



# Why **CAX**per<sup>ts</sup> ?

Engineered Efficiency

## Use Cases to Consider

We've highlighted some areas that offer significant benefits, along with customers who show that use case in action. See if any of these solve a problem for you.

2016-07-04



Reporting & QA



Data reuse



Visualisation



Symbol & catalogue

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## UniversalReporter

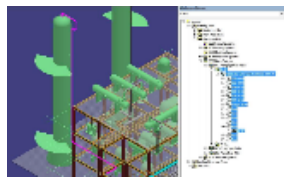
### Use Case 1: Create Smart 3D piping MTO summary report

#### CHALLENGE

It is always a challenge to create a piping MTO report where all components are listed and summarised (per area, unit and/or pipeline system) with the appropriate associations to pipe run, area, unit etc.

#### WORKFLOW STEPS

1. Extract data from the source application by using your own filter



2. View data in UniversalReporter

Area	Unit	Pipeline	Commodity Type	First Size Schedule	Industry Commodity	Npd 1	Npd Un	SUM_of	Quantity	Short Material Descriptio	Spec Name
A2	U01	1002-P	E90LR	S-STD	MCMZZBOZZAAE	6.00	in	3.00	pcs	90 deg LR elbow, S-STD, BE, ASTM-A10031	1C0031
A2	U01	1002-P	PIPE	S-STD	PAAZZBOZZABA	6.00	in	18194.80	mm	Pipe, S-STD, BE, ASTM-A10031	1C0031
A2	U01	1002-P	Shop weld			6.00	in	9.00	pcs	Shop weld	1C0031
A2	U01	1002-P	T	S-STD	MDJZZBOZZAAE	6.00	in	1.00	pcs	Tee, S-STD, BE, ASTM-A10031	1C0031
A2	U02	2001-P	E90LR	S-STD	MCMZZBOZZAAE	6.00	in	4.00	pcs	90 deg LR elbow, S-STD, BE, ASTM-A10031	1C0031
A2	U02	2001-P	FWN	Undefined	FAAAHDCZZAAD	8.00	in	2.00	pcs	Flange, CL150, RFFE/BE, ASTM-A105, 1C0031	1C0031
A2	U02	2001-P	PIPE	S-STD	PAAZZBOZZABA	6.00	in	16491.20	mm	Pipe, S-STD, BE, ASTM-A10031	1C0031
A2	U02	2001-P	REDUC	S-STD	MBCZZBOZZAAE	8.00	in	2.00	pcs	Concentric reducer, S-STD, BE, ASTM-A10031	1C0031
A2	U02	2001-P	Shop weld			6.00	in	12.00	pcs	Shop weld	1C0031
A2	U02	2001-P	Spiral wound, one		GMAHACABXBEP	6.00	in	2.00	pcs	Gasket, CL150, 0.125" th	1C0031

3. Create piping MTO summary report using a report template which includes built-in summary functions

Piping Material Take-OFF										CAXperts
Area	Unit	Pipeline	Commodity	First Size	Industry Commodity Code	Quantity	[pcs/mm]	Short Material Description	Spec Name	
System	System	System	Type	Schedule						
A2	U01	1002-P								
			E90LR	S-STD	MCMZZBOZZAAEADCCZUS	3.00	pcs	90 deg LR elbow, S-STD, BE, ASTM-A10031	1C0031	
			PIPE	S-STD	PAAZZBOZZABAABOAAZZUS	18194.80	mm	Pipe, S-STD, BE, ASTM-A10031	1C0031	
			Shop weld			9.00	pcs	Shop weld	1C0031	
			T	S-STD	MDJZZBOZZAAEADCCZUS	1.00	pcs	Tee, S-STD, BE, ASTM-A10031	1C0031	
A2	U02	2001-P								
			E90LR	S-STD	MCMZZBOZZAAEADCCZUS	4.00	pcs	90 deg LR elbow, S-STD, BE, ASTM-A10031	1C0031	
			FWN	Undefined	FAAAHDCZZAADABQZZUS	2.00	pcs	Flange, CL150, RFFE/BE, ASTM-A105, 1C0031	1C0031	
			PIPE	S-STD	PAAZZBOZZABAABOAAZZUS	16491.20	mm	Pipe, S-STD, BE, ASTM-A10031	1C0031	

