DEXPI®
Data Exchange in
the Process Industry

DEXPI
- the Entry into Asset Lifecycle Information Management

Open Industry 4.0 Alliance
Knowledge Camp
February, 28th 2024

Wilhelm Otten, member of DEXPI board, head of networking team

DEXPI® Data Exchange in the Process Industry

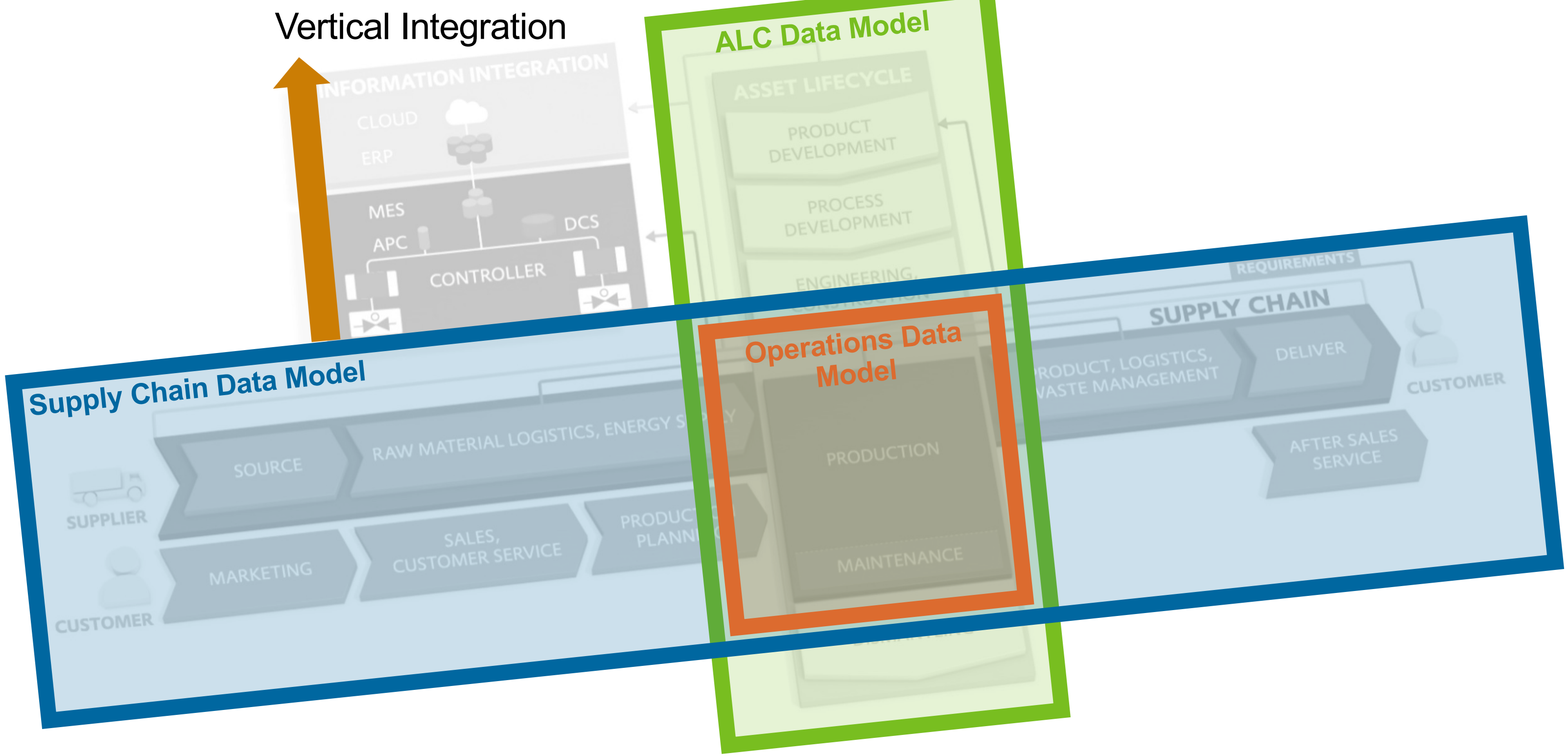
Asset lifecycle information management

Content:

1. **Integrated Engineering Process**
2. Asset Lifecycle Information Model
3. The white spot ”Process Model” – DEXPI+
4. Global initiatives and alignment

