

DISC DEXPI Project



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Draga.no

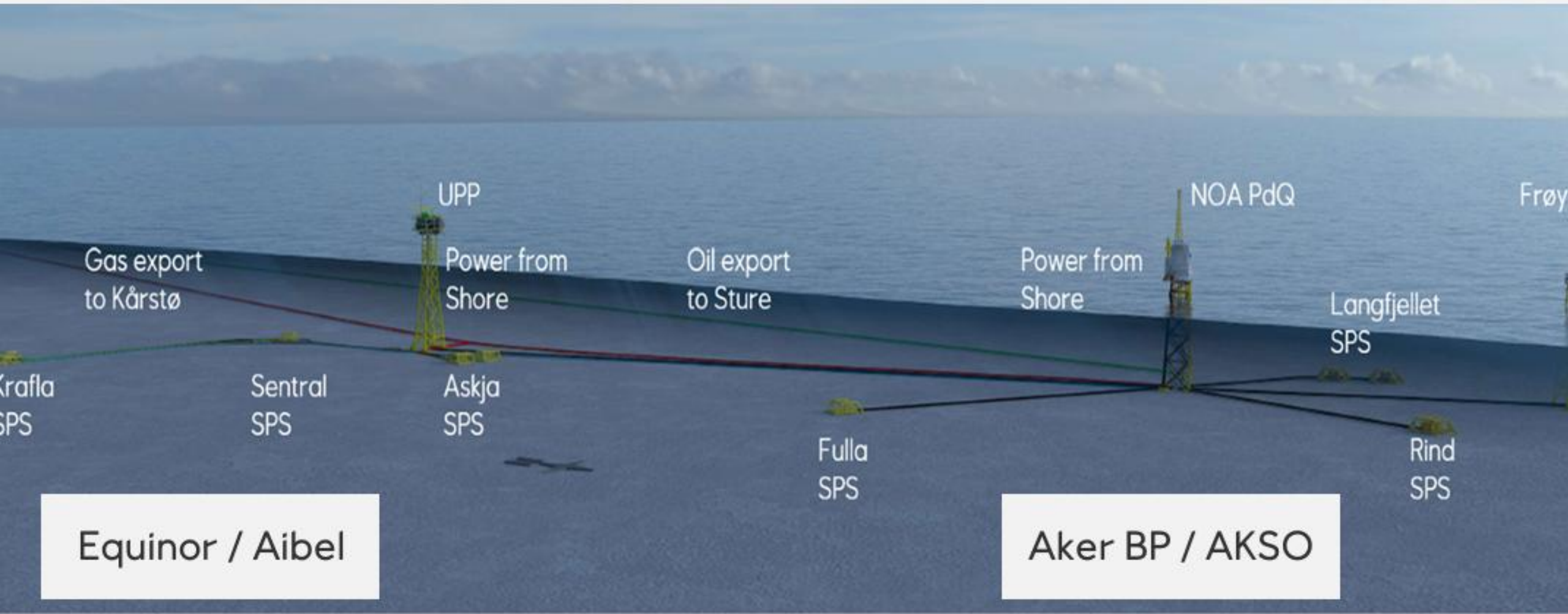
Presentation

- DISC DEXPI Project
 - DISC Collaboration
 - DISC DEXPI Profile
 - Why a profile ?
 - Key decisions
 - Where are we now ?
 - Verification
 - Further work
-