#### SOLUTION

- **3D ReportAdapter** adds the hierarchy information to the pipe parts, so **UniversalReporter** is able to use the relation to pipeline, area, unit etc. for grouping the output
- This type of report gives you a quick - up to date - overview of the material used in your plant

## About CAXperts

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## UniversalReporter

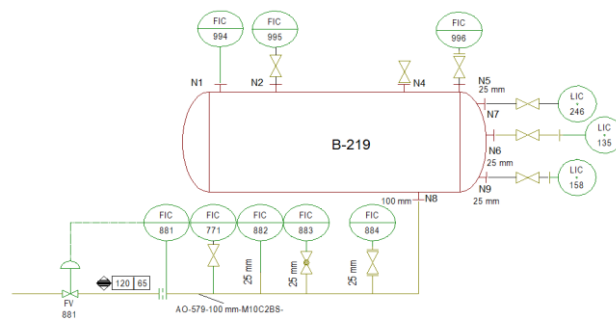
### Use Case 2: Create SmartPlant P&ID instrument lists

#### CHALLENGE

It is always a challenge to create an instrument list with the appropriate connections to equipment or pipe runs due to the fact that the information is stored in different areas in the database

#### WORKFLOW STEPS

1. Extract data from the source application including the connectivity and process data information.



2. View data in **UniversalReporter** (check instrument connections and additional parameters)

Item Tag	Equipment_Tag	Nozzle_Tag	ConnectedPipeRun	ConnectedPipeRunDN	PipeRun_DesignMaxPress	PipeRun_DesignMaxTemp
FE-881			01579-AO	100 mm	120 psi	65 F
FIC-771			01579-AO	100 mm	120 psi	65 F
FIC-881			01579-AO	100 mm	120 psi	65 F
FIC-882			01579-AO	25 mm	120 psi	65 F
FIC-883			01579-AO	25 mm	120 psi	65 F
FIC-884			01579-AO	25 mm	120 psi	65 F
FIC-994	B-219	N1				
FIC-995	B-219	N2				
FIC-996	B-219	N5				

3. Create instrument list report

Instrument List						CAXperts
Item Tag	Equipment Tag	Nozzle Tag	PipeRun Tag	PipeRun DN	PipeRun DMP	PipeRun DMT
FE-881			01579-AO	100 mm	120 psi	65 F
FIC-771			01579-AO	100 mm	120 psi	65 F
FIC-881			01579-AO	100 mm	120 psi	65 F
FIC-882			01579-AO	25 mm	120 psi	65 F
FIC-883			01579-AO	25 mm	120 psi	65 F
FIC-884			01579-AO	25 mm	120 psi	65 F
FIC-994	B-219	N1				
FIC-995	B-219	N2				
FIC-996	B-219	N5				

#### SOLUTION

- The **PID ReportAdapter** adds the connectivity information to the offline instruments so that the connection to equipments, piperuns etc. is available for reporting
- This type of report is very useful for downstream applications like SmartPlant Instrumentation.

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## UniversalReporter

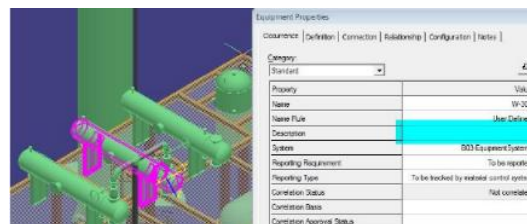
### Use Case 3: Update Smart 3D equipment data

#### CHALLENGE

Data is stored in different locations/departments each having the ownership of parts of the data. Data must be imported in a controlled process to the Smart 3D application.

