Data Exchange in the Process Industry
- The DEXPI initiative -

M. Wiedau, RWTH Aachen University

PCA SIG Meeting / Semantic Days
May 27th 2013, Stavanger, Norway

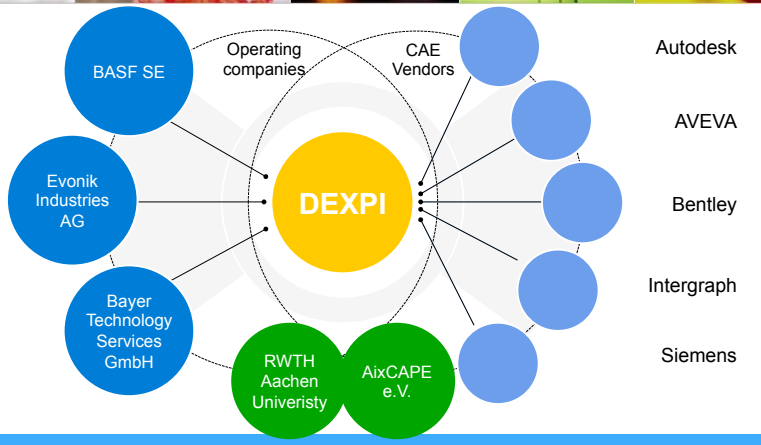
Agenda

- Why DEXPI and what is it?
- Information Modeling
- Usage of ISO 15926-4 and JORD
- Modeling issues
- Application of the information models
- Model validation
- Summary & Outlook

DEXPI – common problem

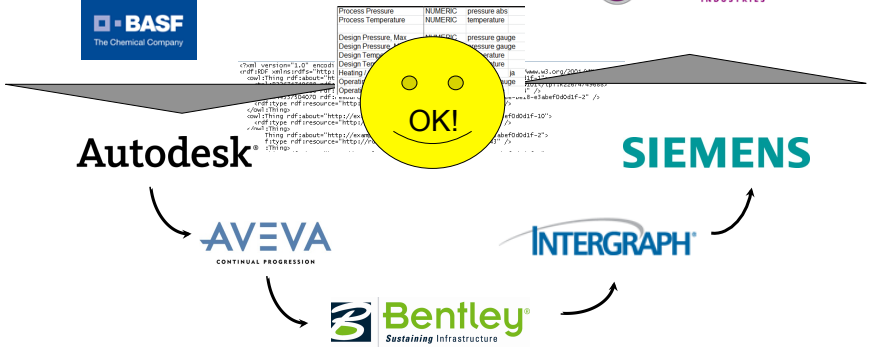
Lack of interoperability between CAE systems is a major business barrier

DEXPI parties



DEXPI proof of concept ISO 15926 – PAAT Fulda 2011

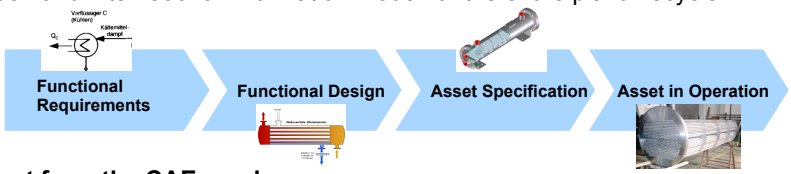
Some equipment properties as ISO 15926 OWL format



DEXPI - common goals

General standard for the process industry based on ISO 15926, implemented in the next CAE software generation

