Interpreting customer requirement to DEXPI
LCDM phase 2, Pilot project 1

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Convert customer requirements to detailed framework according DEXPI specification

1. Stora-Enso (Johnny Sundström) created a document with requirements for P&ID delivery. This document specifies what graphical symbols to use and what object data must be delivered

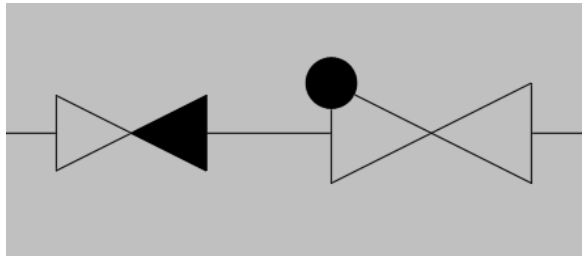
2. Symetri tries to find corresponding symbols in ISO10628 / ISO14617-6 to enable cross-reference between SSG / ISO

3. Symetri also tries to find DEXPI attributes that match Stora-Enso's requirements

Graphics

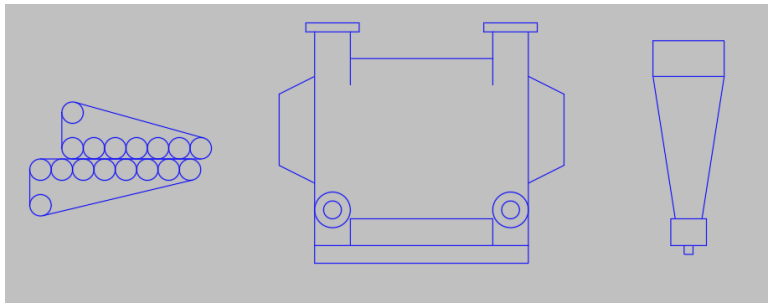
Customer wants flowcharts to be delivered with symbols in accordance with SSG 5270 and SSG 5276.

“As far as possible, the symbols have been based on international standards.” quote from SSG 5270



Check Valves SSG vs ISO

SSG has also a lot of industry-specific symbols that are missing in the ISO standard



Graphics

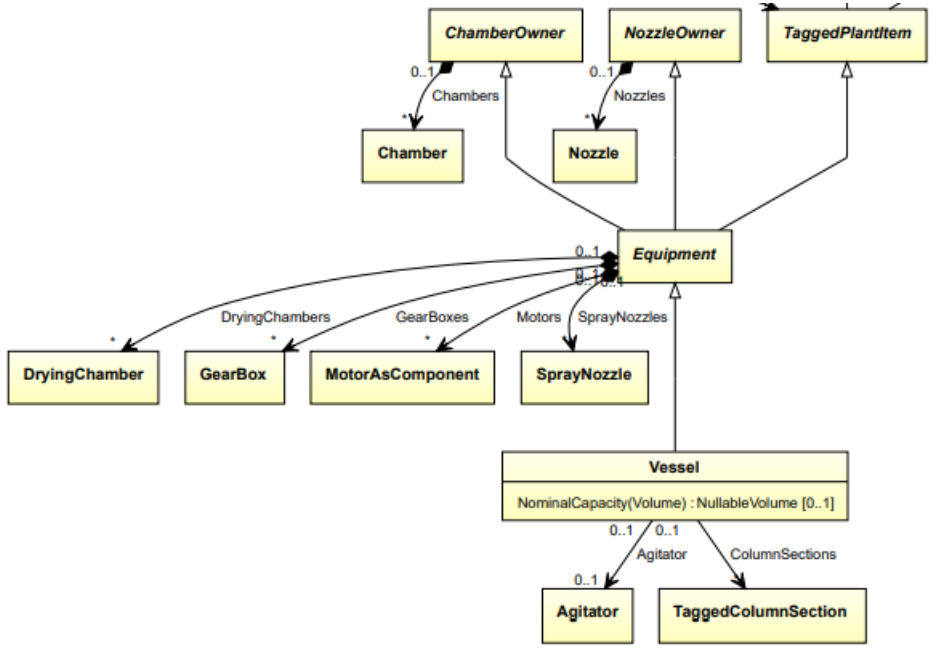
The design of symbols is based on ISO standards but SSG uses a different symbol size, this makes it difficult to **swap symbols** during export/import.

