Process Flow diagrams in DEXPI

Pilot 1

THE RENEWABLE MATERIALS COMPANY

LCDM Phase 2

Stora Enso Pilot / DEXPI

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StoraEnso Pilot Deliverables

WP3.1 Stora Enso Pilot 1. (Pulp & Paper)

Set up AutoCAD Flowchart Drawing P&ID based on established standards and the open deXPI standard, which is a concept of data exchange specifications in the neutral FORMAT XML based on Proteus P&ID Profile Schedule 4.0

- Stora Enso / Fors
- Symetri AB
- AFRY
- (SSG)

Leverables

L3.1.1: Test the exchange of graphics and design data with, for example, consultant
L3.1.2: Validation tools such as checking objects in schema against existing facility
L3. 1.3: Action analysis of SSG's existing Guidelines for PI&D

Process Flow diagrams in DEXPI

Pilot 1

Background

- Since the early 1990s, the Stora Enso mills in Sweden used IDOK Plant design system
  - AutoCAD and IDOK Process application according to SSG standards was used for Process Flow diagrams.
- IDOK was relatively widespread in Sweden and most of the plant owner's and consultants in the forest industry used the applications
- IDOK was not used for more than document management, and it was replaced in 2005 by SAP DMS for document management and the drawings was created with AutoCAD and a symbol library according to SSG standards
  - We still followed a graphical standard, and no one reflected on the technology behind it
  - We suddenly had two different symbol sets and relatively quickly several came.

Current Status

- For the past 15 years, we have only required process flow diagrams to be drawn graphically according to SSG standards, and because of this, other symbols have come in from various parties.
- Today we have at least 4 different symbol sets as we know
  - They all follow the same graphical SSG standards
  - They have different tag configuration due to different software manufacturers
  - They occur mixed in the Process Flow diagrams.
- It is not possible to handle the information in an easy way
  - Graphics and part of the technical information in the drawings and the rest in several Excel lists, one per technical object type such as, pumps, pipes, valves etc
- We need a new way of working and the idea was born in 2019 when someone said, “Shall we do a DEXPI project together”

What do we need to do?

- Most of the established software companies in plant engineering develop their systems to function according to established standards for drawing flow chart diagrams. These also work with open solutions for the delivery of plant information.

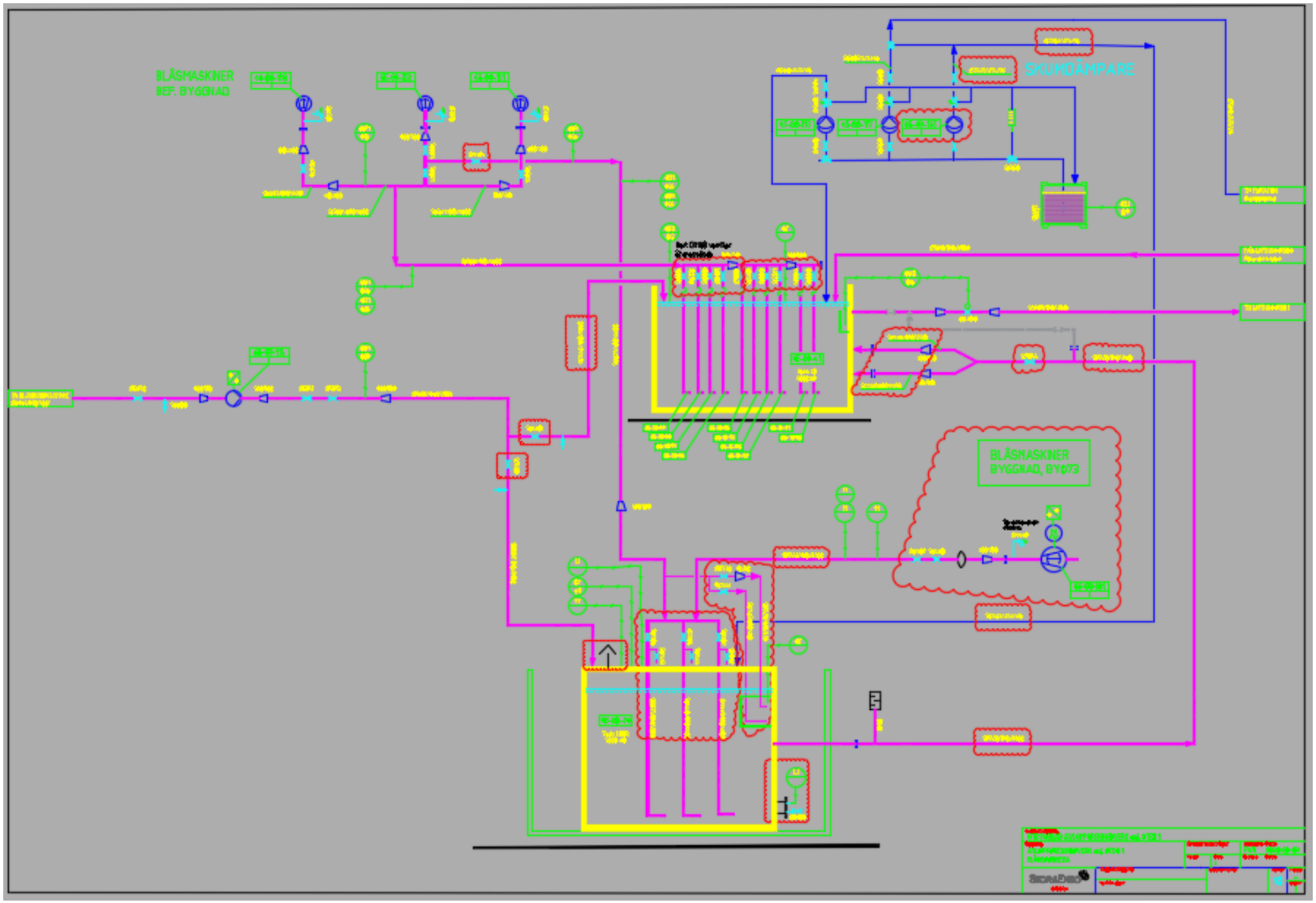
- We need to learn:
  - Which standards affect the work with a flow chart diagram from an international perspective.
    - ISO standards for example, graphical symbols, drawing rules, design data etc
    - How DEXPI works
    - Which SSG standards need to be harmonized to be useful from an Interoperability perspective
  - How information exchange in neutral formats works
  - What “increased interoperability” means as it is an important step towards digitization of process plants
  - **How should we handle existing flow chart diagrams that contain valuable information and where many hours already have been invested.**

