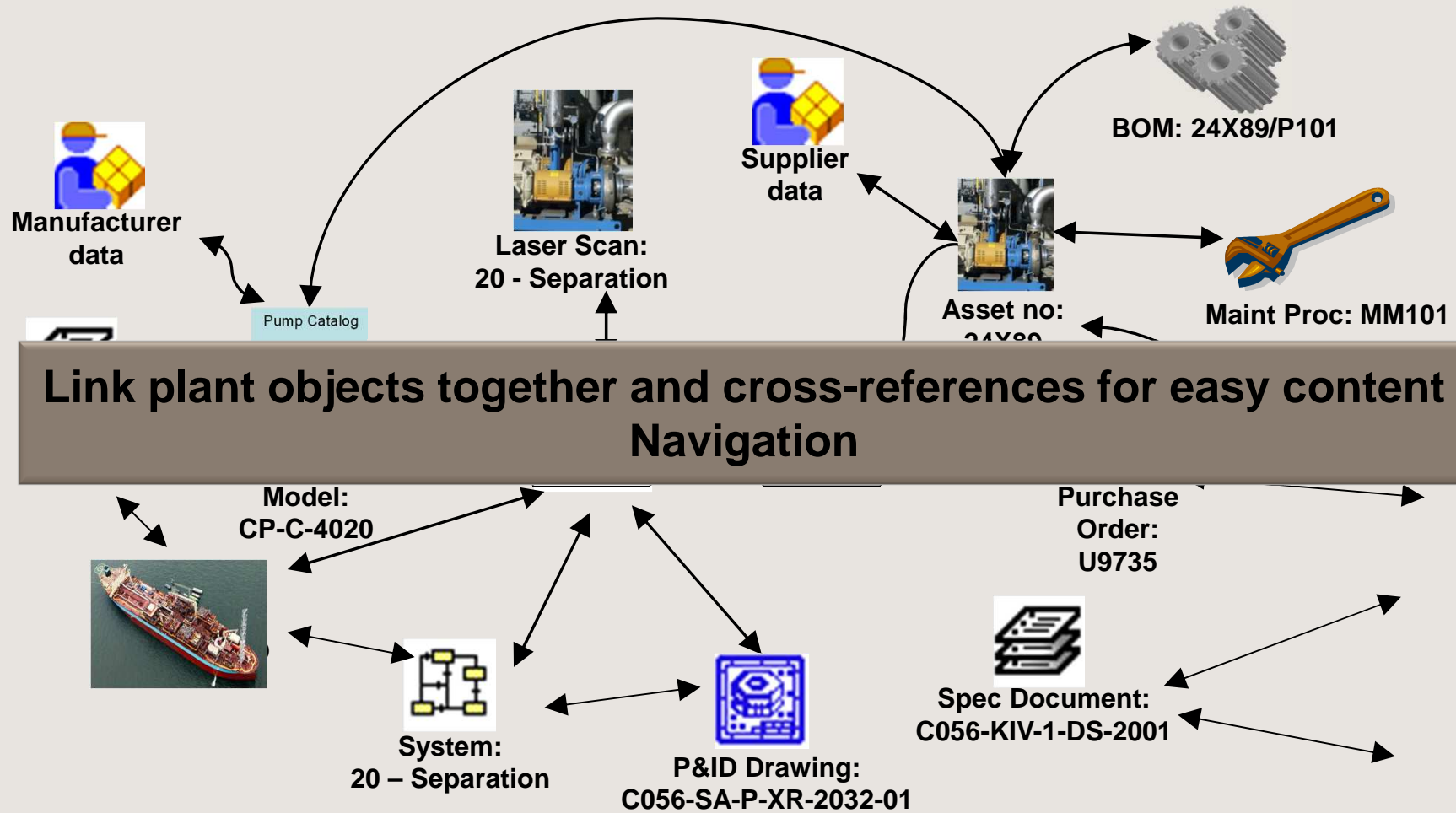
Identify the Master



Unstructured data analysis



Data structure analysis complete ..





BDO (Fusion) Realised benefits

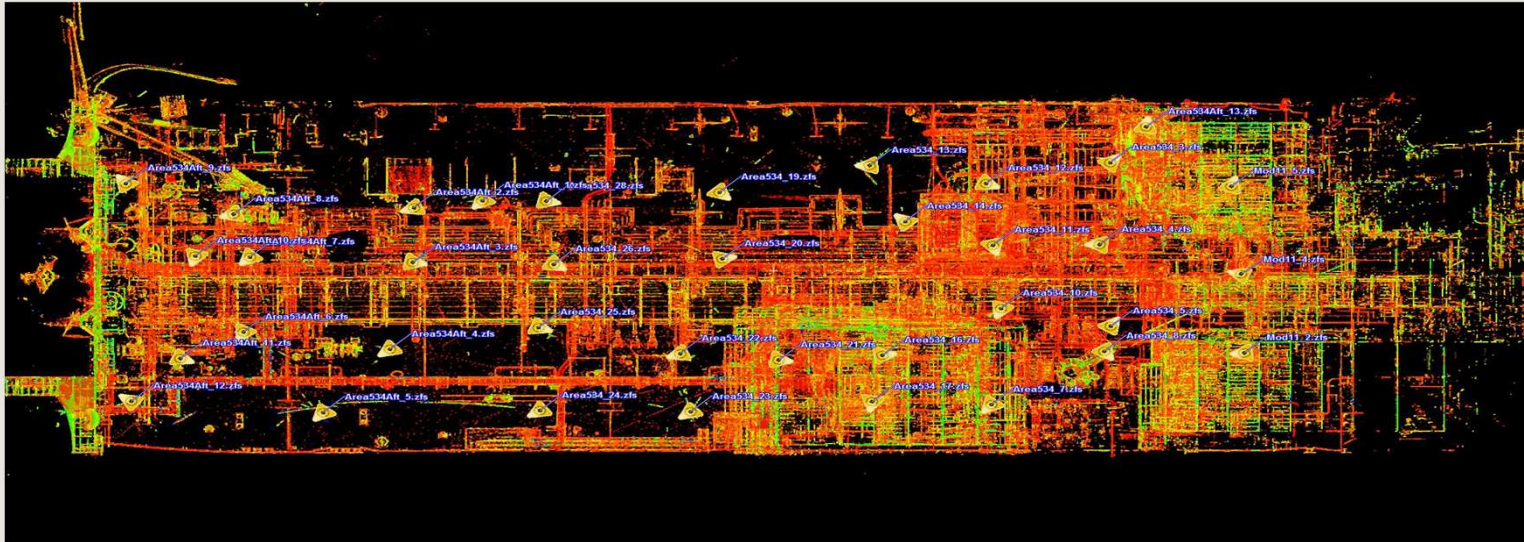
- Significantly improves analysis time i.e. Enables the ability to search on a document and view every version before making an assessment. Much faster than using Windows Explorer.
- Allows multiple users to be working within the one Master Data Source.
- Singular software source i.e. No need to run multiple applications such as MS Excel, MS Access.
- Highly configurable and customisable, which is only beneficial if the client firstly understands what they require and secondly understands the capability of the software.
- Contains an integral web based Portal allowing project personnel remote access to live data during the project phase, a key requirement on all major projects.
- Workflow Process to enable documentation approval and acceptance.
- Operates on common industry standard software such as SQL Server as well as Oracle.