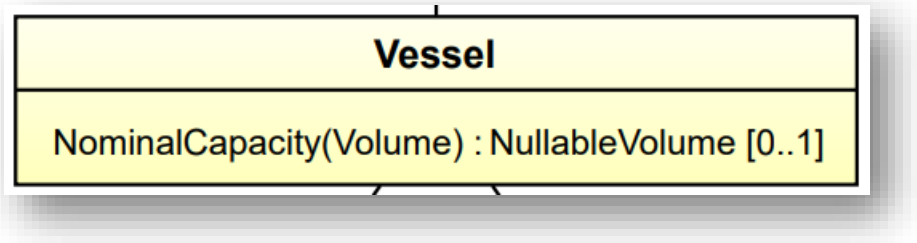
Line types	SSG 5270	ISO10628
Primary line	1,0	1,0
Secondary line	0,7	0,5
Instrument line	0,35	0,25
Symbols	NA	0,25

Symbol types	SSG 5270	ISO10628
Flow arrow	4	2,5
Pump/Blower	12,5	15
Valve	7,5	10
Actuator	5	0,5

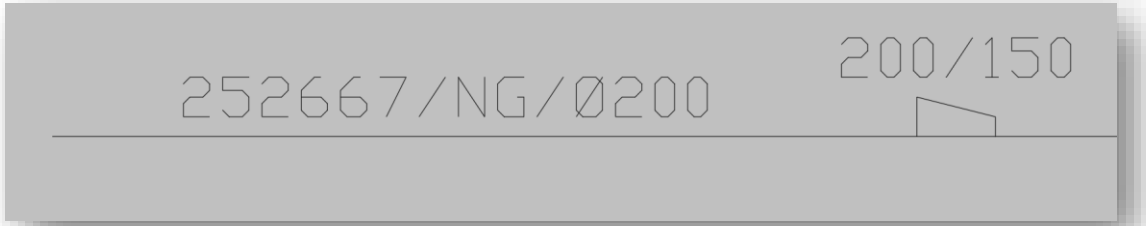
Data model and attributes

DEXPI's data model has some defined data attributes for each class. Several of these attributes are easy to map to data required by customer. However, there are many attributes that must be defined as "CustomAttributes“.





Rörledning (Pipeline)



Requirements from customer

	Stora-Enso	DEXPI	Sub Parts	Attribute Owner
Object type	Rörledning	PipingNetworkSystem		
Tag (identity)	Objektnummer	LineNumberAssignmentClass		PipingNetworkSystem
Description	Beskrivning			
Service	Mediakod	FluidCodeAssignmentClass		PipingNetworkSystem
Pressure	Tryck			
Temperature	Temp	OperatingTemperature		PipingNetworkSegment
Koncentration	Konc			
Diameter	Diameter	NominalDiameterRepresentationAssignmentClass	NominalDiameterTypeRepresentationAssignmentClass, NominalDiameterNumericalValueRepresentationAssignmentClass	PipingNetworkSystem