#### WORKFLOW STEPS

1. Extract data from Smart 3D using **3D ReportAdapter**



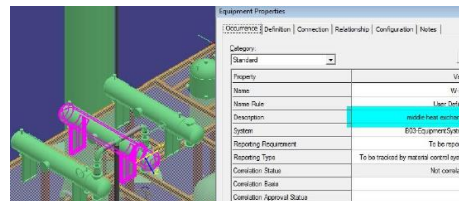
2. Receive Excel report from other department, including additional information

CAXperts Equipment List				
	Name	Description	Supply Responsibility	Weight
27	K-001	tube cracker	Supp C	170
28	K-002	tube cracker	Supp B	230
53	W-301	left heat exchanger	Supp B	130
55	W-303	middle heat exchanger	Supp B	560
56	W-311	right heat exchanger	Supp B	380

3. Import additional data from the Excel sheet to **UniversalReporter**

Equipm	Old Value_(of)_De	Description
W-311		right heat exchanger
W-303		middle heat exchanger
W-302		
W-301		left heat exchanger
W-005		

4. Write imported data back to Smart 3D



#### SOLUTION

- **UniversalReporter** allows importing of external data available in the familiar Microsoft Excel interface; the data can be from any other application or build up manually
- In addition **UniversalReporter** is able to create its own Excel reports, to allow persons not having access to Smart 3D to enhance and change 3D data

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## UniversalReporter

### Use Case 4: Update process data for P&ID

#### CHALLENGE

Data is stored in different locations/departments each having the ownership of parts of the data. Data must be imported in a controlled process to the SmartPlant P&ID application.

#### WORKFLOW STEPS

1. Extract data from the source application

Item Tag	Fluid Code	Design Max Press	Design Max Temp	Piping Materials Class	Drawing Name
05139-W	W			1C0031	Po Wa
05140-W	W			1C0031	Po Wa
05144-W	W			1C0031	Po Wa
05183-W	W			1C0031	Po Wa
05276-W	W			1C0031	Po Wa
05367		5 bar	10 C		Po Wa
05375-W	W	6 bar	60 C	M10C2ES	Po Wa

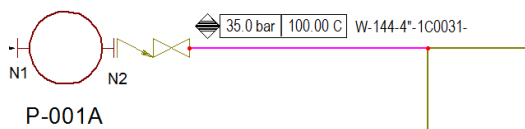
2. As Process Engineer add / modify technical parameters

Item Tag	Fluid Code	Design Max Press	Design Max Temp	Piping Materials Class	Drawing Name
05139-W	W	20 bar	200 C	1C0031	Po Wa
05140-W	W	20 bar	200 C	1C0031	Po Wa
05144-W	W	35 bar	100 C	1C0031	Po Wa
05183-W	W	35 bar	80 C	1C0031	Po Wa
05276-W	W	36 bar	81 C	1C0031	Po Wa
05367		5,5 bar	10,5 C		Po Wa
05375-W	W	6 bar	60 C	M10C2ES	Po Wa

3. Import the modified reports into **UniversalReporter**

Item Tag	Fluid Code	Old Value_[of]_De	Design Max Press	Old Value_[of]_De	Design Max Temp	Piping Materials
NOT-NULL			Changed Values			
05139-W	W		20 bar		200 C	1C0031
05140-W	W		20 bar		200 C	1C0031
05144-W	W		35 bar		100 C	1C0031
05183-W	W		35 bar		80 C	1C0031
05276-W	W		36 bar		81 C	1C0031
05367		5 bar	5,5 bar	10 C	10,5 C	
05375-W	W	100 psi	6 bar	99F	60 C	M10C2ES

4. Write the changes to SmartPlant P&ID



Properties	
Pipe Run - 05144-W	
<div> <div>Identification</div> <div>Physical</div> <div>Process</div> <div>Responsibility</div> </div>	
Design Max Press	35 bar
Design Max Temp	100 C
Stream No	
Construction By	
Supply By	