As Building - Field based data capture

1. Physically collect all and accurate As Built data for existing Brownfield Plant.
2. Data cleanse existing drawings and databases.
3. Populate Portals with As-Built Data from any source or cad system
4. Keep Asset Data Up-Dated as an Out Sourcing Service for Customer
5. Surveying using photo and laser scanning

Leica 3D Laser Surveying



Scanner positions were chosen to satisfy:

- Scope – Vessel Topsides, engine room, turret, and pump rooms.
- Maximise target usage to optimise surveying density.
- Point cloud overlap to optimise clarity.
- Redundancy to allow for re-surveying of modified areas.



The point cloud

Laser Scanning with High-Resolution Photos

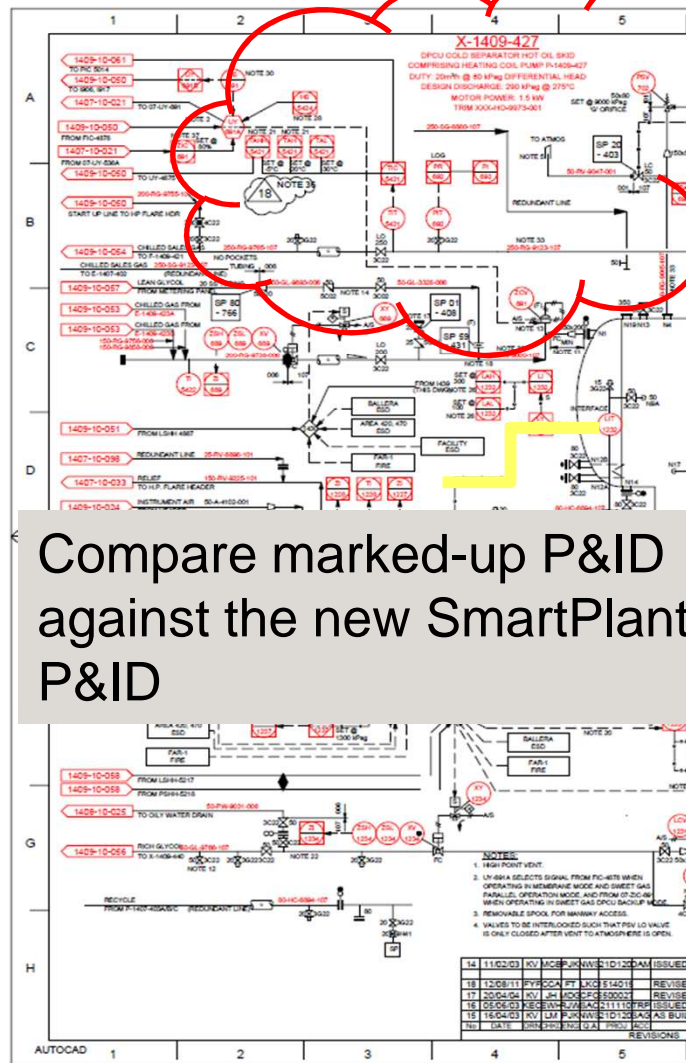


Bringing it together in SmartPlant Fusion

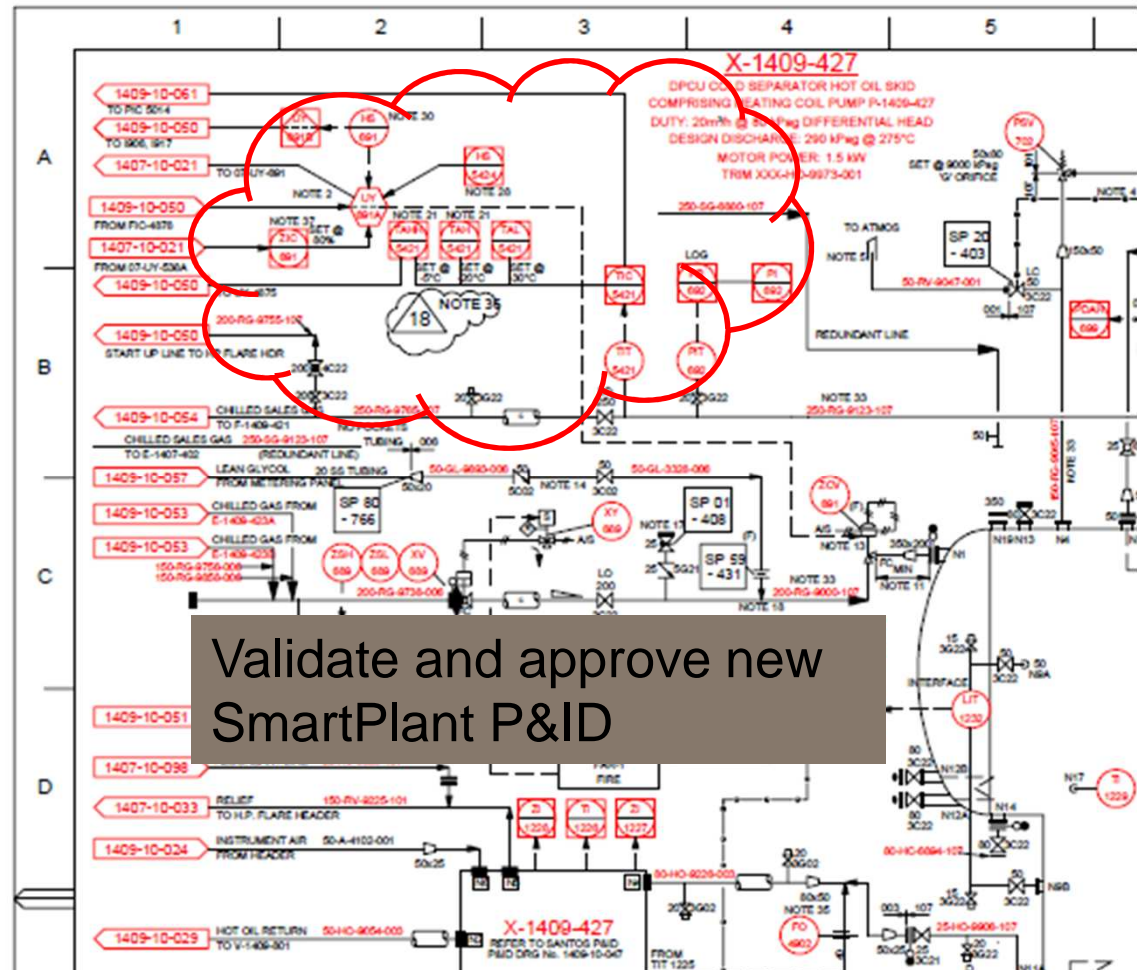
The screenshot displays the SmartPlant Fusion software interface. At the top, the user is logged in as 'superuser' with a 'Query Scope = Vincent' and 'Selected Roles = Super User'. The interface is divided into several sections:

- Discover:** A tree view on the left showing a hierarchy of equipment and document types, including 'Equipment, Equipment type level-0 (top-level)', 'superuser', 'Instrument process function', 'Vincent, Vincent', 'Document category', 'Doc Types Maersk, Vincent Maersk DocumentTypes', 'DisciplineTypes, Vincent DisciplineTypes', 'WoodsideDisciplineTypes, Woodside Discipline Types', 'Saved Queries', and 'Search Results'.
- Review:** A panel for the selected item 'P-SSV-1058', showing 'Properties' and 'Actions' such as 'Add To Home Collection', 'Create Affiliated Rels', 'Details', 'History...', 'Summary View Equipment...', 'View Drawing', 'View Item In Laser Scan', 'View Shared Equipment...', 'Show All Relationships', 'Show Comprised of', 'Show Document (5)', 'Show Drawings', and 'Show Latest Versions Containing Tagged Item'.
- TruView:** A 3D perspective view of industrial equipment labeled 'Station4'. Red arrows point to specific components with labels: 'P-SSV-1060', 'P-SSV-1058', 'P-PCV-1056', 'P-PIT-1054', 'P-PIT-1052', and 'P-HV-1052'.
- Drawing(s):** A 2D P&ID drawing titled 'VA1100DP0001.0001' showing the process flow and equipment connections corresponding to the 3D model. The drawing includes various symbols for pumps, valves, and vessels, with labels like 'P-SSV-1058', 'P-SSV-1060', 'P-PCV-1056', and 'P-PIT-1052'.