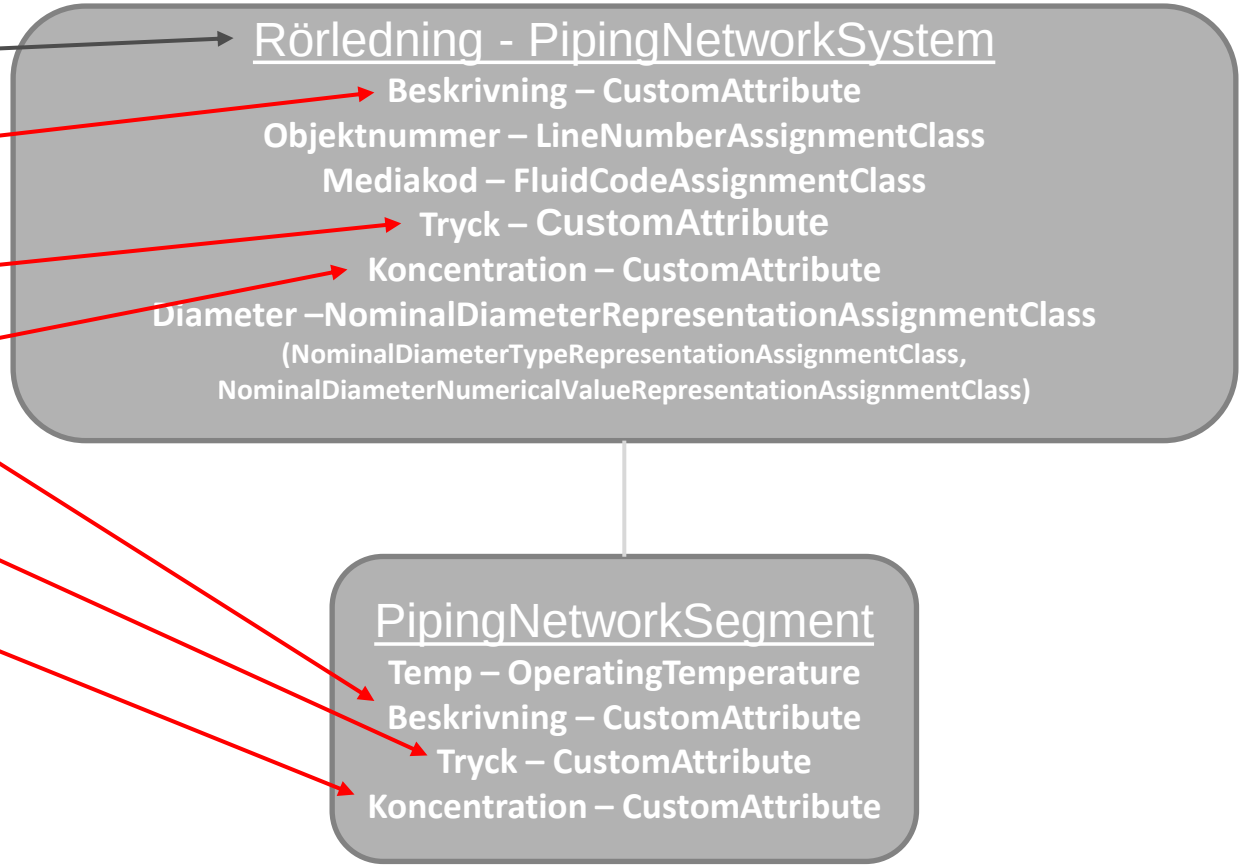
Three Pipeline (PipingNetworkSystem) properties doesn’t exist as DEXPI attribute.

Rörledning (Pipeline)

DEXPI Attributes
Custom Attributes

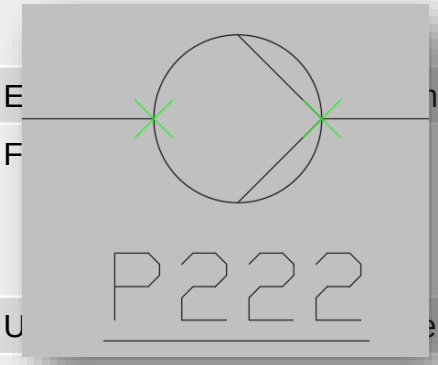
	Stora-Enso
Object type	Rörledning
Tag (identity)	Objektnummer
Description	Beskrivning
Service	Mediakod
Pressure	Tryck
Temperature	Temp
Koncentration	Konc
Diameter	Diameter

????