Pilot idea and scenario

Fors Wastewater treatment MBBR bin

Pilot scope

- We chose an ongoing project which had a suitable scope
  - MBBR (Moving Bed Biofilm Reactor) extension and re-build of a section in the existing wastewater treatment plant
  - Objectives: Secure the wastewater plants function after the destroyed wall in the existing bin
  - Scope: Eliminate business risk with existing technical solution. Built a new bin for MBBR (Pos 65-50-78) and take a way the middle wall in the existing bin (Pos 65-50-61) and separate it from the sludge step.
- The original Process Flow diagram is designed with IDOK Process application for AutoCAD and symbols according to SSG Standards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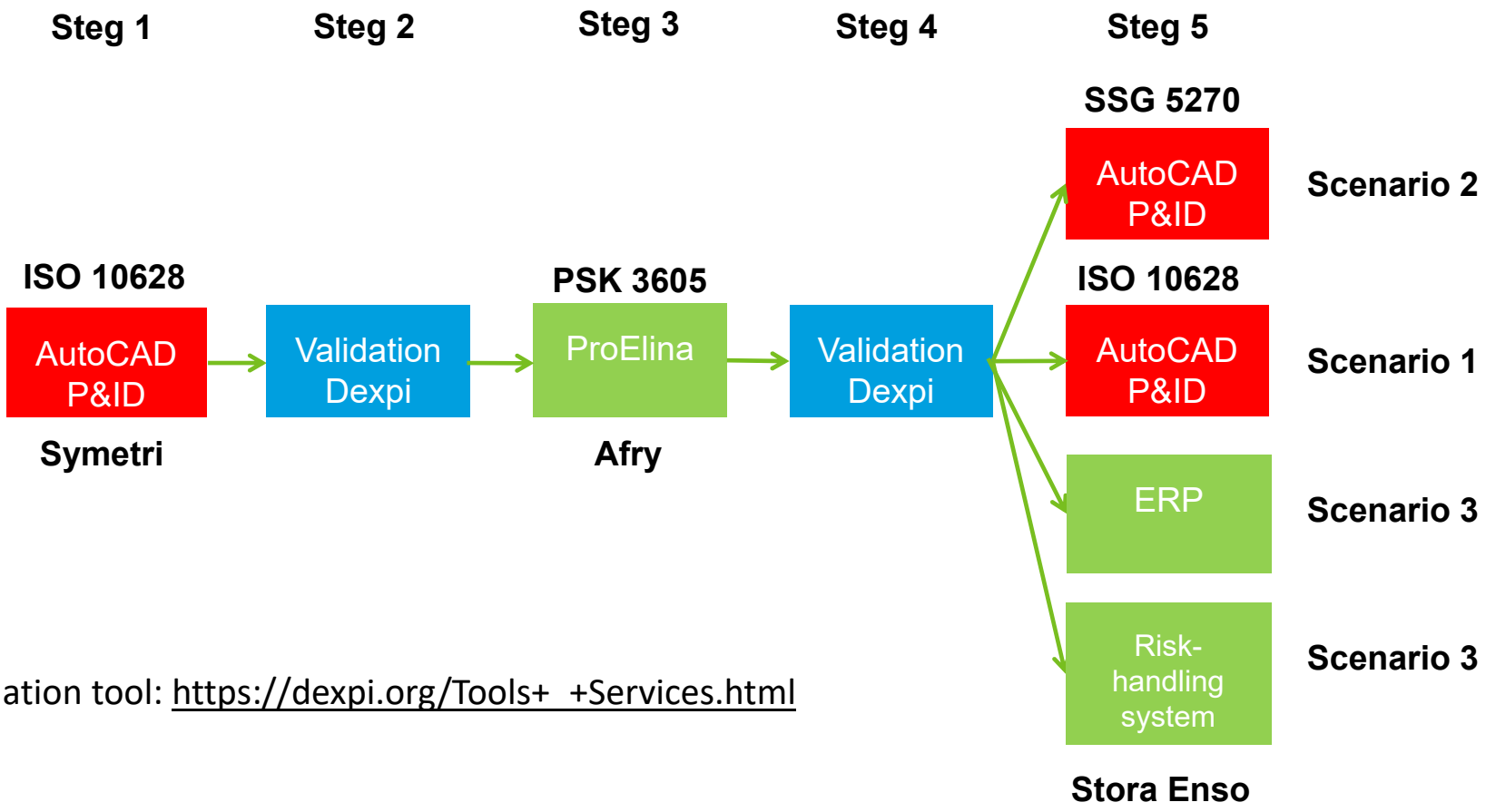
Objects for the test scenario