#### SOLUTION

- **UniversalReporter** allows modification of source data using the familiar Microsoft Excel interface; the data can be modified by users from different departments each adding their part of information and then imported into **UniversalReporter**
- The changes towards the Smartplant P&ID application are traced in a history file (history logging)
- In addition:
  - Verification steps ensure all changes are applied correctly (for example check of codelist values)
  - Restricted data cannot be changed
  - Changes are propagated to connected objects as defined in the rules
  - Changed data is reflected in labels on the corresponding SmartPlant P&ID documents

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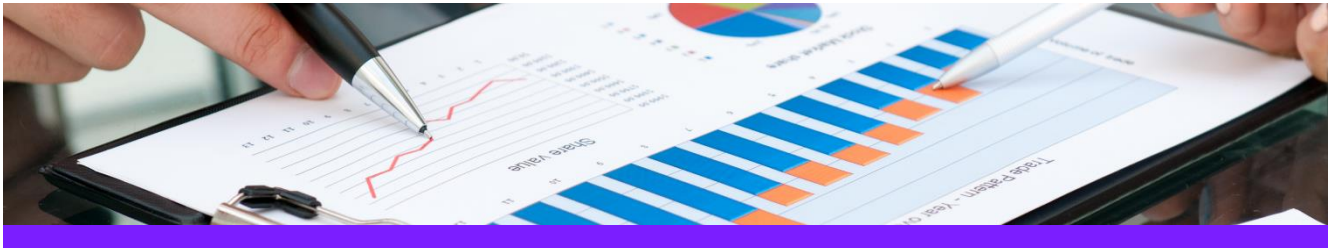
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## QualityAssuranceModule

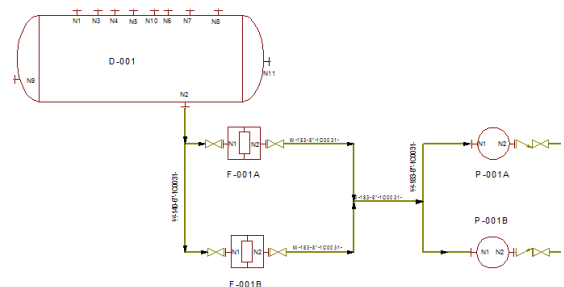
### Use Case 1: Check syntax of SmartPlant P&ID equipment tags

#### CHALLENGE

It is always a challenge to keep track if all tags apply to the naming convention which is mandatory for the project; users can make mistakes when they key in the different attributes the tags are made of.

#### WORKFLOW STEPS

1. Extract source data from SmartPlant P&ID using **PID ReportAdapter**



2. View data in the **QualityAssuranceModule** and apply the rule to check the tags  
Tag rule: "Tag must start with a character; plus the TagSequenceNumber must be numeric and 3 digits long, for the last digit 0 is not allowed"

Drawing Name	Item Tag	Tag Prefix	Tag Seq No	Tag Suffix	Equip Class
Po Wa	-168		168		Heat Transfer Equipment
Po Wa	F-001A	F	001	A	Mechanical Equipment
Po Wa	F-001B	F	001	B	Mechanical Equipment
Po Wa	P-001B	P	001	B	Mechanical Equipment
Po Wa	P-001A	P	001A		Mechanical Equipment
Po Wa	D-001	D	00	1	Vessel Equipment

Or

[Item Tag] Is not like [A-Z]%

[Tag Seq No] Is not like [0-9][0-9][1-9]

3. Create Excel report from the **QualityAssuranceModule**

	A	B	C	D	E	F
	Drawing Name	ItemTag	Tag Prefix	Tag Sequence No	Tag Suffix	Equipment Class
1	Po Wa	-168		168		Heat Transfer Equipme
2	Po Wa	F-001A	F	001	A	Mechanical Equipment
3	Po Wa	F-001B	F	001	B	Mechanical Equipment
4	Po Wa	P-001B	P	001	B	Mechanical Equipment
5	Po Wa	P-001A	P	001A		Mechanical Equipment
6	Po Wa	D-001	D	00	1	Vessel Equipment