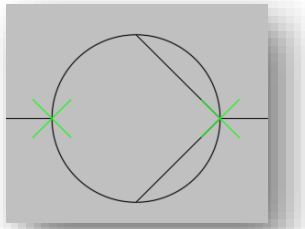
Generell Pump (General Pump)

	Stora-Enso	DEXPI	Sub Parts	Attribute Owner
Object type	Generell Pump	Pump		
Tag (identity)	Objektnummer	TagNameAssignmentClass	TagNamePrefixAssignmentClass, TagNameSequenceNumberAssignmentClass, TagNameSuffixAssignmentClass	TaggedPlantItem
Description	Beskrivning	E…entClass		Equipment
Service	Mediakod	F…		PipingComponent, PipingNetworkSegment, PipingNetworkSysteme, OfflinePrimaryElement
Temperature	Temp	U…		Chamber
	Temp min	LowerLimitDesignTemperature		Chamber
Flow	Flöde min			
	Flöde normal	DesignVolumeFlowRate		Pump
	Flöde max			
Pressure Head	Tryckhöjd	DesignPressureHead		Pump
Pressure Class	Tryckklass	NominalPressureRepresentationAssignmentClass	NominalPressureTypeRepresentationAssignmentClass, NominalPressureNumericalValueRepresentationAssignmentClass	Nozzle



Three Pump properties doesn't exist as DEXPI attribute.

	Stora-Enso
Object type	Generell Pump
Tag (identity)	Objektnummer
Description	Beskrivning
Service	Mediakod
Temperature	Temp
	Temp min
Flow	Flöde min
	Flöde normal
	Flöde max
Pressure Head	Tryckhöjd
Pressure Class	Tryckklass



So, which of these objects should be the "CustomAttributeOwner"?

- Pump
- Equipment
- TaggedPlantItem
- Chamber
- Nozzle

I think this case its pretty obvious that the additional flow properties will be added to the pump.

TaggedPlantItem
Objektnummer – TagNameAssignmentClass
(TagNamePrefixAssignmentClass, agNameSequenceNumberAssignmentClass, TagNameSuffixAssignmentClass)

Chamber
Temp – UpperLimitDesignTemperature
Temp min -LowerLimitDesignTemperature

Equipment
Beskrivning - EquipmentDescriptionAssignmentClass

Nozzle
Tryckklass – NominalPressureRepresentationAssignmentClass
(NominalPressureTypeRepresentationAssignmentClass, NominalPressureNumericalValueRepresentationAssignmentClass)

Generell Pump - Pump
Flöde normal - DesignVolumeFlowRate
Tryckhöjd – DesignPressureHead

Cistern Öppen (Open Tank)

Objekt typ				
Tag (identitet)	Objektnummer	TagNameAssignmentClass		
Beskrivning	Beskrivning	Equip		
Media				OfflinePrimaryElement
Temperatu				Chamber
		ign Temperature		Chamber
Volym		ominalCapacity(Volume)		Vessel
Diameter		InsideDiameter		Chamber
Höjd	Höjd	Height		Chamber
		CylinderLength		Tank

Chamber
Diameter – InsideDiameter
Höjd - Height
Temp – UpperLimitDesign
Temp min -Lower

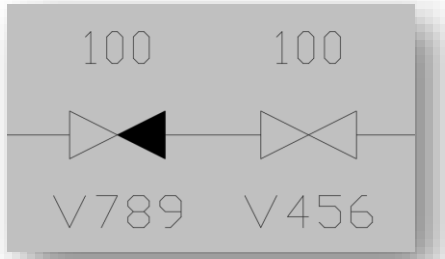
Equipment
ivning - EquipmentDescriptionAssignmentClass

Vessle
Volym - NominalCapacity(Volume)

Cistern Öppen - Tank
Höjd- CylinderLength

Same work for all Object Types
Tanks, Pumps, Blowers

Ventil (Valve)



	Stora-Enso	DEXPI	Sub P
Objekt typ	Ventil	CustomOperatedValve	
Tag (identitet)	Objektnummer	PipingComponent… ass	
Beskrivning	Beskrivning		
Media			
Tryck			
Tempera			
Koncentrati			
Tryckklass			