NOAKA field – NOrth of Alvheim field and the Krafla/Askja field



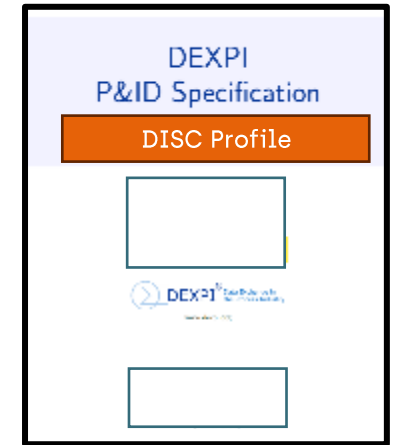
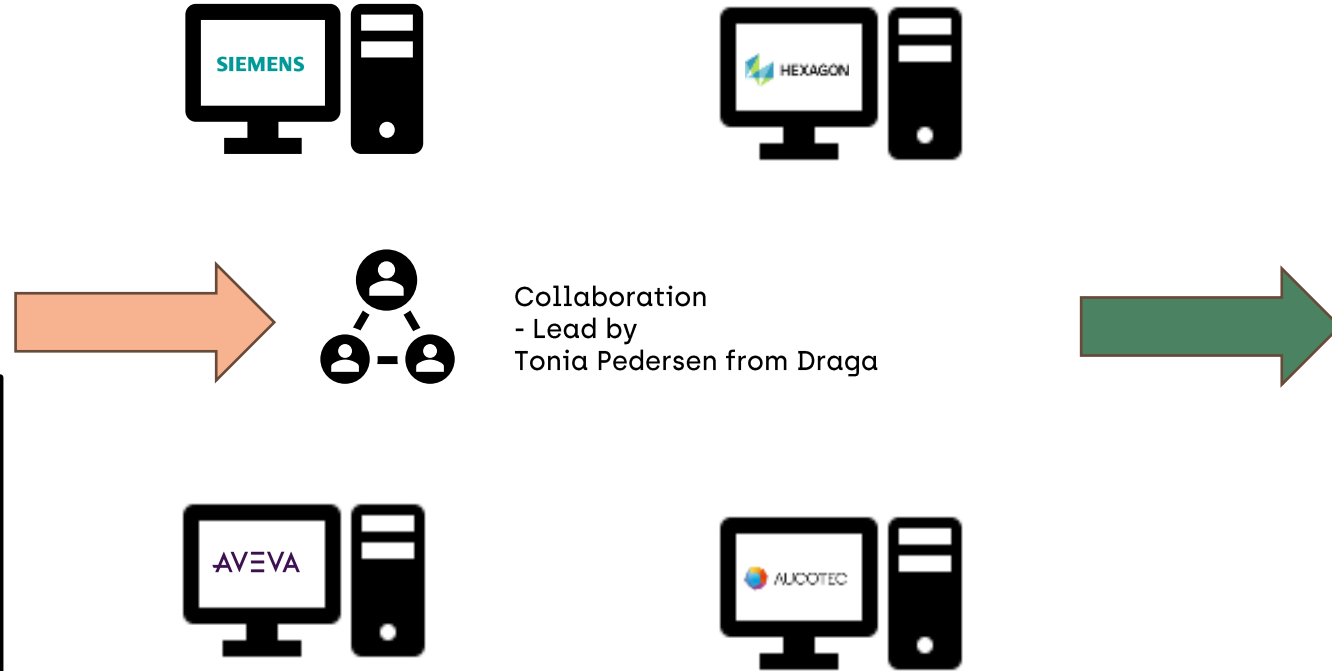
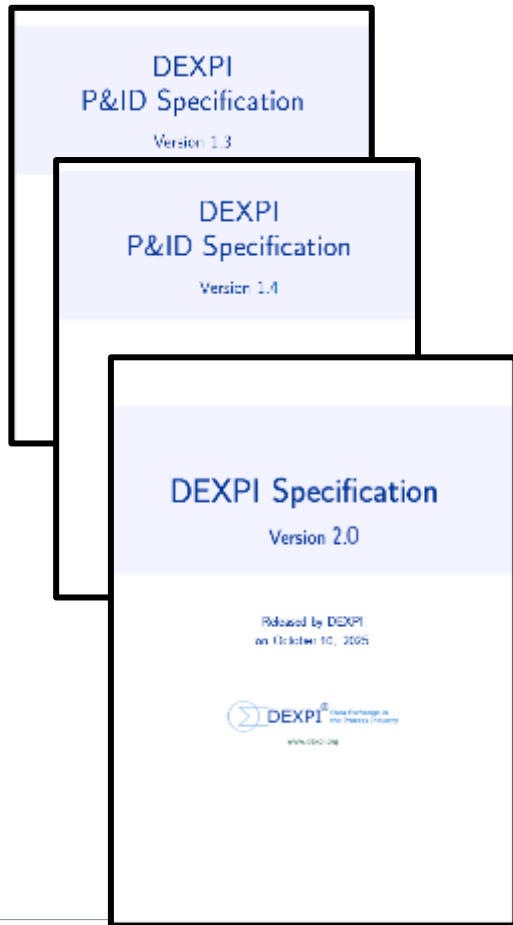
Equinor / Aker BP / Aker Solutions / Aibel