#### SOLUTION

- The **QualityAssuranceModule** makes it easy to identify the tags which are not compliant with the naming convention; these tags can be exported to an Excel report
- This type of report can be handed out to the contractors (or to other inhouse departments) with the goal to have the data reworked so that it complies with the rules

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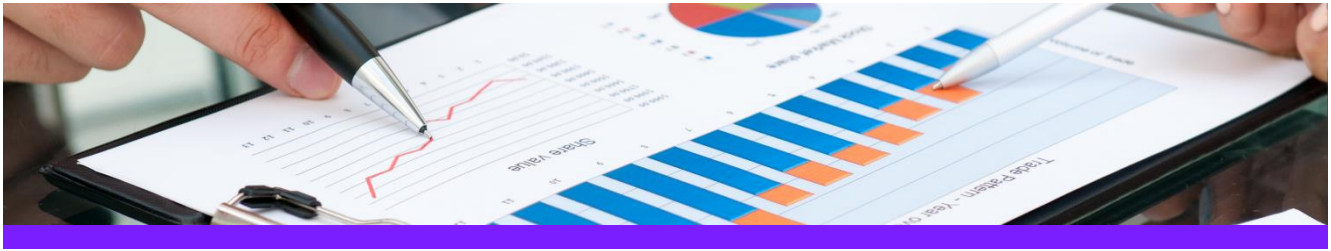
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## QualityAssuranceModule

### Use Case 2: Check if flow elements and control valves are associated to pipe runs

#### CHALLENGE

It is always a challenge to keep track if all inline elements (like flow elements and control valves) have a correct tag number and if they are associated to a pipe run.

#### WORKFLOW STEPS

1. Extract source data from SmartPlant Instrumentation using **SPI ReportAdapter**

Tag Number	Service	Instrument Type	Manufacturer	Model	Line Number
101-FE -125		FE			
101-FE -100	Feed from V-8	FE	FISHER-PORTER		4"-P-1501-11H
101-FV -100	Feed from V-8	FV	FOXBORO		4"-P-1501-11H
101-FE -102	Feed from C-1	FE			4"-P-1502-11H
101-FE -1234/A		FE			
101-FE -1446		FE			
101-FE -201	Stripping Steam to F-102	FE			1.5"-S-2001-4C
101-FE -2212	Feed to B-101 Pass A	FE			3"-FO-1212-4C
101-FV -2212	Feed to B-101 Pass A	FV	FOXBORO		3"-FO-1212-4C
101-FE -2213	Feed to B-101 Pass B	FE			3"-FO-1213-4C
101-FV -2213	Feed to B-101 Pass B	FV	MASONELAN		3"-FO-1213-4C
101-FE -2214	Feed to B-101 Pass C	FE			3"-FO-1212-4C
101-FV -2214	Feed to B-101 Pass C	FV	MASONELAN		3"-FO-1212-4C
101-FE -905	DCS closed loop	FE			
101-FV -905	DCS closed loop	FV			

2. View data in the **QualityAssuranceModule** and apply the rules to check the inline elements:  
Rule 1: "Tag is not allowed to contain a dash followed by one or more blanks"  
Rule 2: "If Tag starts with 'FE' or 'FV' then the LineNumber should not be Null"

Instrument Name	Loop_Service	Instrument Function Type	Instrument Manufa...	Line_Line Number
101-FE -125		FE		
101-FE -102	Feed from C-1	FE		4"-P-1502-11H
101-FE -1234/A		FE		
101-FE -1446		FE		
101-FE -201	Stripping Steam to F-102	FE		1.5"-S-2001-4C
101-FE -2212	Feed to B-101 Pass A	FE		3"-FO-1212-4C
101-FE -2213	Feed to B-101 Pass B	FE		3"-FO-1213-4C
101-FE -2214	Feed to B-101 Pass C	FE		3"-FO-1212-4C
101-FE -905	DCS closed loop	FE		