Data Models have to be related to Business Processes

DEXPI® Data Exchange in the Process Industry


Vertical Integration
ALC Data Model
Operations Data Model
Supply Chain Data Model
INFORMATION INTEGRATION
CLOUD
ERP
MES
APC
DCS
CONTROLLER
ASSET LIFECYCLE
PRODUCT DEVELOPMENT
PROCESS DEVELOPMENT
ENGINEERING
REQUIREMENTS
SUPPLY CHAIN
SOURCE
RAW MATERIAL LOGISTICS, ENERGY S
PRODUCTION
MAINTENANCE
PRODUCT, LOGISTICS, WASTE MANAGEMENT
DELIVER
CUSTOMER
AFTER SALES SERVICE
SUPPLIER
MARKETING
SALES, CUSTOMER SERVICE
PRODUC PLANN
CUSTOMER

* MTP is an operational model

Current engineering process and tool landscape are scattered due to phase/discipline and drawing orientation

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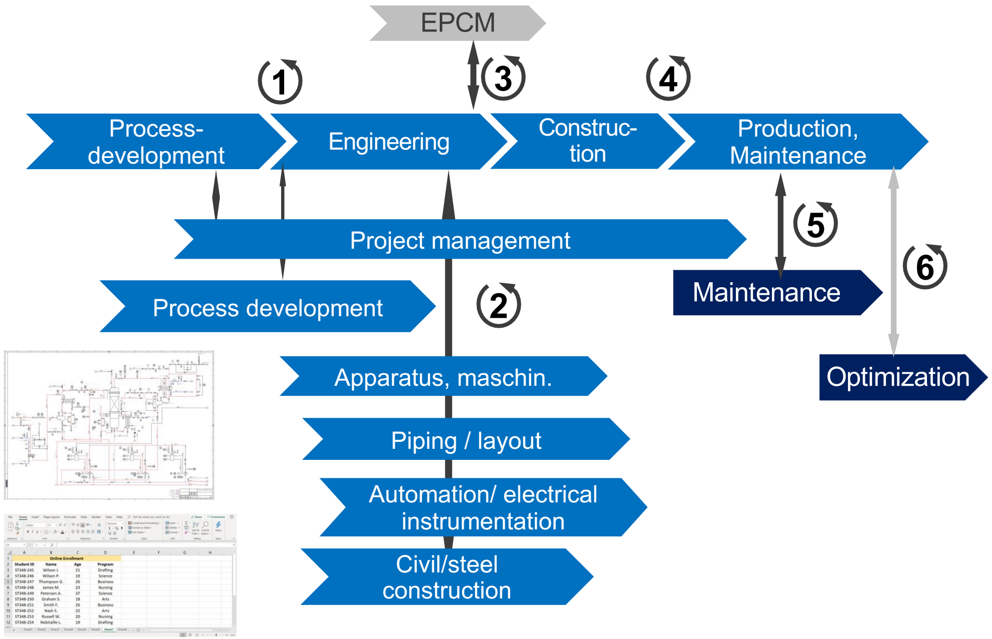
Asset Lifecycle



EPCM

①

③

④

Process-development

Engineering

Construction

Production, Maintenance

⑤

Project management

⑥

Maintenance

Process development

②

Optimization

Apparatus, maschin.

Piping / layout

Automation/ electrical instrumentation

Civil/steel construction

Interfaces and handover along the Asset Lifecycle

- Invest and Fix Cost reduction based on more efficient planning processes using a holistic Asset Lifecycle Data and Document Management:

① – Handover from simulation to CAE

② – Data exchange across disciplines

③ – Date exchange with third parties based on data model

④ – handover to production

⑤ – maintenance management

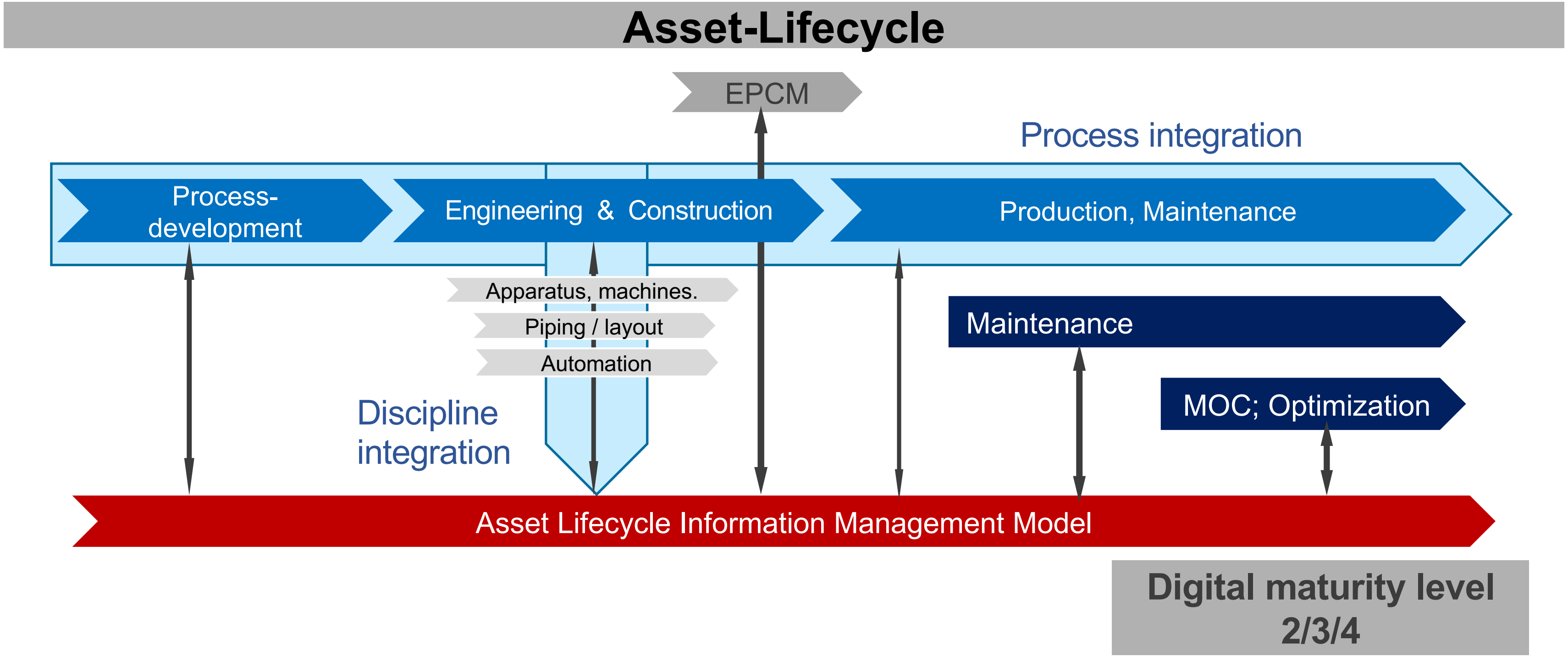
⑥ – No consistent data update during optimization projects

Digital maturity level 0/1

Integrated Engineering provides better quality, speed and efficiency in investment projects, plant engineering and maintenance

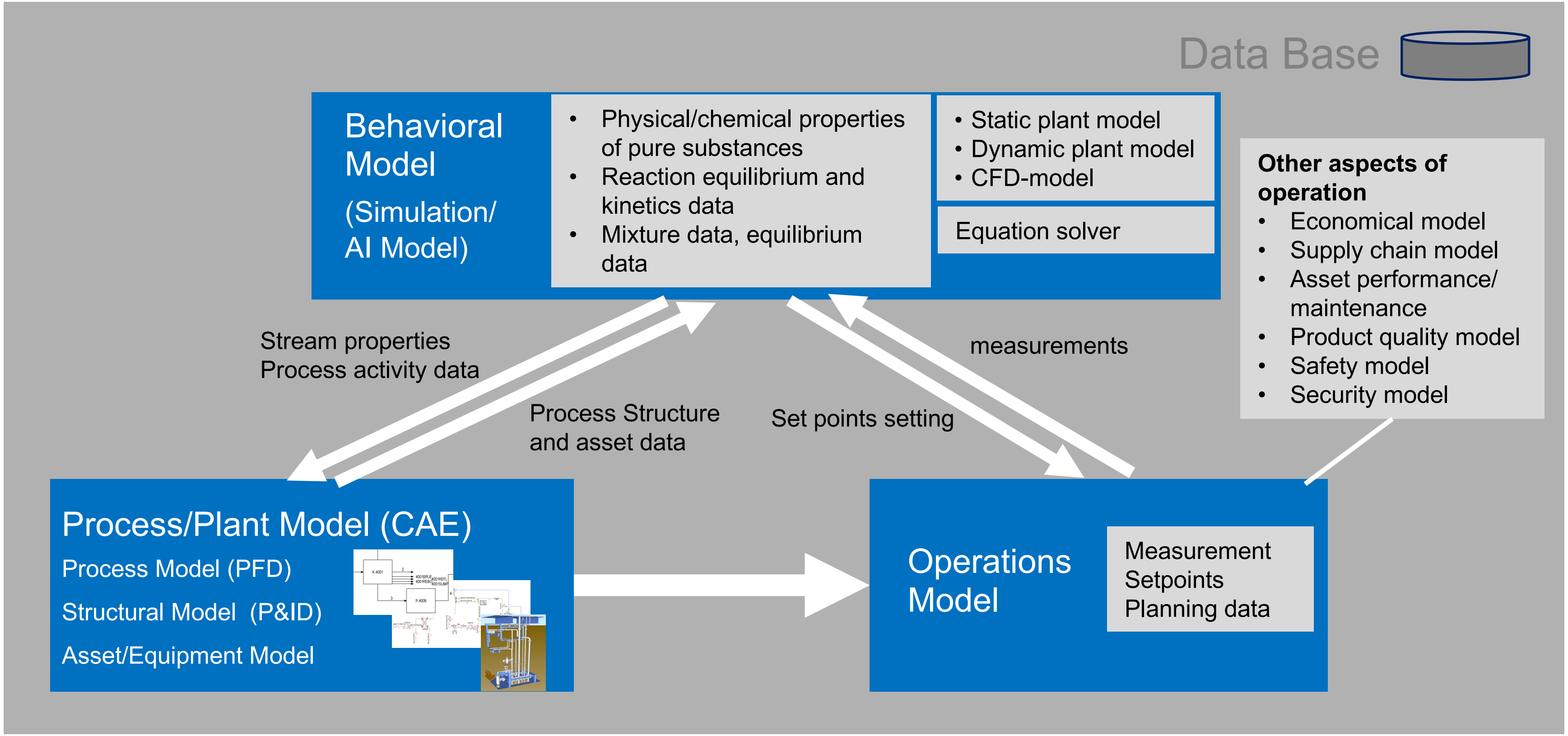
DEXPI® Data Exchange in the Process Industry