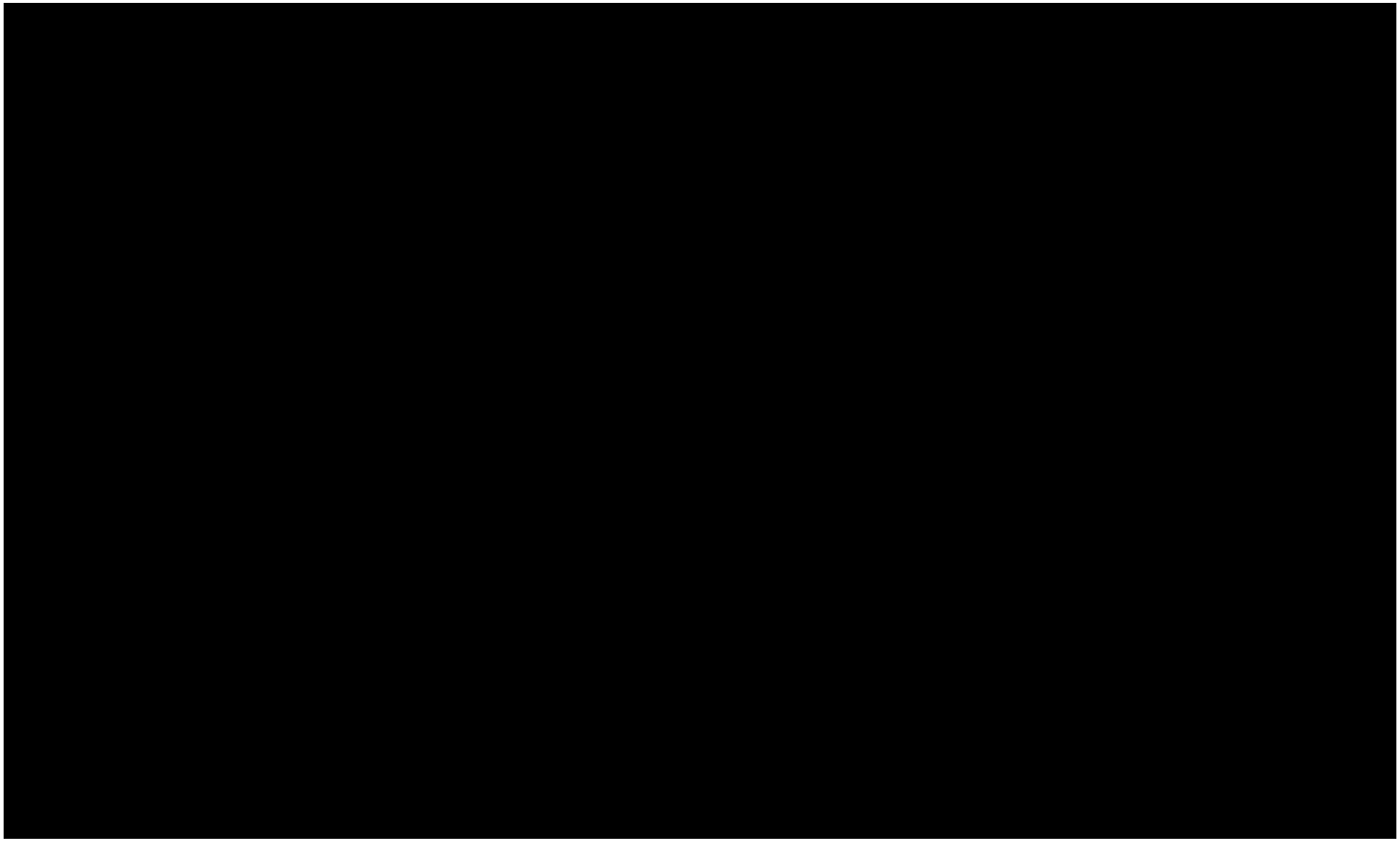
Same work for all Object Types
Valves, Instruments ect.