Equinor / Aibel

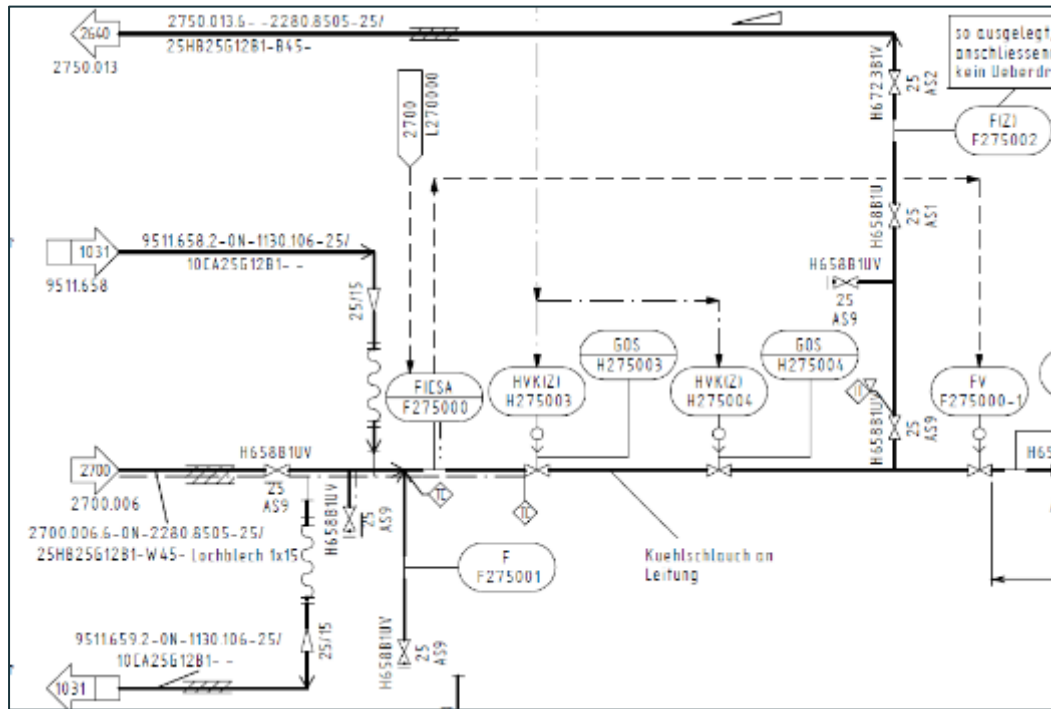
Aker BP / AKSO

DEXPI Implementation at the Norwegian O&G



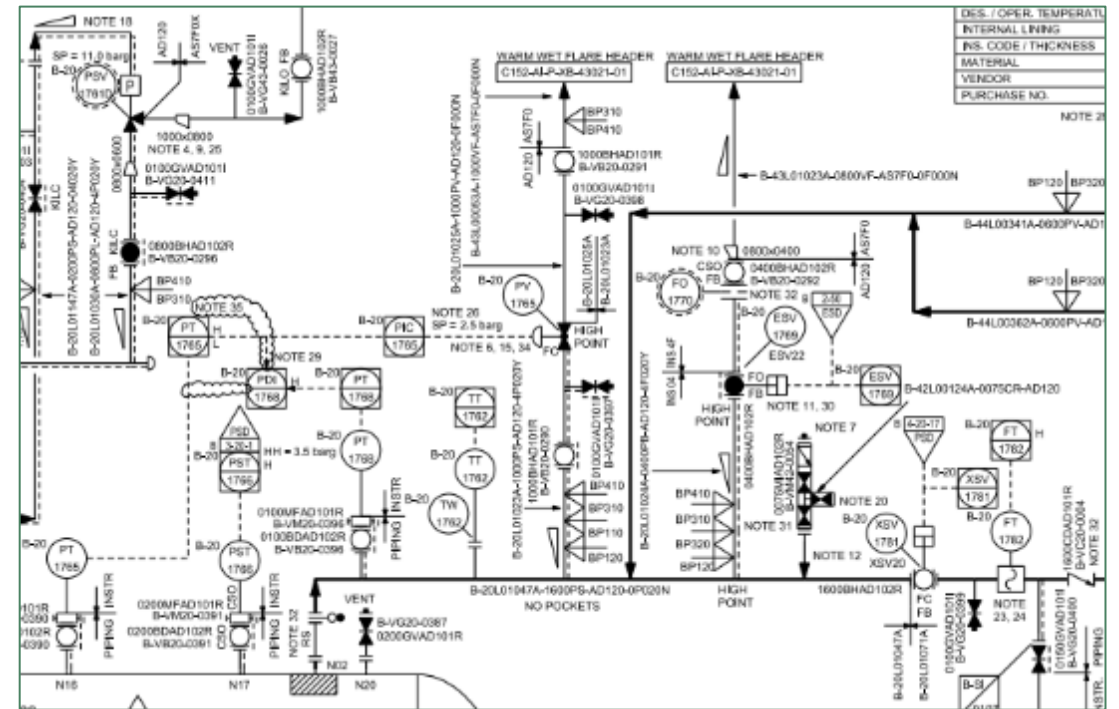
P&ID standards German Chemical Industry

- ISO 10628 / IEC 62424



Norwegian Oil & Gas Industry

- ISO 3511 (Withdrawn)/ NORSOK Z-004



Symbols are a key component in the DISC DEXPI Profile.

Key Decisions

- Transfer the information that is shown on the P&ID (and any necessary supporting attributes)
 - Look at extending to include other attributes as required
- NORSOK Z-004 /TR1970 Symbol library and element definition as project symbol reference ID list
 - Transfer Symbol Reference ID instead of primitive graphical elements
- Missing DEXPI class/attributes shall be defined using ISO 15926-4 (PCA RDL) references by use case
 - transfer via DEXPI custom class/attribute elements.
- DISC Profile (developed by PnB) shall provide for DISC custom class/attribute definitions and rulesets
 - Profile used in conjunction with the DEXPI standard definitions used during verification
- PCA to host DISC digital symbol library
 - Management of detailed symbols in machine readable format



DISC profile for DEXPI

Idea: Define requirements for DISC, e.g.,

- exact appearance of symbols
- which classes and attributes to use
- mandatory amount of information using the DEXPI vocabulary.