- We selected the types of process objects that would be included in the scope, such as pumps, compressors, valves, pipelines, cones, flanges and, of course, measurements and control functions.
- We created a document describing data content. *The rules!*
  - Object properties, unit and Dexpi Component class
  - Relation between symbols and standards

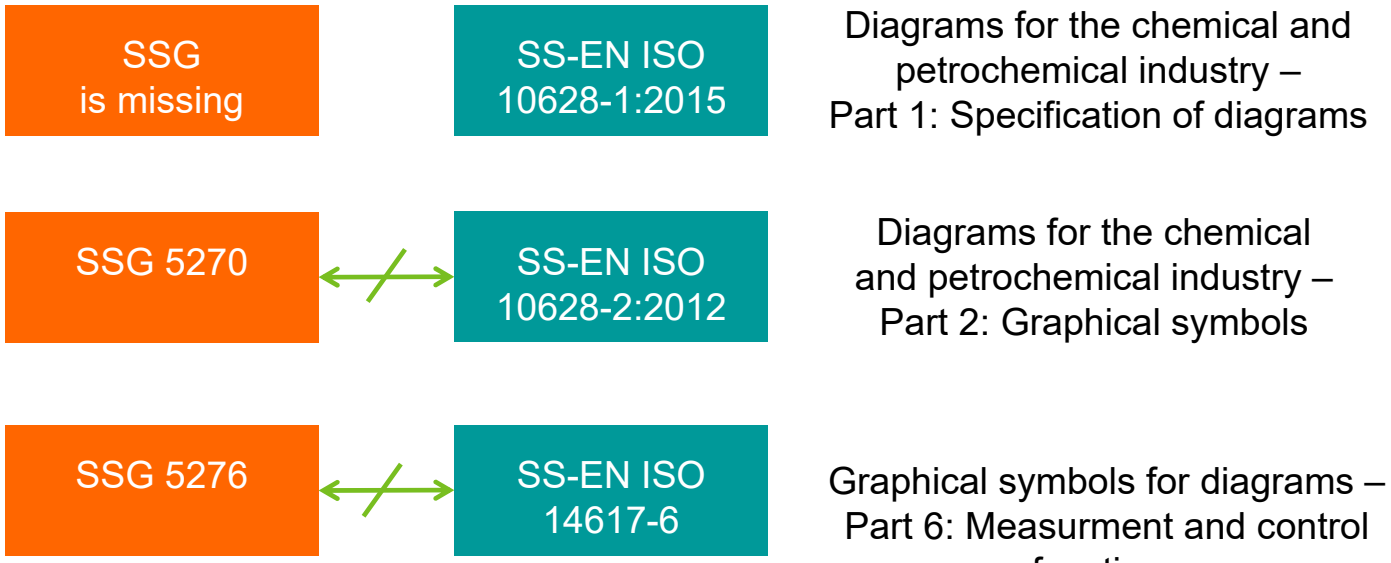
Objekt	Egenskap	Enhet	ISO10628	ISO14617-6	SSG 5270	SSG 5276	Dexpi ComponentClass (*1)
Generell Pump			2301		PS3301		http://data.posccaesar.org/rdl/RDS327239
	Objektnummer						
	Beskrivning						
	Mediakod						
	Temp	C					http://data.posccaesar.org/rdl/RDS357119
	Temp min						http://data.posccaesar.org/rdl/RDS360584
	Flöde min	m3/h					
	Flöde normal						
	Flöde max						
	Tryckhöjd	m					
	Tryckklass	Bar					