PipingNetworkSegment
Temp - OperatingTe…

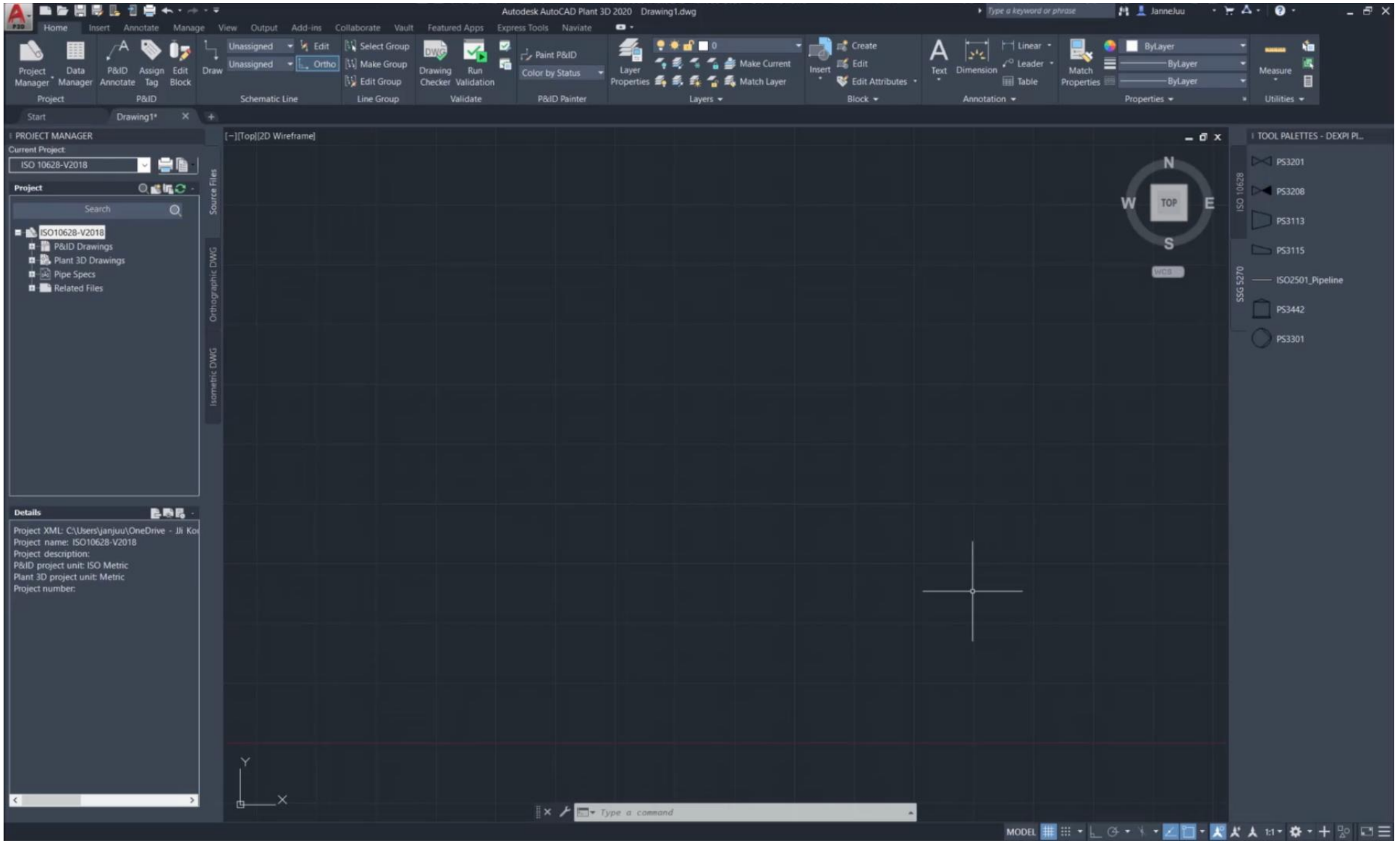
OperatedValve
Objektnummer –
PipingComponentNameAssignmentClass
(PipingComponentNumberAssignmentClass**)**