DEXPI P&ID
Specification

Plant model standard
/information
transport model

DISC Profile

DISC (NCS) rule set
overlay

see

https://github.com/ToniaPedersen/DISCDEXPI_2026Pack
for publicly available content

definition of
exchange format
for DISC P&IDs

Industry Participants in DISC DEXPI Profile project

Operators & EPCs

Equinor – Provided process engineering input & pilot driver

AkerBP – Operator partner contributing domain requirements

Aker Solutions – Technical engineering partner and domain expertise

Aibel – Provided process engineers and practical P&ID expertise

Software & Vendor Contributors

Hexagon – CAE tool implementation and P&ID modelling expertise

Autotec – CAE tool implementation and P&ID modelling expertise

Siemens (COMOS) – CAE tool implementation and P&ID modelling expertise

Aveva – CAE tool implementation and P&ID modelling expertise

Plants and Bytes (pnb) – DEXPI tooling, verifiers, and pilot workflows

Project Lead; Draga - Migration project management expertise

Participation through:

Periods of development 1) 2021 to 2023 and 2) 2025

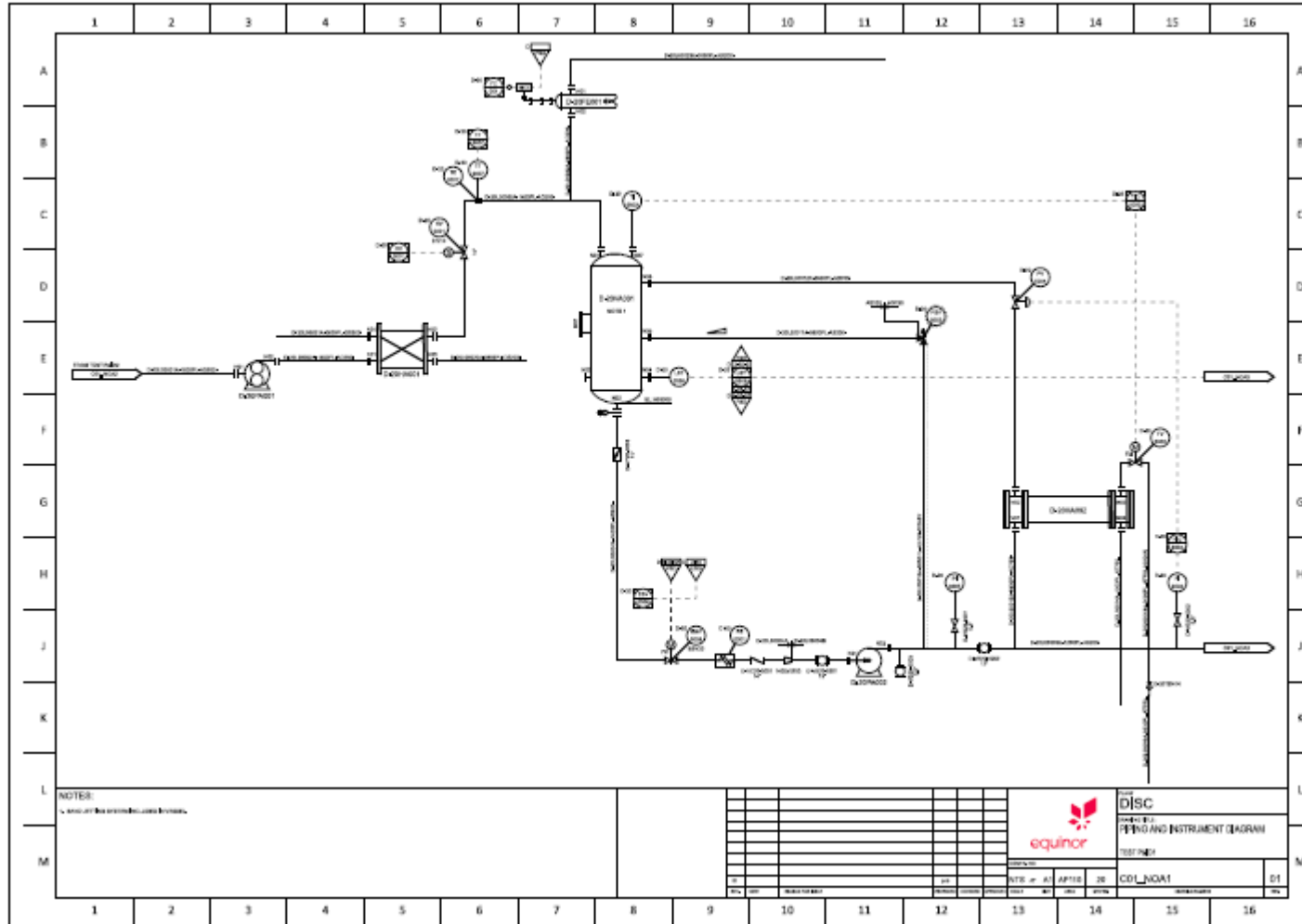
Weekly technical meetings

6 off 2 day on-site at Equinor Fornebu hackatons/workshops

3) 2026 move to DEXPI 2.0 and extend symbol library



DISC DEXPI test cases



Includes:

- Main equipment
- Actuated valves
- Piping components
- In-line instrument
- Off-line instrument
- Signal lines & line styles
- Property Breaks
- Title block
- Intelligent Valve Symbol usage
- Clamp-on
- OPC
- Electrical 'instrument' MCC
- Annotation
- Pipe slope
- Elevation
- Alarms
- Heat tracing
- Symbol resizing /rotation / mirroring
- Persistent ID
- Revision cases

Excerpt from DISC DEXPI requirements document

The screenshot displays a software interface for a process diagram, likely a DEXPI (Dynamic Extensible Process Instrumentation) environment. On the left, a process diagram shows a TIC (Temperature Indicating Controller) labeled 'D-20' and '0003' connected to a motor 'M' and a flow meter 'FM'. The main interface is divided into several panels:

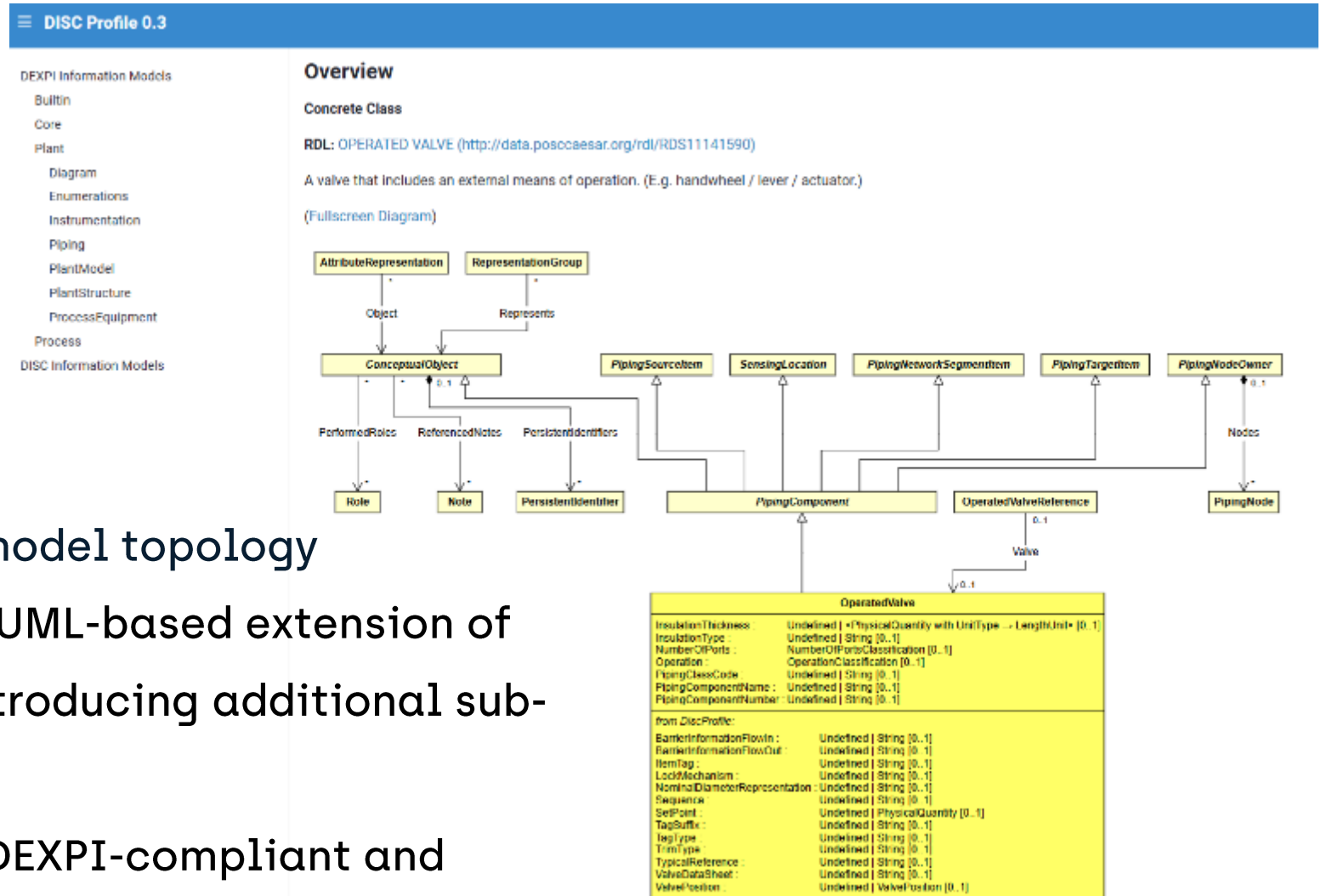
- Tree View (Top-Left):** A hierarchical tree structure showing the object model. The selected object is 'ActuatingSystem2', which is a 'Plant/Instrumentation.ActuatingSystem'. It has a 'ControlledActuator' property of type 'Plant/Instrumentation.ControlledActuator' and an 'OperatedValveReference' property of type 'Plant/Instrumentation.OperatedValveReference'. The 'OperatedValveReference' property is linked to a 'Valve' object with ID '#WedgeGateValve1'.
- XML Editor (Top-Right):** An XML editor showing the structure of the selected object. The XML is as follows:


```

      </Components>
      </Object>
      <Object id="ActuatingSystem2" type="Plant/Instrumentation.ActuatingSystem">
      <Components property="ControlledActuator">
      <Object id="ControlledActuator2" type="Plant/Instrumentation.ControlledActuator">
      <Data property="FailAction">
      <DataReference data="Plant/Enumerations.FailActionClassification.FailClose"/>
      </Data>
      <Components property="PersistentIdentifiers">
      <Object type="Core/PersistentIdentifier">
      <Data property="Context">
      <String>DISC DEXPI</String>
      </Data>
      <Data property="Value">
      <String>a6a13b6e-c129-d0bf-6817-a7dcc53e56</String>
      </Data>
      </Object>
      </Components>
      <References objects="DiscProfile/InformationModel.ControlledActuatorTypeCodes.Motor" property="DiscProfile/TypeCode"/>
      </Object>
      </Components>
      <Components property="OperatedValveReference">
      <Object type="Plant/Instrumentation.OperatedValveReference">
      <References objects="#WedgeGateValve1" property="Valve"/>
      </Object>
      </Components>
      </Object>
      </Object id="ActuatingSystem3" type="Plant/Instrumentation.ActuatingSystem">
      
```
- Table Selection Browser (Bottom):** A table showing the attributes and subtags of the selected object.