Integration along the process and across the disciplines by using one single Asset Lifecycle Data Management System


Asset-Lifecycle
EPCM
Process integration
Process-development
Engineering & Construction
Production, Maintenance
Apparatus, machines.
Piping / layout
Automation
Maintenance
MOC; Optimization
Discipline integration
Asset Lifecycle Information Management Model
Digital maturity level 2/3/4

What is the digital twin for process industry?

Information model in process industry



Data Base

Behavioral Model

(Simulation/ AI Model)

- Physical/chemical properties of pure substances
- Reaction equilibrium and kinetics data
- Mixture data, equilibrium data

- Static plant model
- Dynamic plant model
- CFD-model

Equation solver

Other aspects of operation

- Economical model
- Supply chain model
- Asset performance/ maintenance
- Product quality model
- Safety model
- Security model

Stream properties
Process activity data

Process Structure
and asset data

Set points setting

measurements

Process/Plant Model (CAE)

Process Model (PFD)

Structural Model (P&ID)

Asset/Equipment Model

Operations Model

Measurement
Setpoints
Planning data

DEXPI® Data Exchange in the Process Industry

Asset lifecycle information management

Content:

1. Integrated Engineering Process
2. **Asset Lifecycle Information Model**
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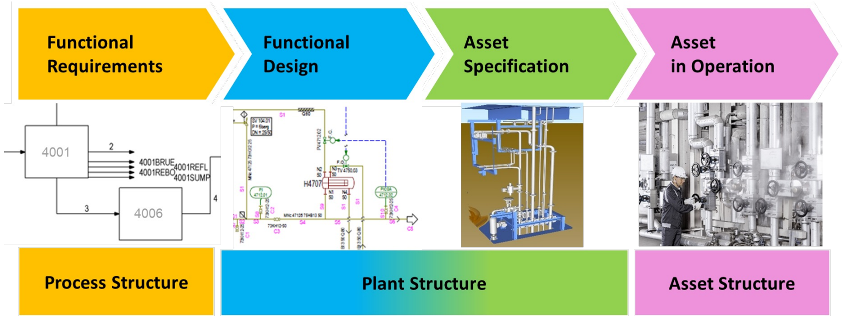
International assocciations gained a common view on lifecycle model

DEXPI® Data Exchange in the Process Industry

DEXPI and ENPRO lifecycle model


Functional Requirements
Functional Design
Asset Specification
Asset in Operation
4001
4006
4001BRUE
4001REBO
4001REFL
4001SUMP
H4707
Process Structure
Plant Structure
Asset Structure