Convert “as built” into an Intelligent P&ID System

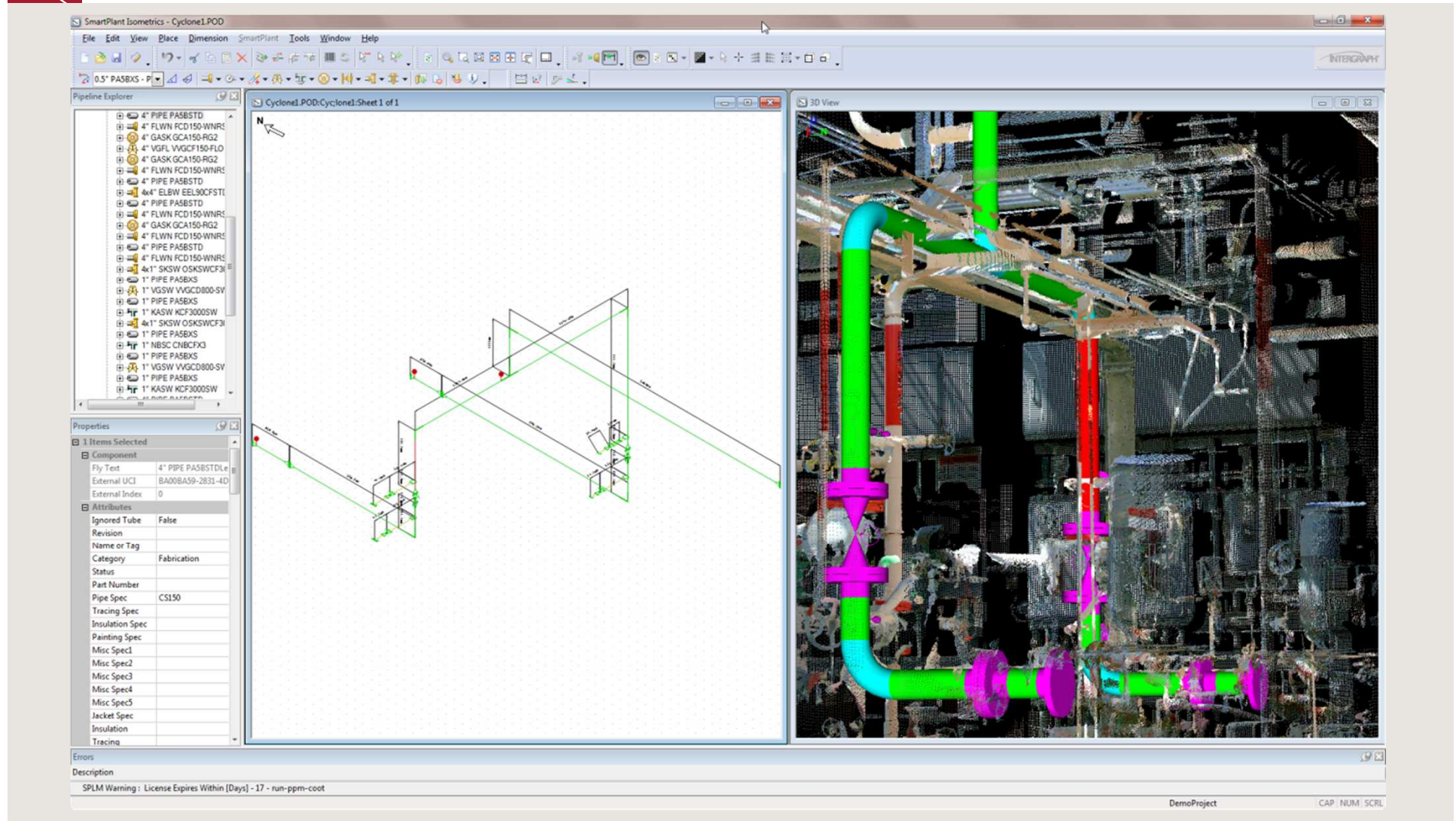


Compare marked-up P&ID against the new SmartPlant P&ID

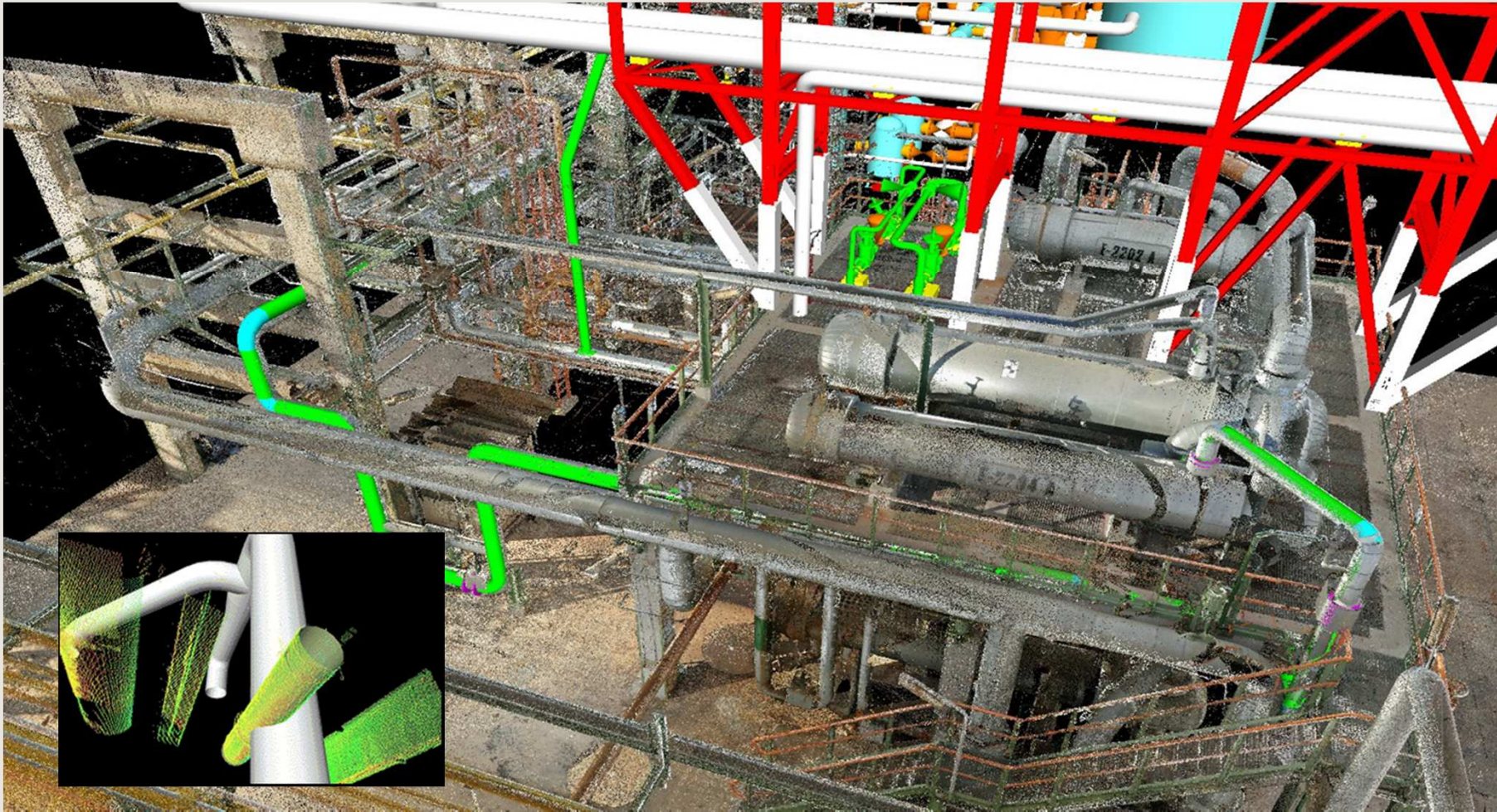


Validate and approve new SmartPlant P&ID

Create Isometrics using CloudWorx for SmartPlant Isometrics



Point Cloud and S3D Model - Hybrid



Mobile online asset tagging and as building



1. Create a register of assets and assign tags (RFID, barcode, physical, GIS) online
2. Manage asset location, status and condition online using customizable forms
3. Capture as build results in the field on handhelds.
4. Manage inspection schedules, including overdue alerts
5. Gain easy access to all documents relating to assets
6. Get flexible reporting