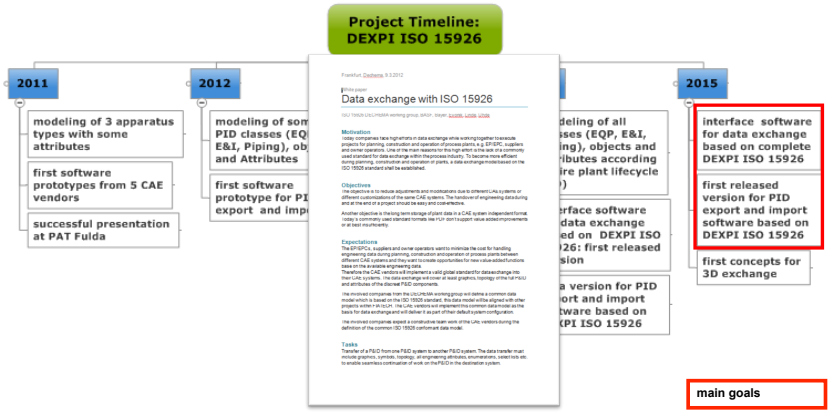
Input from process industry (working party DEXPI ISO 15926):
Open and international information model for the entire plant lifecycle



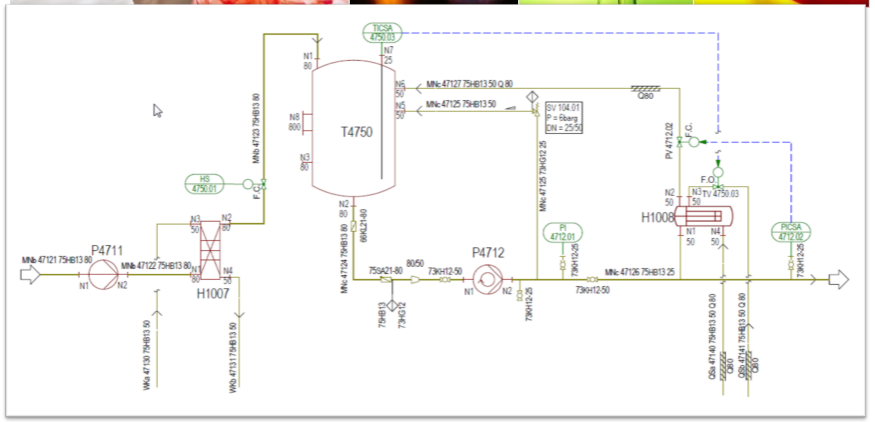
Input from the CAE vendors:

- General exchange standard for graphics
- export and import functions based on the new information model and graphics standard