ISO 15926 lifecycle model

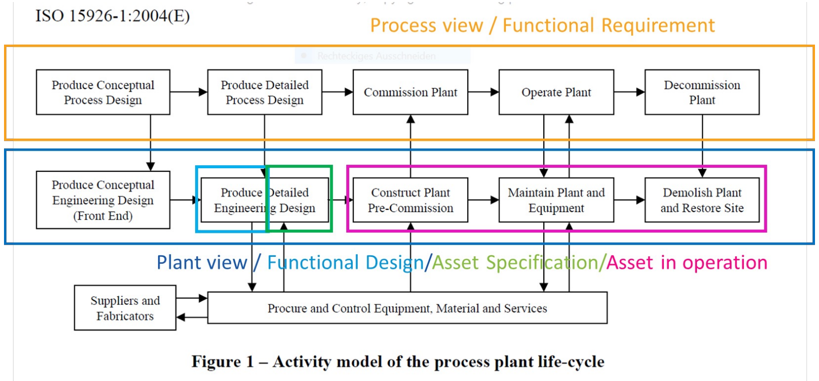
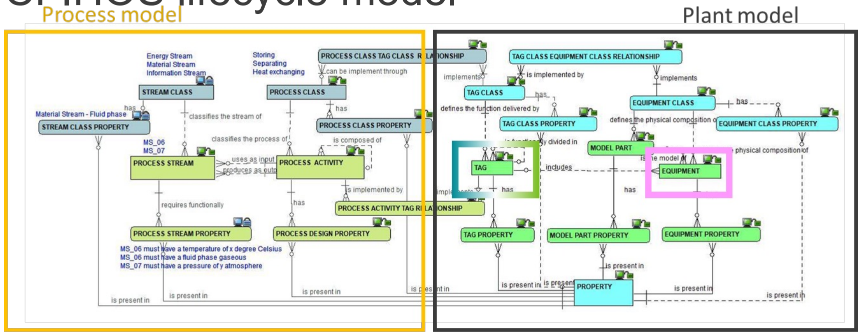
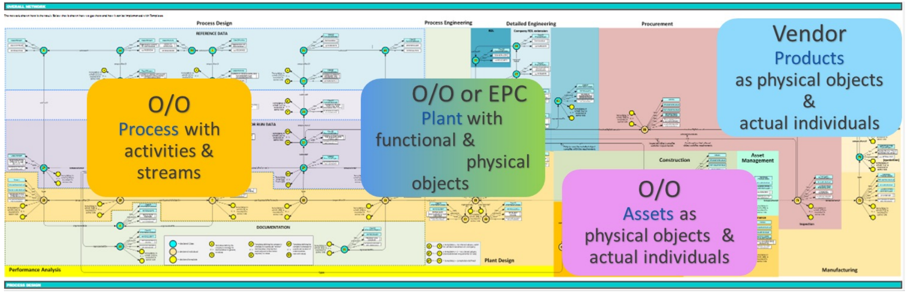

ISO 15926-1:2004(E)
Process view / Functional Requirement
Produce Conceptual Process Design
Produce Detailed Process Design
Commission Plant
Operate Plant
Decommission Plant
Produce Conceptual Engineering Design (Front End)
Produce Detailed Engineering Design
Construct Plant Pre-Commission
Maintain Plant and Equipment
Demolish Plant and Restore Site
Plant view / Functional Design/Asset Specification/Asset in operation
Suppliers and Fabricators
Procure and Control Equipment, Material and Services

Figure 1 – Activity model of the process plant life-cycle

CFIHOS lifecycle model


Process model
Plant model
Energy Stream
Material Stream
Information Stream
STREAM CLASS
Storing
Separating
Heat exchanging
PROCESS CLASS
PROCESS CLASS TAG CLASS RELATIONSHIP
can be implement through
has
Material Stream - Fluid phase
STREAM CLASS PROPERTY
classifies the stream of
PROCESS CLASS PROPERTY
classifies the process of
is composed of
MS_06
MS_07
PROCESS STREAM
uses as input
produces as output
PROCESS ACTIVITY
is implemented by
requires functionally
has
PROCESS ACTIVITY TAG RELATIONSHIP
PROCESS STREAM PROPERTY
PROCESS DESIGN PROPERTY
MS_06 must have a temperature of x degree Celsius
MS_06 must have a fluid phase gaseous
MS_07 must have a pressure of y atmosphere
is present in
TAG CLASS EQUIPMENT CLASS RELATIONSHIP
implements
is implemented by
TAG CLASS
has
defines the function delivered by
EQUIPMENT CLASS
TAG CLASS PROPERTY
defines the physical composition of
EQUIPMENT CLASS PROPERTY
is functionally divided in
MODEL PART
physical composition of
is the model of
TAG
includes
EQUIPMENT
has
TAG PROPERTY
MODEL PART PROPERTY
EQUIPMENT PROPERTY
PROPERTY
is present in

Functional Requirement/Functional Design/Asset Specification/Asset in operation


Process Design
Process Engineering
Detailed Engineering
Procurement
Construction
Asset Management
Plant Design
Manufacturing
Performance Analysis
O/O
Process with activities & streams
O/O or EPC
Plant with functional & physical objects
Vendor
Products as physical objects & actual individuals
O/O
Assets as physical objects & actual individuals

PUMPING
as a process step

PUMP and CENTRIFUGAL PUMP
as a plant object

A CENTRIFUGAL PUMP
as an installed object

DEXPI - General exchange standard for the P&ID in the process industry based on ISO 15926