2 Attributes:		
Name	Value	
id	ActuatingSystem2	
type	Plant/Instrumentation.ActuatingSystem	
2 Subtags:		
Tag name/Text	property	Object
Components	ControlledActuator	Object
Components	OperatedValveReference	Object

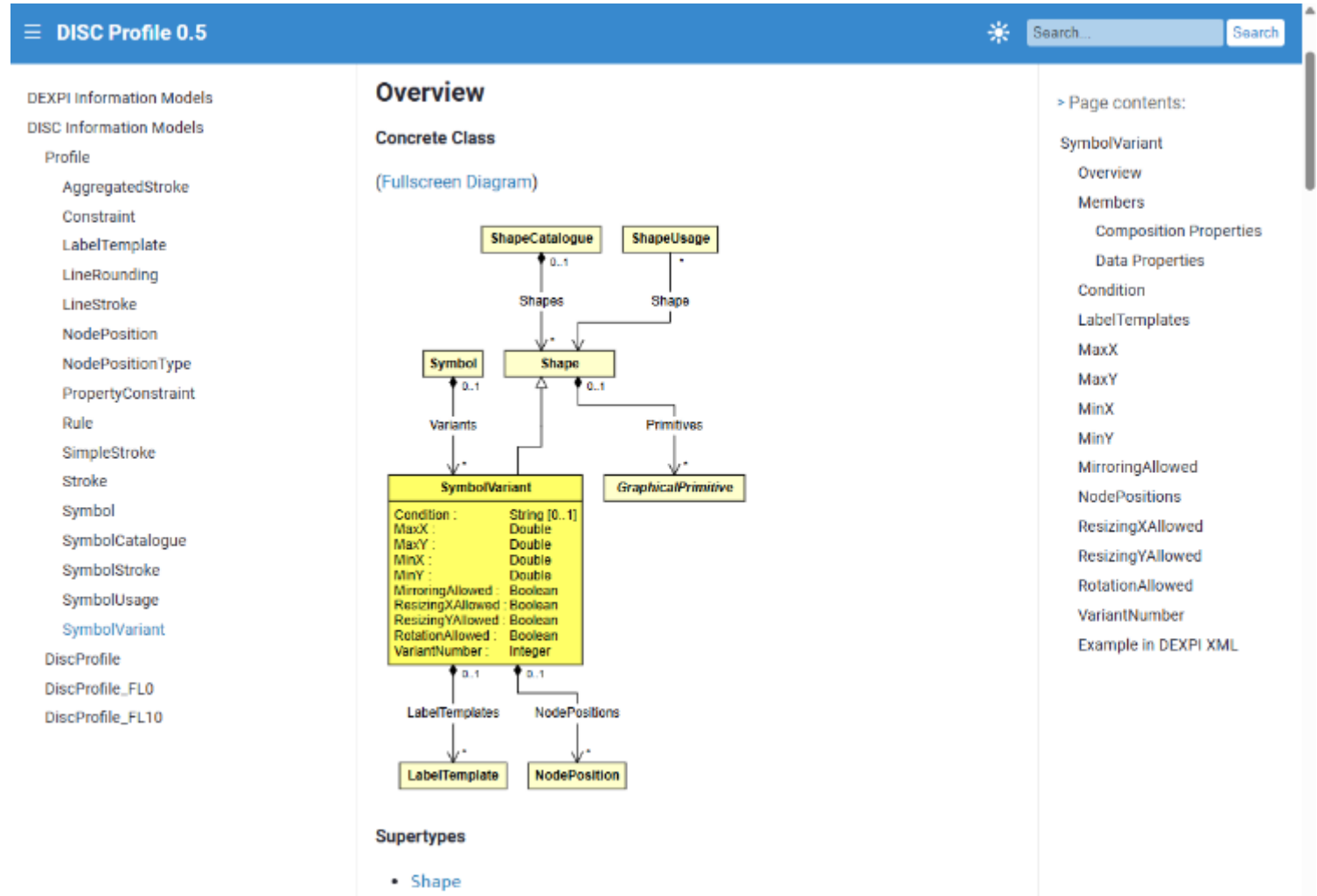
Example of DEXPI Profile Topology Model



- DEXPI defines the plant object model topology
- The DISC profile is defined as a UML-based extension of the DEXPI information model, introducing additional subtypes, symbols and rules.
- Together they form a complete DEXPI-compliant and verifiable topology for DISC

Profile meta model: Visualization, Connectivity, Rule definitions

- Complex line model definition
- Symbol definitions
 - Usage rules per class
 - Label
 - Variants
 - Nodes
- Constraints
 - Property constraints overlay
- Rule model definition



Example of DEXPI Profile : Visualization, Connectivity, Labelling Rules

- Symbol mapping for DEXPI classes
- Defined connection points and connection types
- Enforced topology and connectivity rules through the DEXPI model
- Standardized symbol labelling
- Machine-verifiable consistency

PV005B

DiscProfile::SymbolCatalogue::PV005B

Overview

Object (Symbol)

Valve Gate (Actuated Valve)

Usage

GateValve

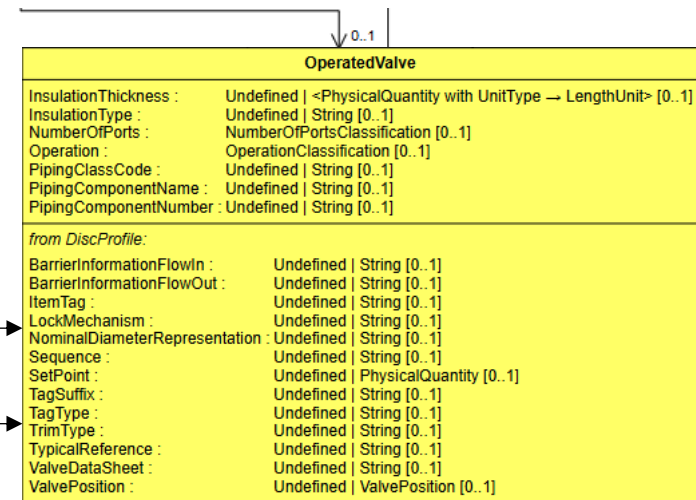
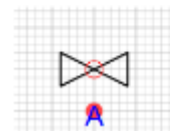
Label Template A

Alignment: CenterCenter

<NominalDiameterRepresentation><ValveDataSheet>

<TrimType> <LockMechanism>

(Fullscreen Diagram)



GateValve

Example of DEXPI Profile – Blueprint file

PV005B

DiscProfile::SymbolCatalogue::PV005B

Overview

Object (Symbol)

Valve Gate (Actuated Valve)

Usage

GateValve

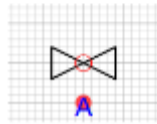
Label Template A

Alignment: CenterCenter

<NominalDiameterRepresentation><ValveDataSheet>

<TrinType> <LockMechanism>

(Fullscreen Diagram)



```