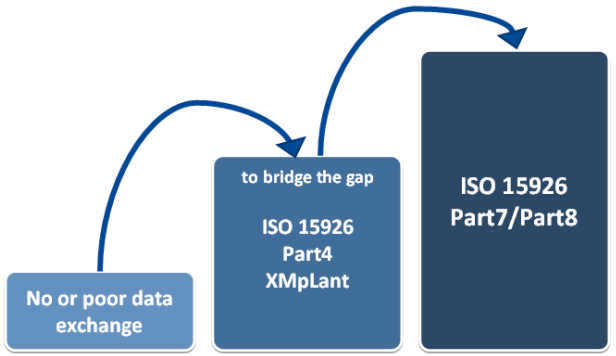
DEXPI - roadmap until 2015



Scope for data exchange - P&ID fragment



Technology – Proteus / XMpLant schema to bridge the gap for P&IDs

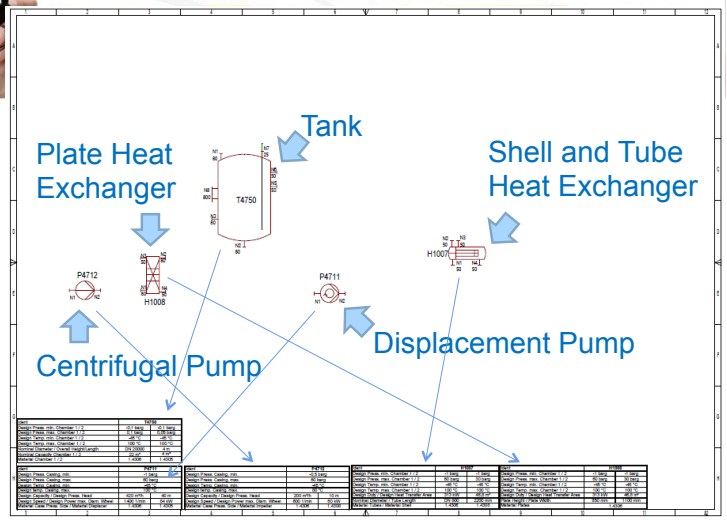


Data part OK, but graphic part is only well under way

From data to semantics

INFORMATION MODELS FOR ENGINEERING DATA

A first, reduced P&ID …

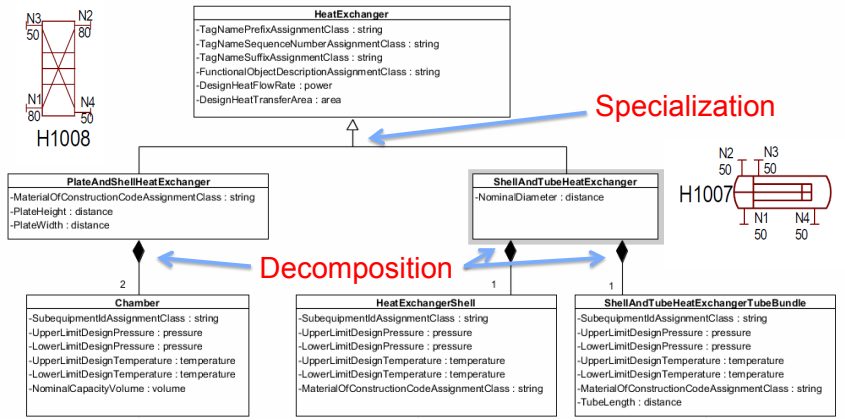


Challenges / Constraints

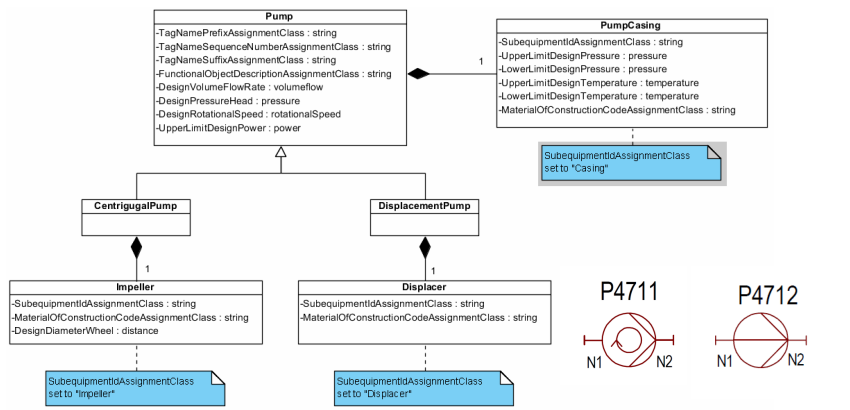
- Use ISO 15926 part 4 vocabulary
- Information models should be generic
- Use XMpLant for bridging the gap
- Verify the software outputs