DEXPI® Data Exchange in the Process Industry

Piping

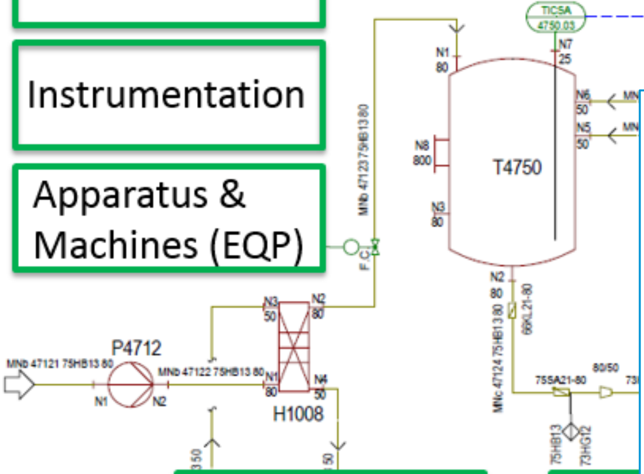
Instrumentation

Apparatus & Machines (EQP)

Symbols

Off Page Connectors

Ann


TICSA
4750.03
N1
80
N7
25
N6
50
N5
50
N8
800
T4750
N3
80
N2
80
F.C.
P4712
MNb 47121 75HB13 80
MNb 47122 75HB13 80
N1
N2
N3
50
N2
80
N1
80
N4
50
H1008
75SA21-80
80/50
75HB13
73HG12

The DEXPI Working Group

Software Vendors

- Aucotec
- Autodesk
- Aveva
- Bilfinger
- Cadmatic
- Element
- Eurocon
- Hexagon
- Industrial Analytics
- ITandFactory
- PTC
- pnb plants & bytes
- Semantum
- Siemens
- Sirfull
- X-Visual