3. Create Excel report from the **QualityAssuranceModule**

#### SOLUTION

- The **QualityAssuranceModule** makes it easy to identify the tags which are not compliant with the naming convention or tags that have no association to for instance pipe runs.
- This type of report can be handed out to the contractors (or to other in-house departments) with the goal to have the data reworked so that it complies with the rules

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# PlantReModeller

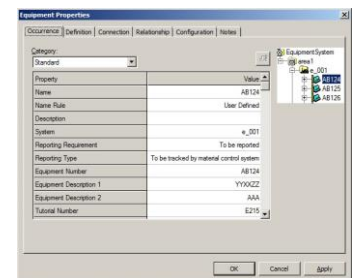
## Use Case 1: Import equipment models from PDS into Smart 3D

### CHALLENGE

Main challenge for the import of equipment data from PDS to Smart 3D is the completeness of graphical and meta data after the conversion

### WORKFLOW STEPS

1. Aspects are transferred correctly (insulation, maintenance, operation, etc.)
2. Intelligent Smart 3D nozzles
3. All PDS-MicroStation attachments are imported automatically
4. All attributes can be transferred
5. Imported as a modifiable Designed Equipment



### SOLUTION

- **PlantReModeller** import functionality for equipment is designed to be used by project engineers.
  - A straight forward mapping methodology together with an expressive reporting ensures an effective and complete import process

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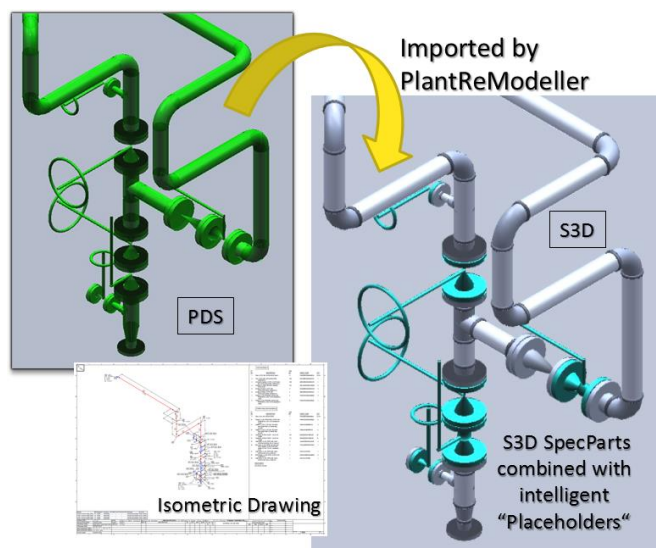
## Use Case 2: Import piping models from PDS into Smart 3D

### CHALLENGE

Main challenge for the import of piping data from PDS to Smart 3D is the correct placement of all components as spec parts or intelligent “placeholders”. Finally an isometric drawing should be generated.

### WORKFLOW STEPS

1. Easy mapping of PDS parts to Smart 3D short codes



2. Intelligent import mechanism with dimension check and fall-back scenario
3. All attributes can be transferred

### SOLUTION

- **PlantReModeller** import functionality for piping is designed to be used by project engineers.
  - A straight forward mapping methodology together with an expressive reporting ensures an effective and complete import process

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## UniversalPlantViewer

### Use Cases: A free viewer for your 3D model and data

#### CHALLENGES

1. All stakeholders should have access to the same up-to-date model, the model should be also available when there's currently no online connection
2. Plant models need to be available on multiple hardware and software platforms
3. Joint model reviews of EPCs and Owner-Operators (to check the design progress, clashes etc.) should be easy for both sides
4. Pipelines need to be reviewed in a convenient way
5. Reading isometrics is sometimes difficult

#### SOLUTION

##### UniversalPlantViewer

1. Allows all stakeholders can access the model from a central source (e.g. intranet server), a download to the local device is possible (i.e. offline mode)
2. Is available for Windows, Android, iOS and browsers that support the Unity plugin. It supports touch, mouse and keyboard modes, the GUI is identical on all platforms.
3. Provides the necessary flexibility by supporting several source systems, hard- and software platforms to make joint model reviews of EPCs and Owner-Operators an easy task. Additionally, the content of the viewer session can be reduced and restricted in several ways to protect your IP.
4. Allows to follow a pipeline step-by-step, the pipe line can be also cropped out and coloured (e.g. based on the fluid code) conveniently
5. Isometric drawings can be linked to the 3D model on the part level, reading these drawings on-site gets easy.