Noumenon Consulting Limited

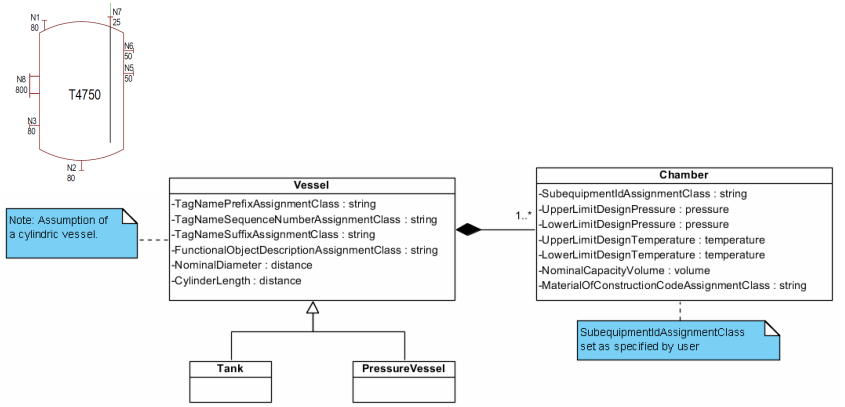
Heat Exchanger



Pump

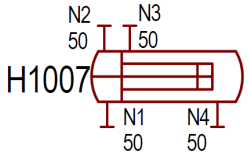


Vessel



Exemplary: Heat Exchanger

Here:
Shell and Tube Heat Exchanger



Ident	H1007	
Design Press. min. Chamber 1 / 2	-1 barg	-1 barg
Design Press. max. Chamber 1 / 2	60 barg	30 barg
Design Temp. min. Chamber 1 / 2	-45 °C	-45 °C
Design Temp. max. Chamber 1 / 2	100 °C	100 °C
Design Duty / Design Heat Transfer Area	313 kW	46,8 m²
Nominal Diameter / Tube Length	DN 800	2200 mm
Material Tubes / Material Shell	1.4306	1.4308

Heat Exchanger attributes

- Specifications by the DEXPI group:
  - Tag Name (e.g. „H1007“)
    - Tag Name Prefix („H“)
    - Tag Name Sequence Number („1007“)
    - Tag Name Suffix („“)
  - Description
  - Flow Rate
  - Transfer Area

HeatExchanger
-TagNamePrefixAssignmentClass : string -TagNameSequenceNumberAssignmentClass : string -TagNameSuffixAssignmentClass : string -FunctionalObjectDescriptionAssignmentClass : string -DesignHeatFlowRate : power -DesignHeatTransferArea : area

Attributes in JORD Sandbox?

- FunctionalObjectDescriptionAssignmentClass
- NominalDiameter
  → http://posccaesar.org/rdl/RDS366794

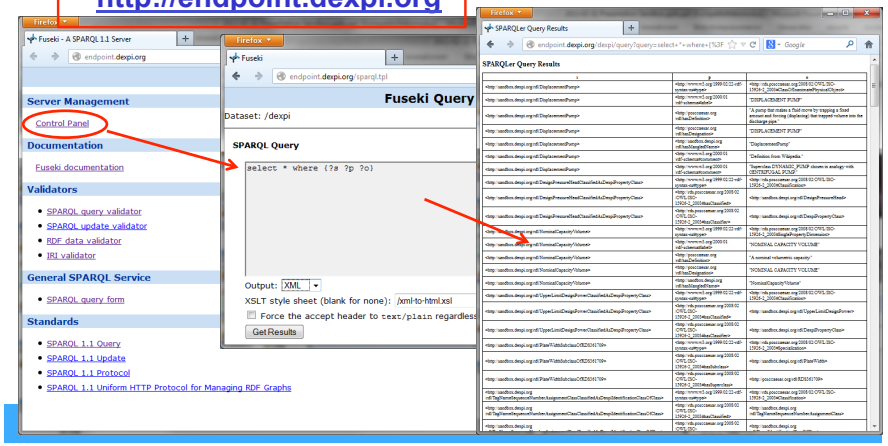
- TagNamePrefixAssignmentClass
- TagNameSequenceNumberAssignmentClass
- TagNameSuffixAssignmentClass
- DesignHeatFlowRate
- DesignHeatTransferArea
  → http://sandbox.dexpi.org/rdl/DesignHeatTransferArea

Solution for missing attributes:

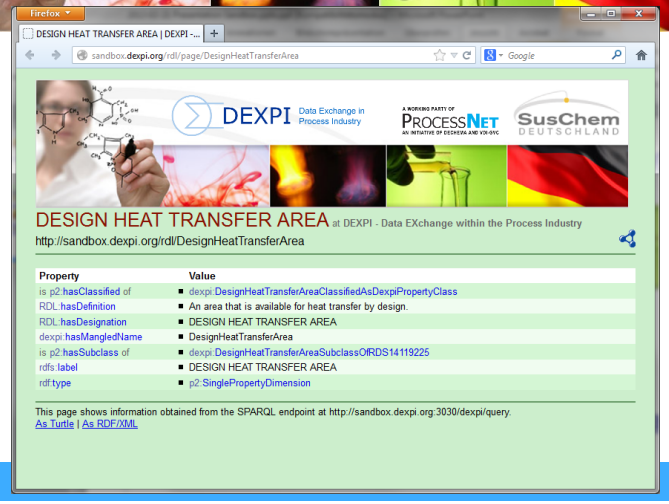
THE DEXPI SANDBOX

Endpoint

- http://endpoint.dexpi.org



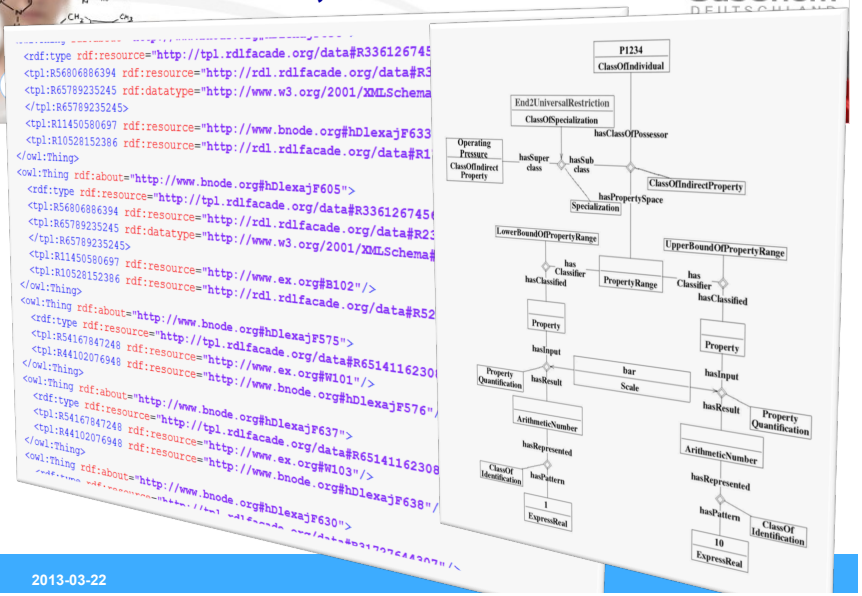
Sandbox



XMpLant and ISO-OWL

APPLICATION OF DEXPI INFORMATION MODELS

ISO-OWL, Part 7/8



Proteus XMpLant V3.3.3

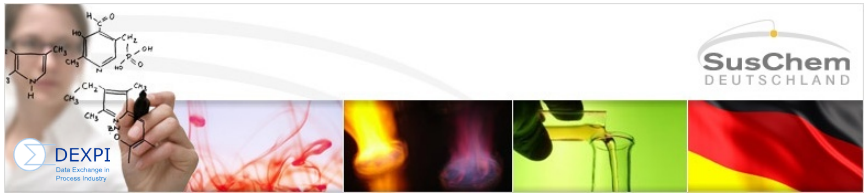
- Several predefined attributes

```
<NominalDiameter Value="80.0" Units="mm"  />
```

- Non-predefined attributes as „generic attributes“:

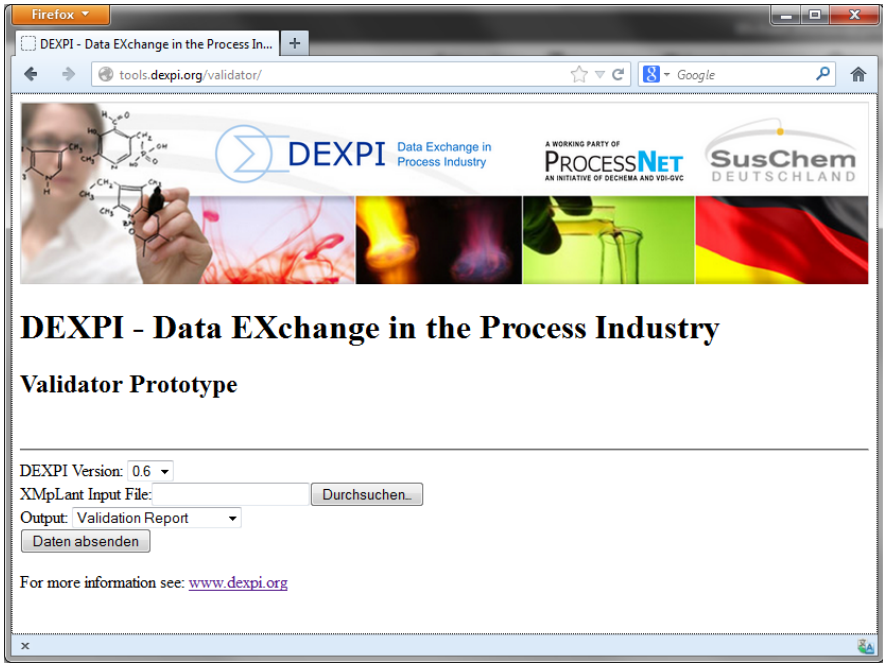
```
<GenericAttribute
Name="FunctionalObjectDescriptionAssignmentClass"
Value="Prozessgaskühler"
Format="string"
URI="http://posccaesar.org/rdl/RDS2101566251"/>

<GenericAttribute
Name="DesignHeatFlowRate"
Value="313"
Format="double"
Units="Kilowatt"
URI="http://sandbox.dexpi.org/rdl/DesignHeatFlowRate"/>
```