Software
Requirements
Specifications
ISO Models

Owner / Operators

- BASF
- Bayer
- Covestro
- Equinor
- Evonik
- Merck
- Wacker

EPCs

- ThyssenKrupp
- Yokogawa
- Aibel

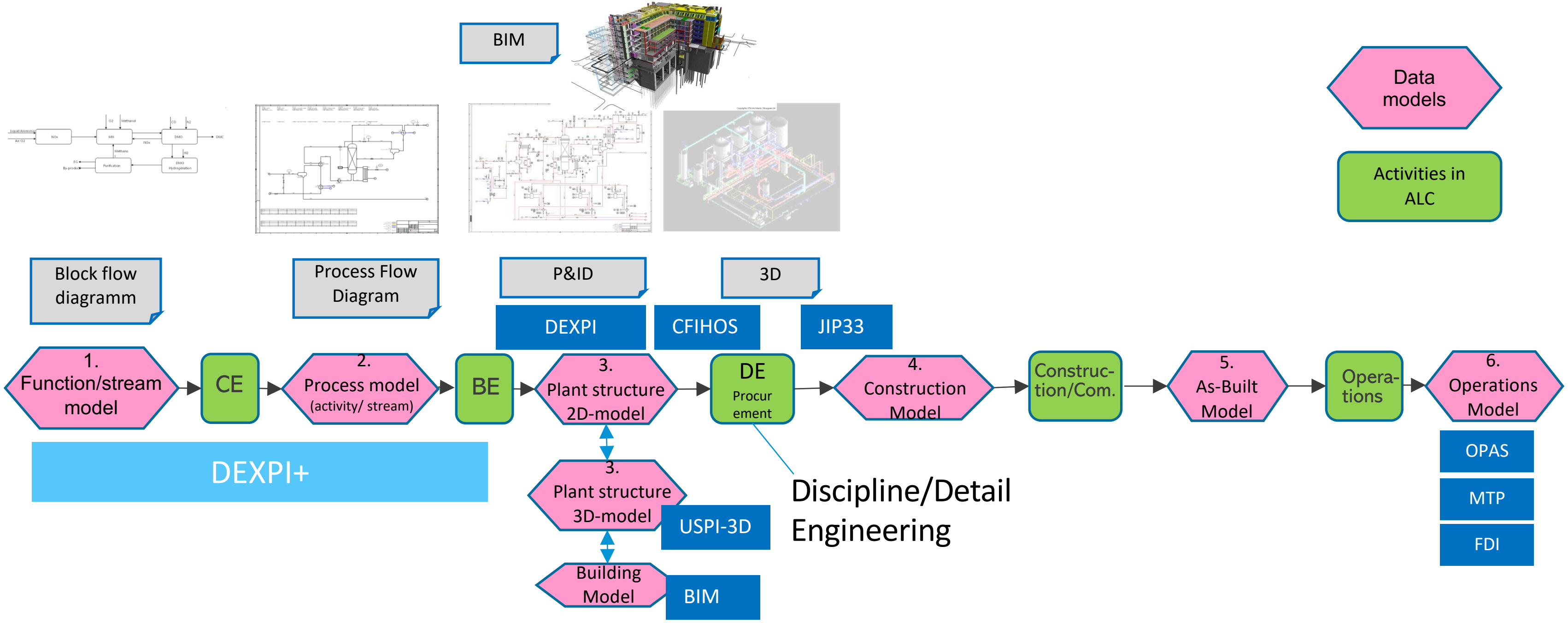
Research Organizations

- A* Star Singapore
- AixCAPE e.V.
- VTT of Finland
- TU Berlin
- TU Dortmund
- RWTH Aachen University
- Tecgraf/PUC-Rio
- Korea University
- University of Oslo / SIRIUS

Integrated Engineering along the Asset Lifecycle Process and Data Models

DEXPI® Data Exchange in the Process Industry

Asset Life Cycle (ALC)



BIM

Data models

Activities in ALC

Block flow diagramm

Process Flow Diagram

P&ID

3D

DEXPI

CFIHOS

JIP33

1. Function/stream model → CE → 2. Process model (activity/ stream) → BE → 3. Plant structure 2D-model → DE Procurement → 4. Construction Model → Construction/Com. → 5. As-Built Model → Operations → 6. Operations Model

DEXPI+

3. Plant structure 3D-model

USPI-3D

Building Model

BIM

Discipline/Detail Engineering

OPAS

MTP

FDI

One integrated data/information model and CAE-landscape using a common data model

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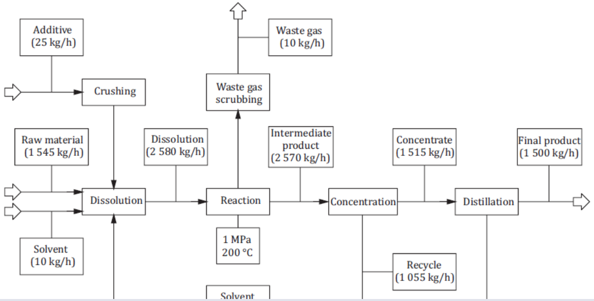
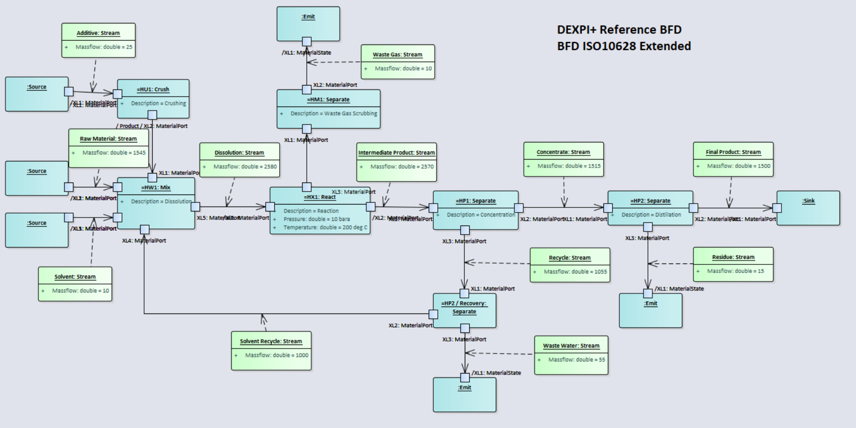
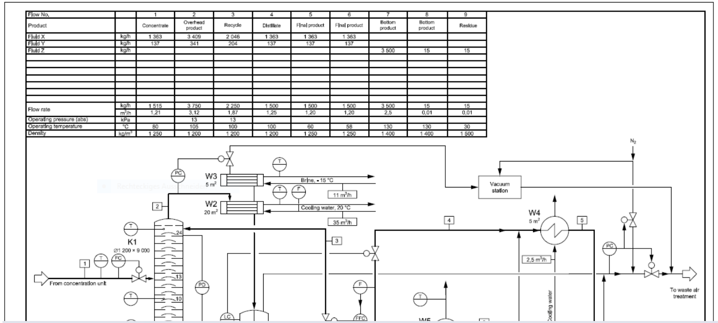
DEXPI+ covers BFD/PFD Information

UML Model for BFD Iso 10628


Additive
(25 kg/h)
Waste gas
(10 kg/h)
Crushing
Waste gas
scrubbing
Raw material
(1 545 kg/h)
Dissolution
(2 580 kg/h)
Intermediate
product
(2 570 kg/h)
Concentrate
(1 515 kg/h)
Final product
(1 500 kg/h)
Dissolution
Reaction
Concentration
Distillation
Solvent
(10 kg/h)
1 MPa
200 °C
Recycle
(1 055 kg/h)
Solvent