<Object id="GateValve1" type="Plant/Piping.GateValve">
  <Data property="DiscProfile/ItemTag">
    <String>D-20HV0001</String>
  </Data>
  <Components property="Nodes">
  </Components>
  <Data property="DiscProfile/NominalDiameterRepresentation">
  </Data>
  <Components property="PersistentIdentifiers">
  </Components>
  <Data property="DiscProfile/Sequence">
  </Data>
  <Data property="DiscProfile/TagType">
  </Data>
  <Data property="DiscProfile/TypicalReference">
  </Data>
</Object>
```

- DEXPI defines the plant object and topology
- DISC profile defines symbols, labels, and connection rules
- Graphical representation is directly linked to the overall data model (DEXPI + DISC Profile) and is machine-verifiable for consistency

```
<Object type="Core/Diagram.RepresentationGroup">
  <Components property="Groups">
    <Object type="Core/Diagram.Static">
      <Components property="Elements">
        <Object type="Profile/SymbolUsage">
          <Data property="IsMirrored">
          </Data>
          <Data property="Position">
          </Data>
          <Data property="Rotation">
          </Data>
          <Data property="ScaleX">
          </Data>
          <Data property="ScaleY">
          </Data>
          <References objects="DiscProfile/PV005B" property="Symbol"/>
        </Object>
      </Components>
    </Object>
  </Components>
  <Object type="Core/Diagram.Label">
  </Object>
  <Object type="Core/Diagram.RepresentationGroup">
  </Object>
  <Object type="Core/Diagram.RepresentationGroup">
  </Object>
</Components>
<References objects="#GateValve1" property="Represents"/>
</Object>
```

Example of DEXPI Profile – Validation

Validate for:

- Symbol/class usage
- Property fill
- Node x,y graphical connections
- Visualize intelligent symbols – match with driving property

...