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## 3D SymbolDesigner

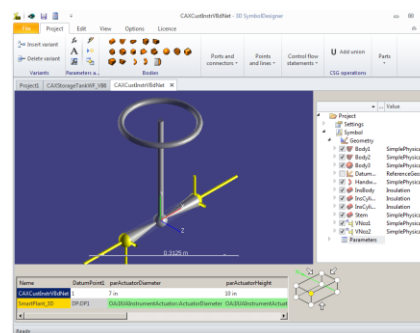
### Use Case 1: Create piping symbols (on-the-fly instruments)

#### CHALLENGE

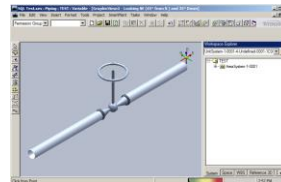
Creation of a piping symbol that cannot be found in the available piping symbols delivered with the standard Intergraph installation of Smart 3D

#### WORKFLOW STEPS

1. Arrange objects in GUI



2. Parameterise objects
3. Export symbol
4. Load/distribute exported data
5. Place symbol



#### SOLUTION

- Simple creation of parametric piping symbols using different object types (bodies, ports and connectors, parameters)
- Extraction of all necessary data including symbol definition (Visual Basic B6 or VB .Net), bulkload file (requires some modifications for piping symbols), documentation, symbol icon (snapshot of **3D SymbolDesigner** graphic)
- The part using the symbol definition can be placed after some standard procedures (publish symbol on symbol share, load bulkload file with Intergraph bulkload utility)

## About CAXperts

Our mission is to improve the productivity of our clients by simplifying key tasks and processes. To achieve this we use our detailed knowledge of engineering systems and work processes to deliver engineered efficiency. Learn more at [www.caxperts.com](http://www.caxperts.com)

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## 3D SymbolDesigner

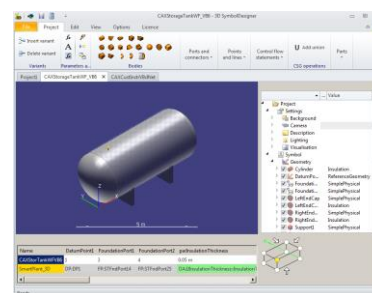
### Use Case 2: Create equipment symbols with user defined forms

#### CHALLENGE

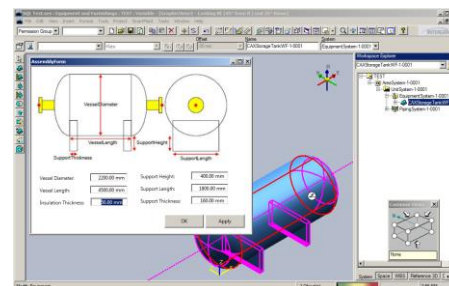
Creation of an equipment symbol with user defined form.

#### WORKFLOW STEPS

1. Arrange objects in GUI



2. Parameterise objects
3. Export symbol
4. Load/Distribute exported data
5. Place symbol



#### SOLUTION

- Simple creation of parametric equipment symbol by using of different object types (bodies, ports and connectors, parameters)
- Extraction of all necessary data including symbol definition (VB6 or VB.Net), template for the user defined form, bulkload file (adapt attribute FormDefinition to assign the user defined form), documentation, symbol icon (snapshot of 3D SymbolDesigner graphic)
- The equipment using the symbol definition can be placed after some standard procedures (publish symbol definition and user defined form on symbol share, load bulkload file with Intergraph Bulkload utility)