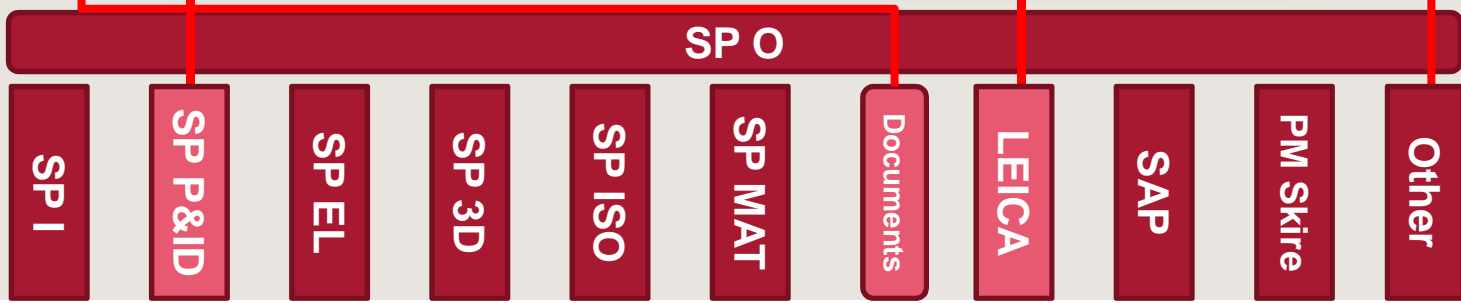
Lock Out Tag Out

Isolation List - 21-VA-415-001

| Sequence | Tag No/ID | Description | Size | Status | Type | Piping Spec | Isolated by | Date/Time | De-Iso Seq | De-Isolated by | Date/Time |
|----------|------------|---------------------------|-------|--------|-------------|-------------|-------------|-----------|------------|----------------|-----------|
| 01 | 21-LV-4111 | Valve isolate closed | 4 in | LC | Block Valve | BS20A | | | | | |
| 02 | | Open drain to relieve pre | 4 in | LO | Drain Valve | | | | | | |
| 03 | N3B | Insert blind | 12 in | Closed | Spade | | | | | | |
| 04 | N3C | Insert blind | 8 in | Closed | Spade | | | | | | |
| 05 | N3A | Insert blind | 6 in | Closed | Spade | | | | | | |
| 06 | N3D | Open inspection port | 8 in | Open | Port | | | | | | |

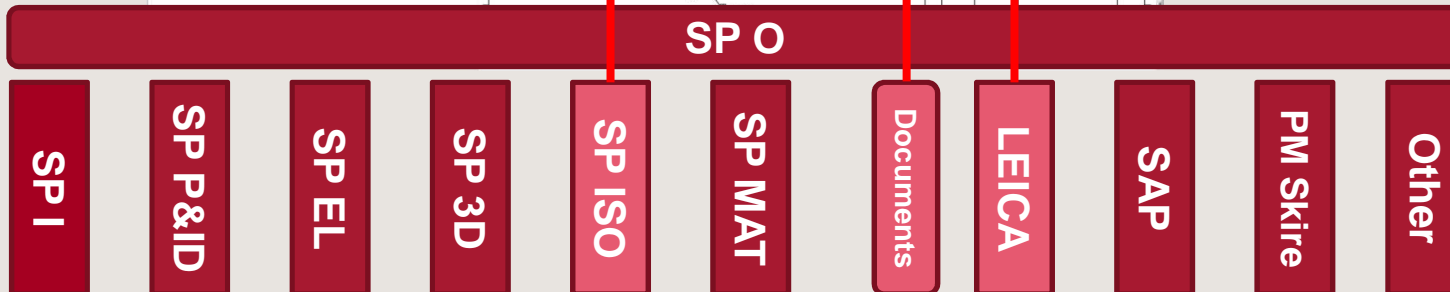
Data Integration Opportunity

| Sequence | Tag No/ID | Description | Size | Status | Type | Piping Spec | Isolated by | Date/Time | De-iso Seq | De-Isolated by | Date/Time |
|----------|------------|---------------------------|-------|--------|-------------|-------------|-------------|-----------|------------|----------------|-----------|
| 01 | 21-LV-4111 | Valve isolate closed | 4 in | LO | Block Valve | BC20A | | | | | |
| 02 | Drain | Open drain to relieve pre | 4 in | LO | Drain Valve | | | | | | |
| 03 | N3B | Insert blind | 12 in | Closed | Spade | | | | | | |
| 04 | N3C | Insert blind | 8 in | Closed | Spade | | | | | | |
| 05 | N3A | Insert blind | 8 in | Closed | Spade | | | | | | |
| 06 | N3D | Open inspection port | 8 in | Open | Port | | | | | | |



Data Integration Opportunity

The screenshot shows the SmartPlant Foundation web interface. The search bar contains '21-VA*' and the 'Discover' section lists search results: '21-VA-412, FEED GAS SECONDARY SEPARATOR', '21-VA-413, DEETHANISER REFLUX DRUM', and '21-VA-415, FEED GAS EXCH SEPARATOR'. The 'Review' section shows details for '21-PA-411'. The main area displays a 3D model of industrial equipment with a red arrow pointing to a specific component. Below the model is a technical drawing and a table with columns for 'ITEM', 'QTY', 'UNIT', 'DESCRIPTION', and 'MATERIAL LIST - FABRICATION'.