<https://toniapedersen.github.io/DEXPIViewer/>

The screenshot displays the DEXPI Viewer interface. The top navigation bar includes the URL toniapedersen.github.io/DEXPIViewer/ and standard browser controls. The main content area is titled "C01_NOA1 PIPING AND INSTRUMENT DIAGRAM - TEST P&ID1" and features a toolbar with options for "Fit", "Connectivity", "Line weight", and "BG Image". Below the toolbar, a "DEXPI Verificator" panel shows the current profile ("Internal") and validation status: "5 Errors", "40 Warn", and "6 Info". The "Validation (51)" tab is active, displaying a list of warnings. The first warning, "PRF-DiscProfile_FL0-HeatTraceRequired", indicates a missing required property 'HeatTraceRequired' on 'Plant/Piping.PipingNetworkSystem' (required by profile 'DiscProfile_FL0'). The second warning, "PRF-E05", reports a misalignment of a node position (361, 55) with a profile connection point (361, 59). The third warning, "PRF-E05", reports a misalignment of a node position (361, 71) with a profile connection point (361, 67). The central area shows a P&ID diagram with various piping, vessels, and instruments. The right-hand "Details" panel provides metadata for the selected object "D-20L00004B-1400PL-AS200", including its persistent identifiers, data fields (such as DiscProfile/ItemTag, DiscProfile/LineDescription, and PipingClassCode), and references to parent structures and plant areas.

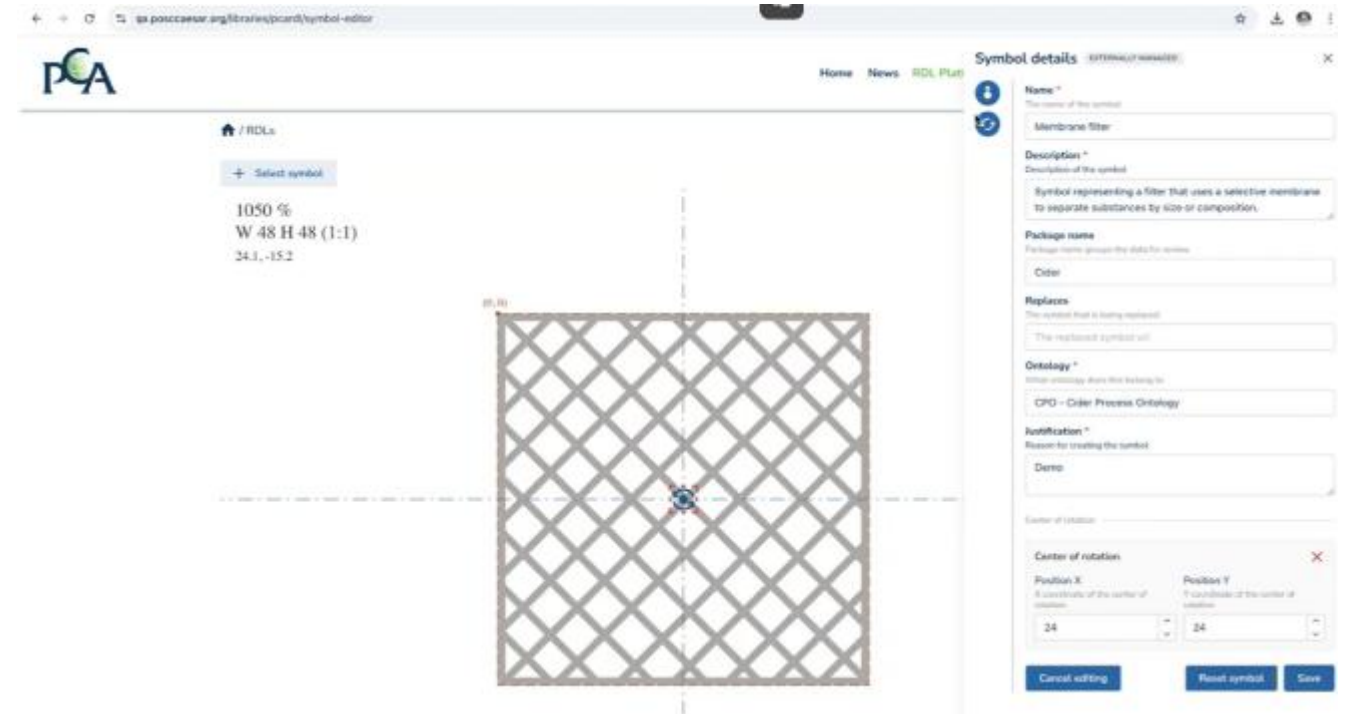
Further work:

DEXPI.org

- Meta model for Profile
- Ongoing work with line styles
- Support for NCS instrumentation model

Reference library work PCA:

- Symbol/line-style library
- RDL class/attribute references



Any Questions?