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## SpecXpert

### Use Case 1: Extract bulkload files from Smart 3D catalogue

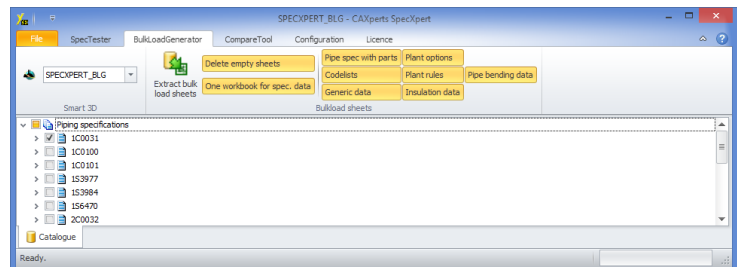
#### CHALLENGE

The piping bulkload files are missing but the Smart 3D piping catalogue data has to be examined and modified because of piping data revisions (pipe spec, piping parts, generic data, plant rules ...)

Reuse of existing Intergraph Smart 3D piping catalogue data in another Smart 3D catalogues or reuse as the basis for As-Built modifications without changing the data in the internal material management system (e.g. valve operator dimensions in SmartPlant ReferenceData).

#### WORKFLOW STEPS

1. Select a Smart 3D Project



2. Select a spec
3. Select the options
4. Press Extract button

#### SOLUTION

- Extraction of piping bulkload files out of the Intergraph Smart 3D catalogue
- Getting the real content of the Smart 3D catalogue
- Getting loadable bulkload files
- In addition:
  - Extract for different Smart 3D versions
  - All sheets with a correct formatting

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## SpecXpert

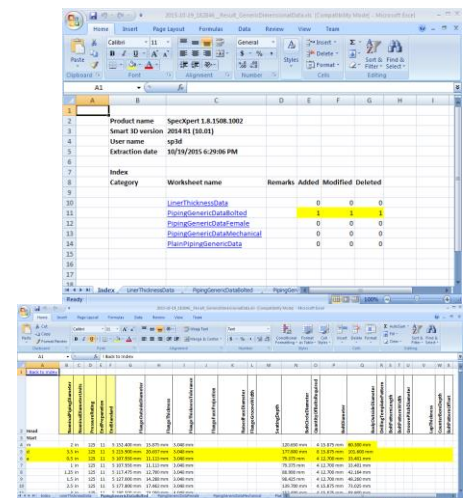
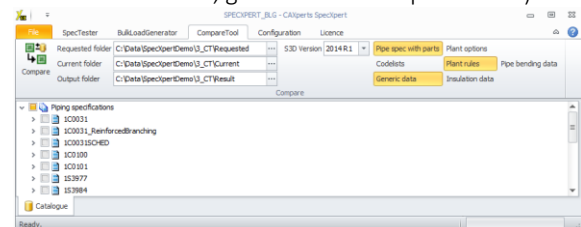
### Use Case 2: Create delta bulkload files by comparison of bulkload files from various sources

#### CHALLENGE

Synchronise piping catalogue data in an existing Smart 3D catalogue with bulkload files delivered by an internal piping material management system (e.g. first synchronisation between standard Intergraph Smart 3D catalogue (CatalogDB.dat/.dmp) and first export out of SmartPlant ReferenceData for codelists, generic data and plant rules).

#### WORKFLOW STEPS

1. Select folders
2. Select Smart 3D version
3. Select the options
4. Press Compare button



#### SOLUTION

- Use two existing sets (current and requested status) of bulkload files from various sources (manually written, exported from SmartPlant Reference Data, exported from in-house material management systems or extracted from the Smart 3D catalogue using SpecXpert, etc.)
- The result of the comparison is/are delta-bulkload file(s) that can be used to synchronise the Smart 3D catalogues: the delta-bulkload file contains A-M-D (add, modify, delete) rows and can be loaded by the Intergraph Bulkload Utility

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