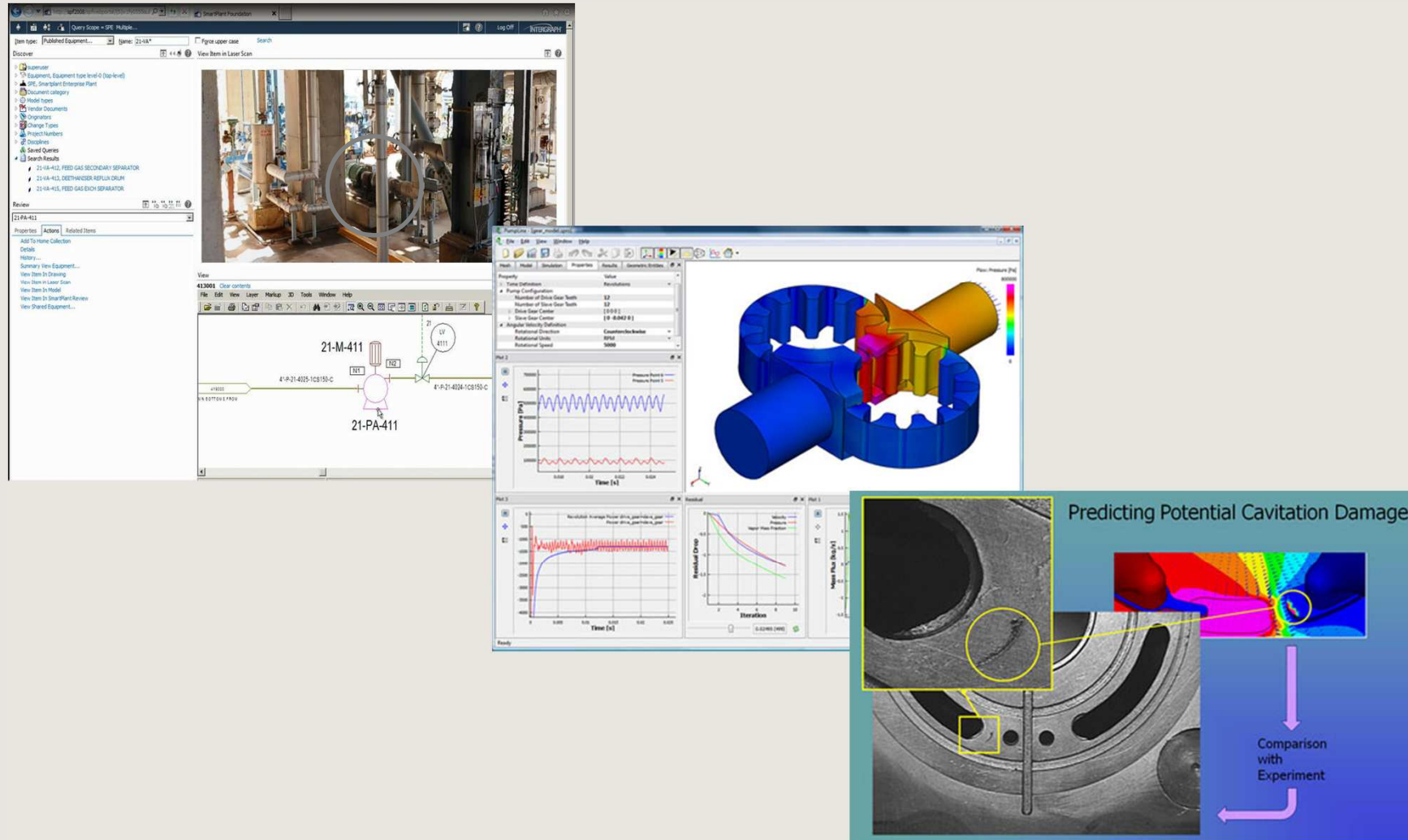
Change management and communications

The more a user has to remember, the less likely he is to use the processes or to interact with the systems.

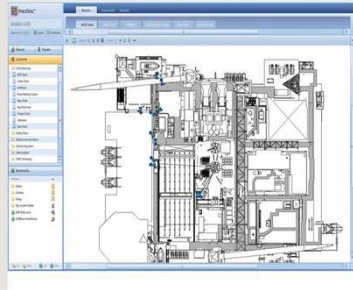
The collage contains several key documents:

- Searching For Ngujima-Yin Documents**: A spreadsheet with columns for 'DISCIPLINE & DOC TYPE DESCRIPTION' and 'Virtual Bookshelf'. It lists various document types like Cause & Effect Charts, P&IDs, and Process Flow Schemes.
- Vincent Acquisition EDM Audit Work Pack Status**: A detailed spreadsheet with columns for 'OAS CODE', 'DOC TYPE DESCRIPTION', 'REV', 'COMPLETE', and 'AS NEEDED REQUIRED'. It categorizes documents into PROCESS, MECHANICAL, STRUCTURAL / CIVIL, FIRE & GAS, INSTRUMENT & CONTROL, and ELECTRICAL.
- Document/Data Process For Vincent Transition**: A flowchart showing the migration of documents from a 'Maersk Documentation not in Woodside System' to a 'Woodside File Share Drive' and then to a 'Brownfields Data Organiser'.
- Ngujima-Yin - Updating Drawings/Documentation Process - OFFSHORE**: A process flowchart with steps: 'Check Latest Version of Drawing/Document', 'Review Drawing and Assess Contribution', 'Create New Copy and Review Approval Signatures', 'Sign as Engineer and Obtain Approval Signatures', 'Send Approved Red Line Work to the Other Party to Check (OAS/Technical/Quality)', and 'Place the Approved Red Line Work on the Project File Share and Copy to the Project File Share'. It also includes a 'Process Completed Log'.
- Ngujima-Yin - Updating Drawings/Documentation Process - ONSHORE**: A process flowchart with steps: 'Drawings Processed', 'Review Copy & Release to Shop', and 'Document Control to Complete O&A Check (if required)'. It also includes a 'Process Completed Log'.
- Document/Data Process For Vincent Transition** (continued): A flowchart showing the transfer of seven critical document types into the Woodside system, involving 'Brownfields Data Organiser', 'Transfer of Seven Critical Documentation Types into Woodside System', 'Documentation Migration into Woodside System', and 'Brownfields Data Organiser'.
- Project Working Documentation**: A flowchart showing the flow from 'Working Copy Process' to 'Brownfields Data Organiser' and finally to 'Document and Data Available in:'. It lists document types like 'H&M Report', 'Process Flow Schemes', and 'P&IDs'.