CustomOperatedValve

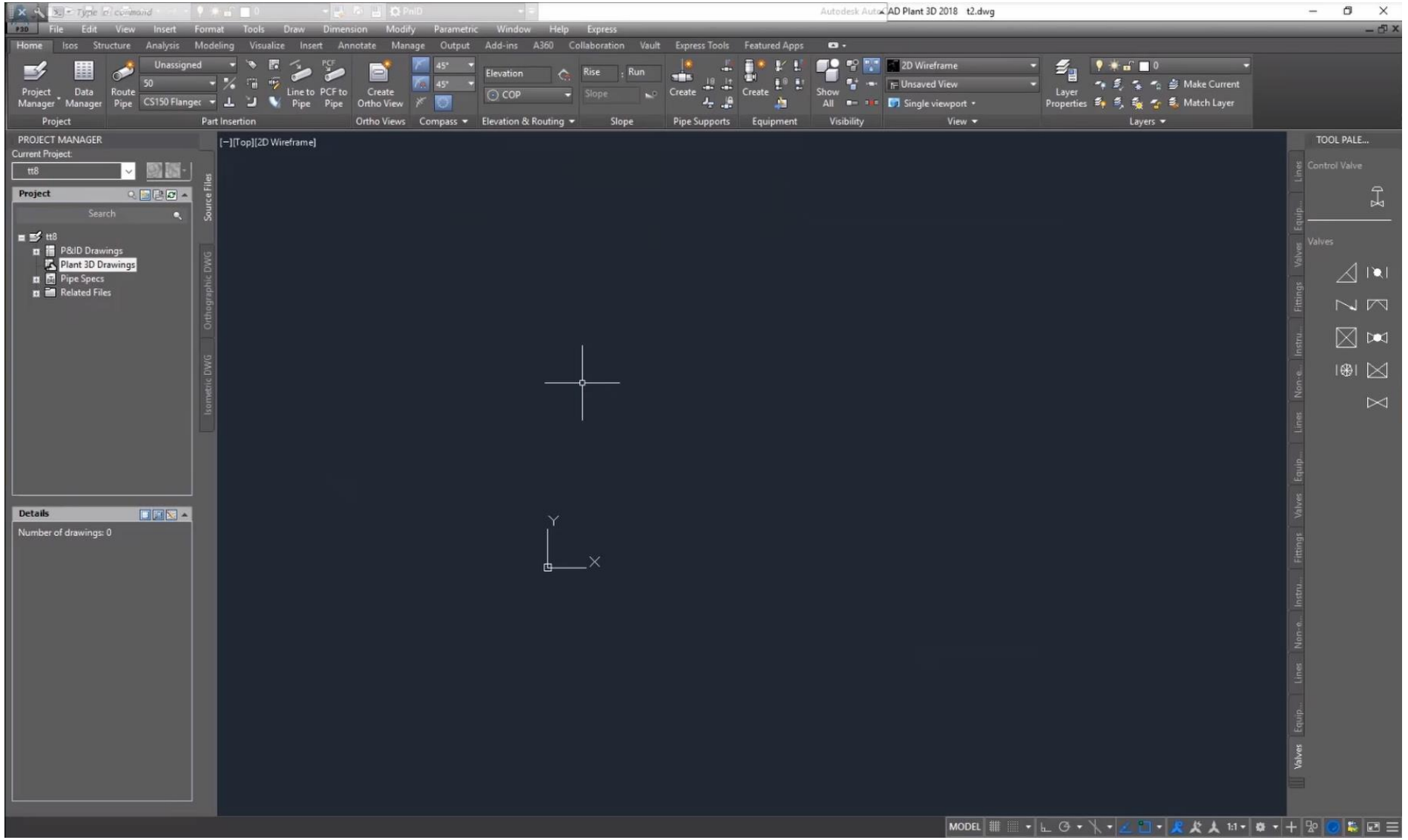
Framework ready, time to setup CAE system