Test Scenarios

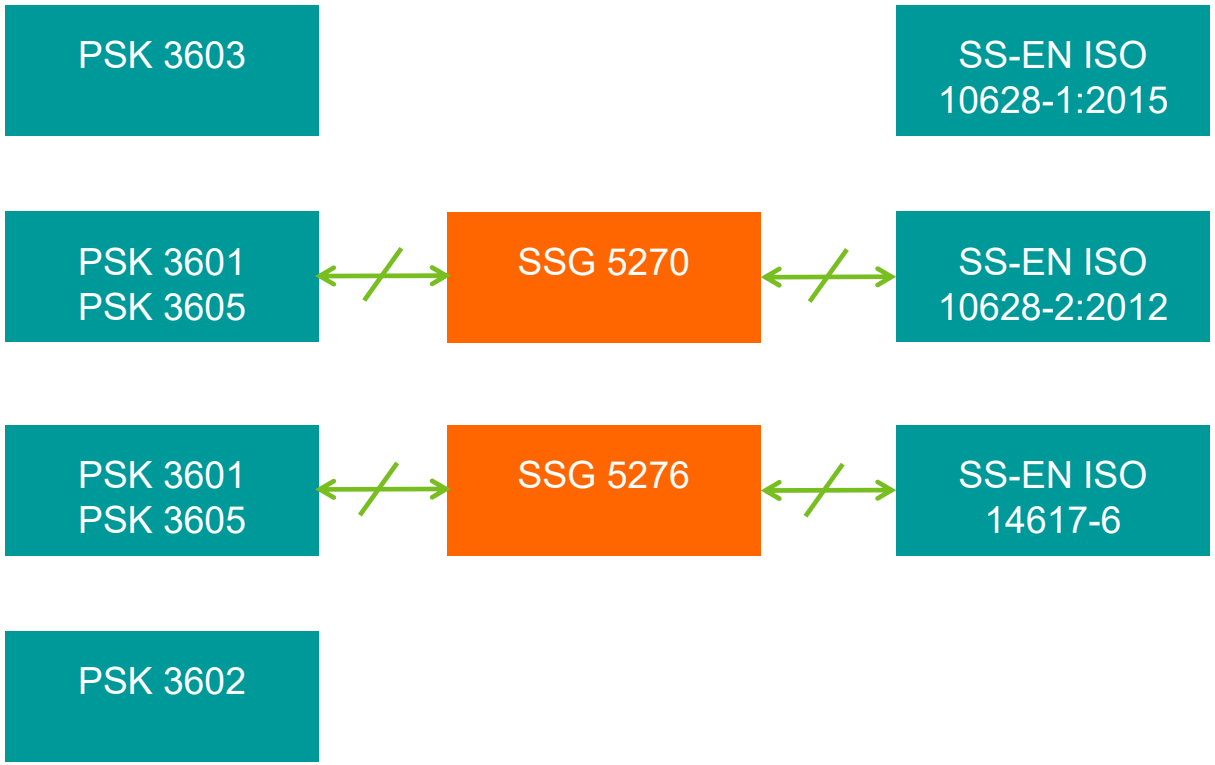


Validation tool: https://dexpi.org/Tools+_+Services.html

Relation between drawing standards in the Dexpi project



Relation between some drawing standards



Diagrams for the chemical and petrochemical industry – Part 1: Specification of diagrams

Diagrams for the chemical and petrochemical industry – Part 2: Graphical symbols

Graphical symbols for diagrams – Part 6: Measurment and control functions

Data Content of P&ID
Classification rules / framework

SSG Standards

- It needs to be clarified what information level the process flow diagram intends to have if you follow the standard SSG 5270. Flow chart or P&ID
- SSG 5270 must be harmonized with ISO 10628-2 and must be available as a complement to the forest industry
- Guideline defining the data content of a Process Flow diagram or P&ID, both the data to be represented and hidden attribute data. The standard presents minimum requirements

Conclusions

- A classification rule / framework is needed that describes at least the data content required to meet legal requirements
- SSG, PSK, THTH and SEIIA should together with the industry develop a framework for the process industry
- The process industry needs an open format for the exchange of plant information that can handle more than graphical symbols
  - Keep information quality
  - Easier handling of flow chart diagrams or P&ID between all involved parties
- It has been a successful project because we have found some important topics and hopefully it will be useful in the continued work