Visualisation and Predictive analytics



Integrated Operations



Engineering Tools



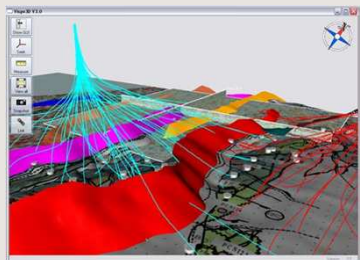
3D Model



People location and camera



Predictive analytics



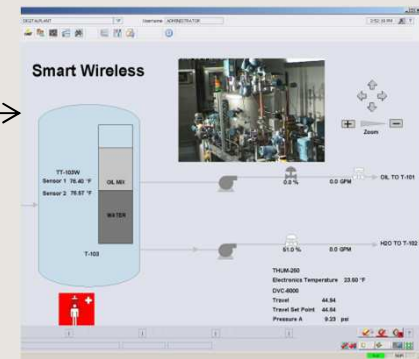
Virtualisation / modelling



Video Conferencing

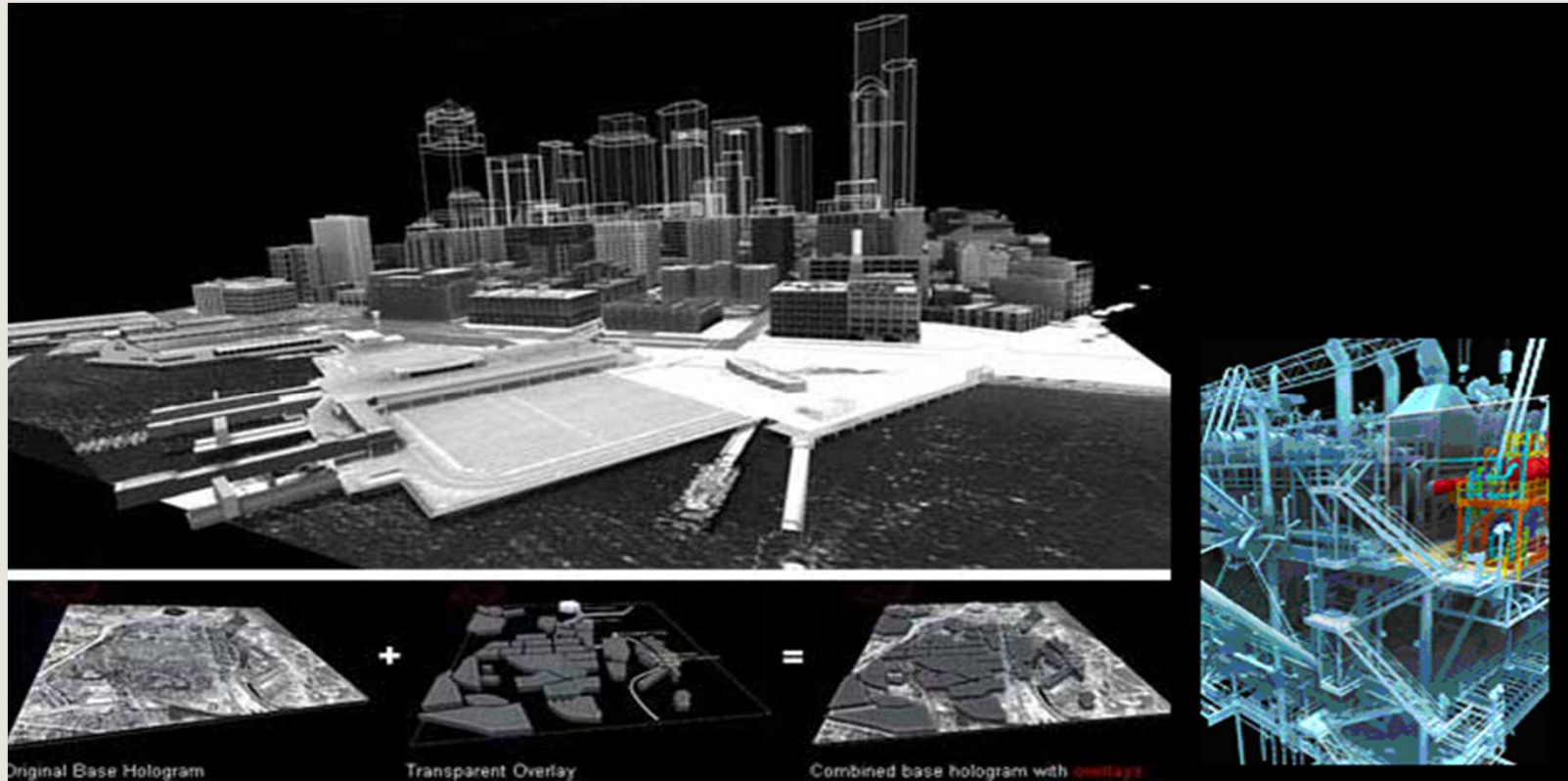


Wireless mobile worker



CCTV

3D Collaborative Displays (Hologram)



Holographic projection that is not only a basic three-dimensional model, but a visual index to the data or information associated with that model's geography, generated from point clouds, terrain models, and 3D construction models.



Integration of Real Time Data

DCS installations on every facility, and nearly every unit, hundreds of thousands of process data tags and millions of data points.

Challenges we are facing:

- Volume is growing rapidly, engineers are drowning in data
- Our focus has to be on exceptions
- Smart surveillance and analytics need to be part of the new engineers toolkit
- Using history to predict the future, model driven analytics
- Upstream systems are demanding consistent and verified values
- Change management is paramount

Technical Data Relational View (collect once use many)

PLANT MASTER DATA MANAGEMENT – High Level ‘To Be’

MASTERS

- Object Class (aligned with ISO 15926)
- Object Sub Class (aligned with ISO 15926)
- Manufacturer Register
- Manufacturer – Make/Model
- Preferred Manufacturers / Vendors
- Spec Sheet Templates
- Datasheet Templates
- Equipment BOM Templates
- Failure Code List of Values by Object Class, by Component
- Hierarchies (Functional; EDCs; Physical; Shutdown; etc); Routes
- Op Stats Network
- FLOCs
- Physical Location (GIS, Barcodes, RFID)
- Equipment (Unique Equipment Nos (UENs))
- Tags
- Catalogue Items
- Tag to Documents link
- Tag to Media Link

HOLDS RULES FOR:

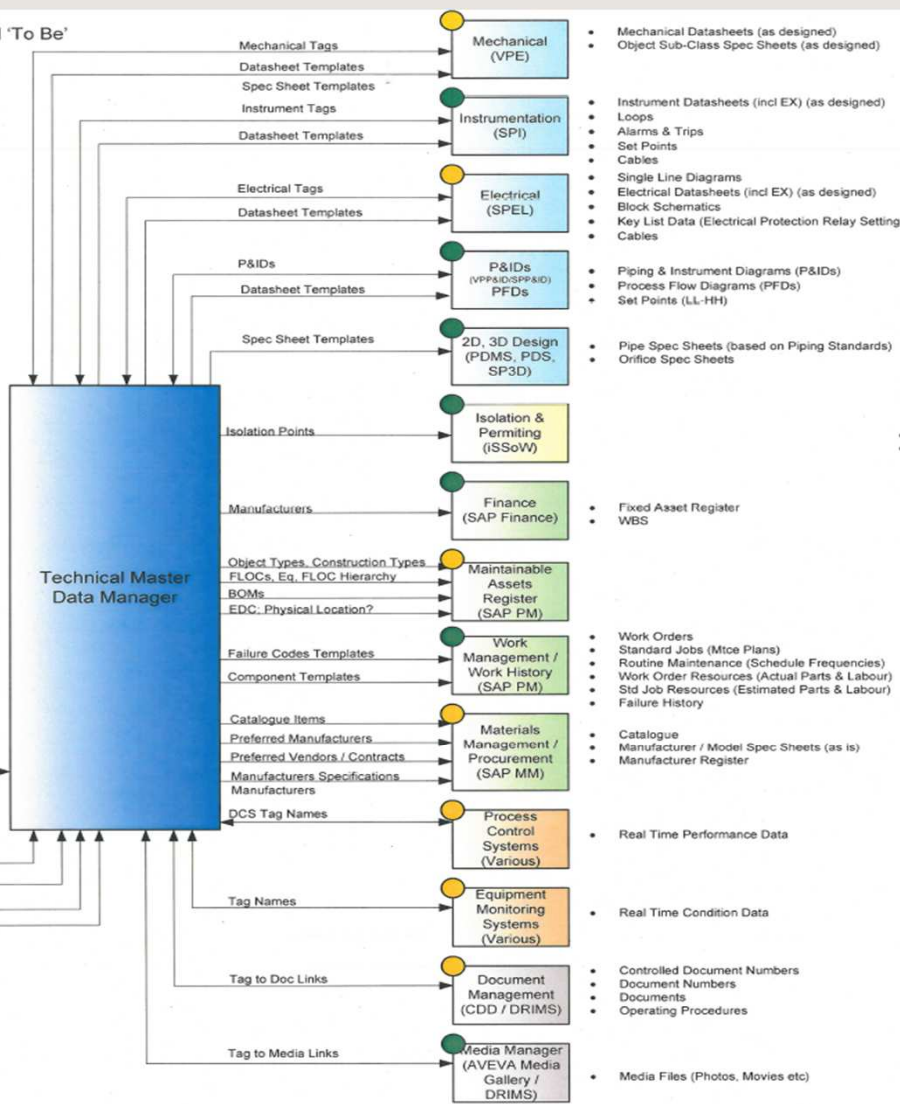
- Compliance to Drawing / Document Numbering Guidelines
- Maintainable Units
- Repairables / Rotables
- Special Tools (initial definition in Mechanical)
- Insurance Spares (initial definition in Mechanical)
- Capital Spares (initial definition in Mechanical)
- Commissioning Spares
- Change Management across all systems
- Federation of information across systems based on one common plant register

Industry Standards

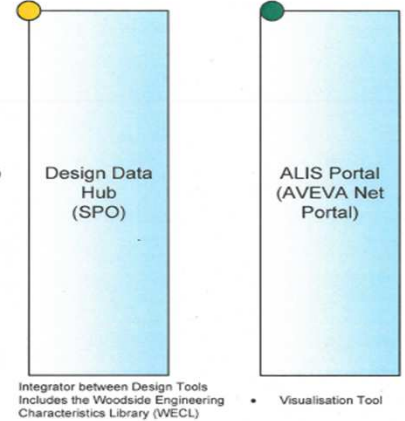
Reference Data Libraries

External Manufacturers Catalogue (Pearson / Harper)

Manufacturer / Models updates
 Manufacturer / Model Specifications
 Vendor / Manufacturer Docs
 Vendor / Manufacturer BOM



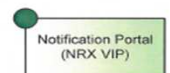
- Mechanical Datasheets (as designed)
- Object Sub-Class Spec Sheets (as designed)
- Instrument Datasheets (incl EX) (as designed)
- Loops
- Alarms & Trips
- Set Points
- Cables
- Single Line Diagrams
- Electrical Datasheets (incl EX) (as designed)
- Block Schematics
- Key List Data (Electrical Protection Relay Settings)
- Cables
- Piping & Instrument Diagrams (P&IDs)
- Process Flow Diagrams (PFDs)
- Set Points (LL-HH)
- Pipe Spec Sheets (based on Piping Standards)
- Orifice Spec Sheets
- Fixed Asset Register
- WBS
- Work Orders
- Standard Jobs (Mtc Plans)
- Routine Maintenance (Schedule Frequencies)
- Work Order Resources (Actual Parts & Labour)
- Std Job Resources (Estimated Parts & Labour)
- Failure History
- Catalogue
- Manufacturer / Model Spec Sheets (as is)
- Manufacturer Register
- Real Time Performance Data
- Real Time Condition Data
- Controlled Document Numbers
- Document Numbers
- Documents
- Operating Procedures
- Media Files (Photos, Movies etc)



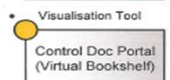
- Integrator between Design Tools
- Includes the Woodside Engineering Characteristics Library (WECL)
- Visualisation Tool

Legend

- System stable
- Data quality reasonable
- System new, being refreshed or needs refreshing, or
- Data quality issues, or data incomplete

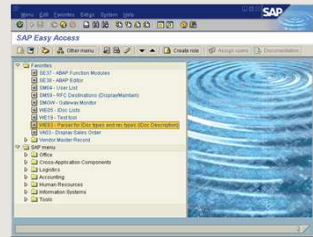


- Process Wizard

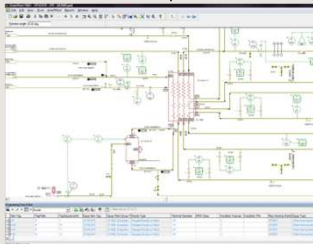


- Visualisation Tool

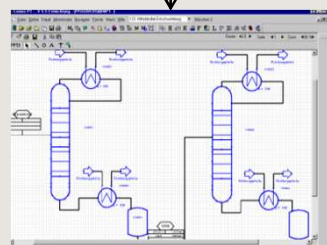
An Integrated Example — Real time early warning....



Critical Equipment



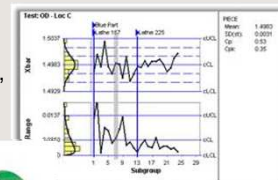
P&ID



Process Flow Diagram

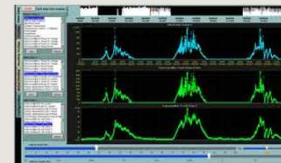
Statistical deviation detected

Vibration, flow, temp, etc

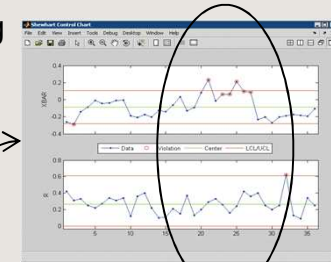


Robust real-time alerting of impending problems

Associates deviations with known problems



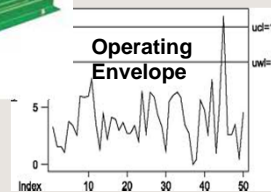
Diagnostic rules engine



Analyst



Vibration, flow, temp, etc



Real-time sensor data



Real-time advisory and action

Questions ...