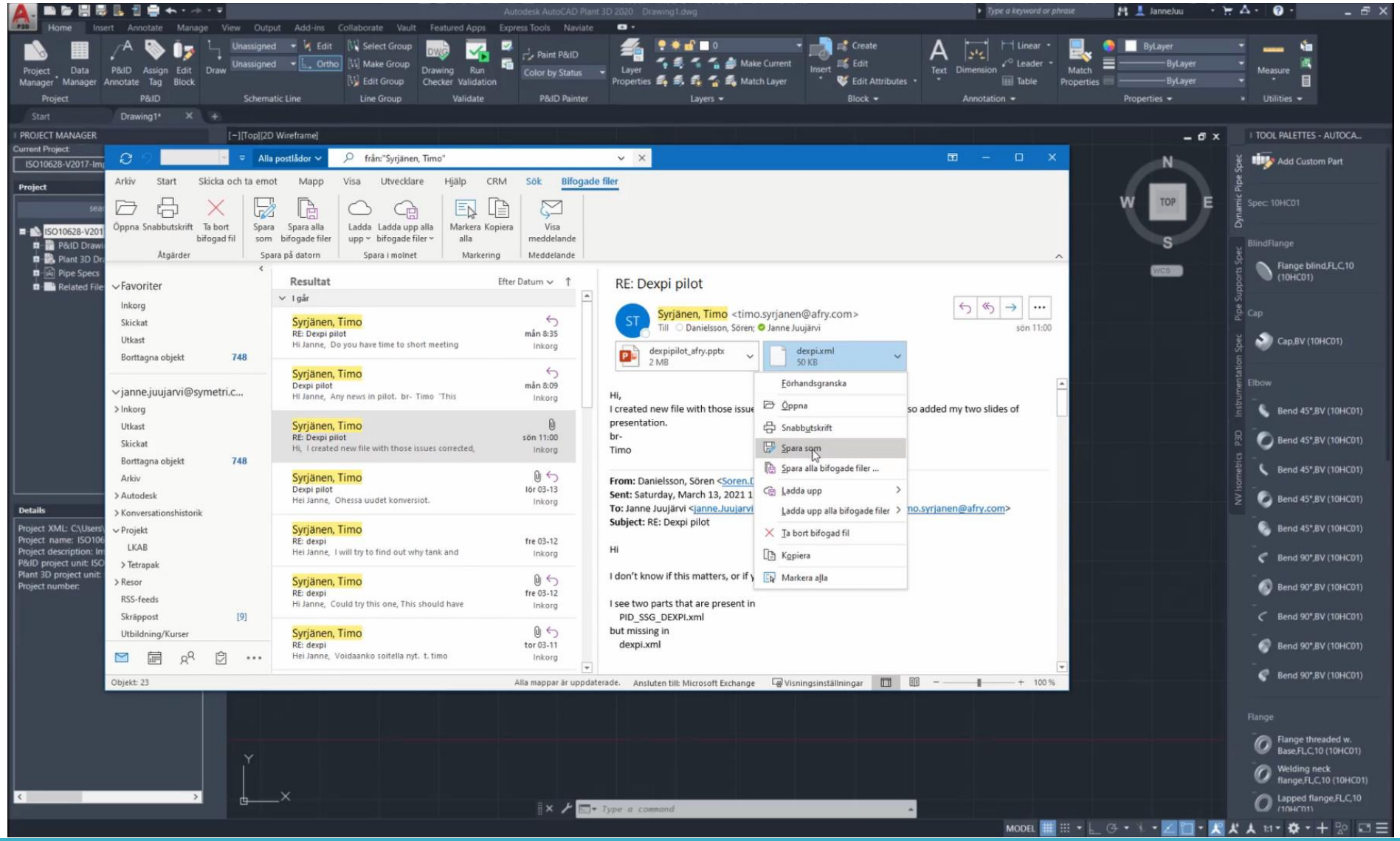
Exporting P&ID to DEXPI compliant XML



Import DEXPI XML to ProElina/AutoCAD P&ID



Import DEXPI XML to AutoCAD P&ID



Conclusions

The DEXPI organization and earlier pilot projects have already proven the concept. This pilot project intended to try the usability in a small ongoing project.

- **DEXPI specification gives a lot of flexibility to customize graphics and data.**
- **To use the DEXPI specification for creating neutral XML files, a VERY detailed set of rules is needed.**
- **Setting up and modifying the framework requires very in-depth knowledge of DEXPI's data model.**
- **The framework will be largely unique for each factory and project until joint efforts set up an industry-specific framework, e.g. paper and forest, mining, etc. .**
- **Trouble shooting import/export is time consuming and difficult**