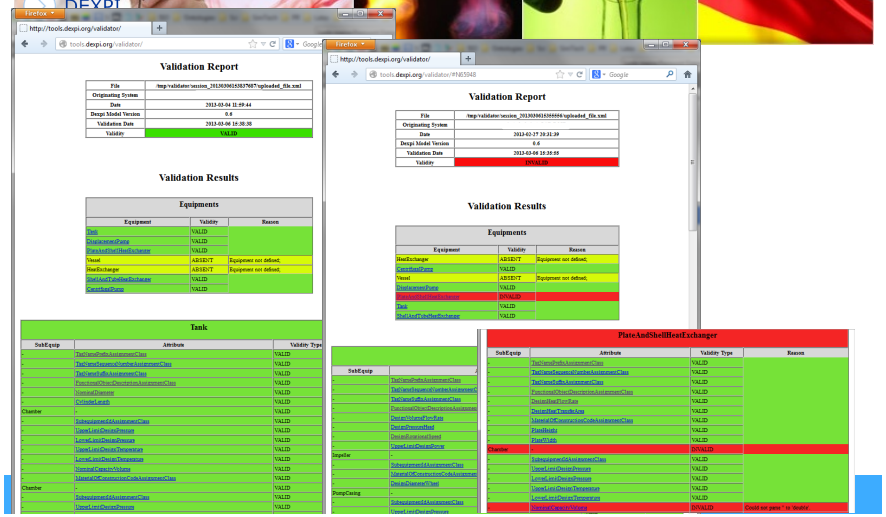


Output of the

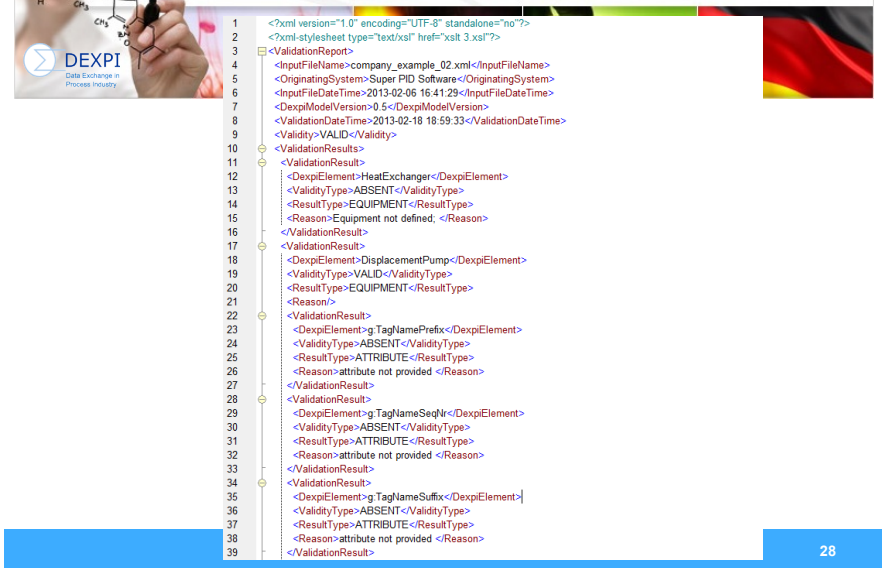
VALIDATION TOOL



Formatted Report



XML Report



Use case P&ID exchange – CAE vendor results

CAE Vendor	Support of DEXPI P&ID model according	Status 2013-03-22
Autodesk	Proteus / XMpLant schema 3.3.3	☑
AVEVA	Proteus / XMpLant schema 3.3.3	☑
Bentley	ISO Part 7/8 OWL	☑(*)
INTERGRAPH	Proteus / XMpLant schema 3.3.3	☑
SIEMENS	Proteus / XMpLant schema 3.3.3	☑

(*) graphic part is well under way

Summary

- DEXPI group is ISO 15926 ready
- Common information model
  - Is generic
  - Can be used for XMpLant
  - Can be used for ISO-OWL
- Validation tool verifies the exports of CAE vendors

Outlook

- Validation of ISO-OWL files
- Additional visualization of XMpLant → as SVG
- Expanding models towards life cycle aspects
- Intensify exchange with members of ISO community
- Communicaton / publication of DEXPI results

Thank you for your attention!

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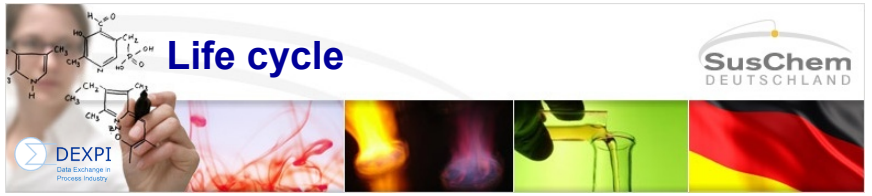
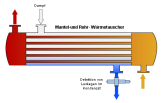
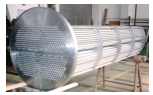
BACKUP



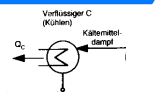
Specification of function in a conceptual phase as in process simulation (Versioning required)



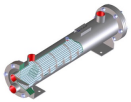
Specification of equipment under a construction aspect as in shop drawings (Versioning required)



Functional requirements → **Functional design** → **Asset specification** → **Asset operational**

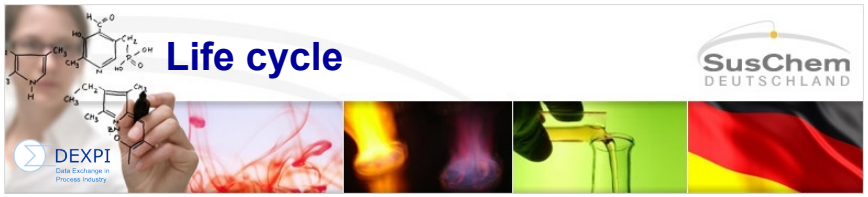


Specification of equipment from a detailed process aspect, e.g. using mathematical models (Versioning required)



Specification of a physical equipment as built and delivered

Life cycle



SusChem DEUTSCHLAND

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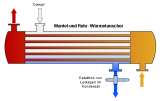

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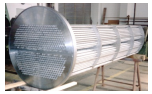

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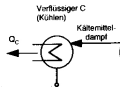

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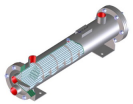

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