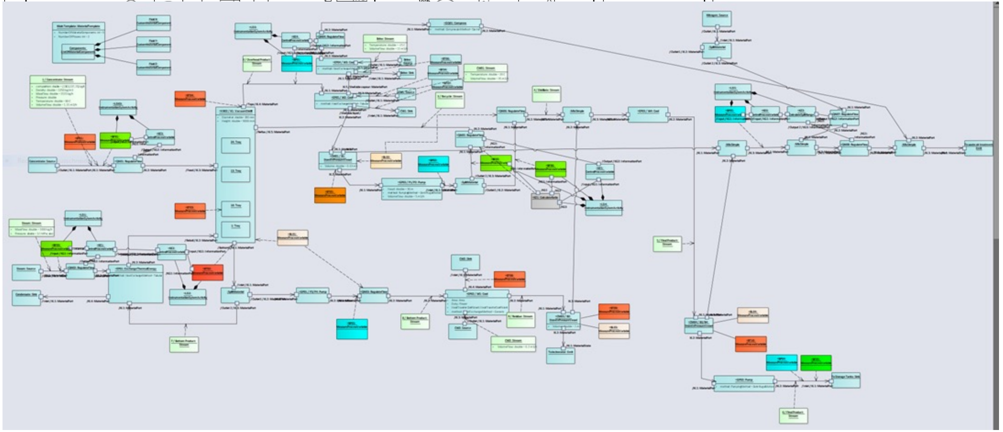

DEXPI+ Reference BFD
BFD ISO10628 Extended
Additive: Stream
+ Massflow: double = 25
:Source
=HU1: Crush
+ Description = Crushing
/XL1: MaterialPort
/ Product / XL2: MaterialPort
Raw Material: Stream
+ Massflow: double = 1545
:Source
/XL2: MaterialPort
=HW1: Mix
+ Description = Dissolution
XL1: MaterialPort
:Source
/XL3: MaterialPort
XL4: MaterialPort
Solvent: Stream
+ Massflow: double = 10
Dissolution: Stream
+ Massflow: double = 2580
XL5: MaterialPort
:Emit
/XL1: MaterialState
Waste Gas: Stream
+ Massflow: double = 10
XL2: MaterialPort
=HM1: Separate
+ Description = Waste Gas Scrubbing
XL1: MaterialPort
=HX1: React
XL3: MaterialPort
+ Description = Reaction
+ Pressure: double = 10 bara
+ Temperature: double = 200 deg C
Intermediate Product: Stream
+ Massflow: double = 2570
/XL2: MaterialPort
=HP1: Separate
+ Description = Concentration
XL3: MaterialPort
Concentrate: Stream
+ Massflow: double = 1515
XL2: MaterialPort
XL1: MaterialPort
=HP2: Separate
+ Description = Distillation
XL3: MaterialPort
Final Product: Stream
+ Massflow: double = 1500
:Sink
Recycle: Stream
+ Massflow: double = 1055
Residue: Stream
+ Massflow: double = 15
/XL1: MaterialState
:Emit
=HP2 / Recovery: Separate
XL1: MaterialPort
XL2: MaterialPort
XL3: MaterialPort
Solvent Recycle: Stream
+ Massflow: double = 1000
Waste Water: Stream
+ Massflow: double = 55
/XL1: MaterialState
:Emit

PFD Iso 10628 extended



Flow No.		1	2	3	4	5	6	7	8	9
Product		Concentrate	Overhead product	Recycle	Distillate	Final product	Final product	Bottom product	Bottom product	Residue
Fluid X	kg/h	1 363	3 409	2 046	1 363	1 363	1 363			
Fluid Y	kg/h	137	341	204	137	137	137			
Fluid Z	kg/h							3 500	15	15
Flow rate	kg/h	1 515	3 750	2 250	1 500	1 500	1 500	3 500	15	15
	m³/h	1,21	3,12	1,87	1,25	1,20	1,20	2,5	0,01	0,01
Operating pressure (abs)	kPa		13	13						
Operating temperature	°C	80	105	100	100	60	58	130	130	30
Density	kg/m³	1 250	1 200	1 200	1 200	1 250	1 250	1 400	1 400	1 500

N₂
PC
W3
5 m²
T
Brine, - 15 °C
T
F
11 m³/h
Vacuum
station
2
W2
20 m²
Cooling water, 20 °C
35 m³/h
W4
5 m²
4
5
K1
Ø1 200 × 9 000
T
3
PC
2,5 m³/h
1
T
FC
From concentration unit
PD
F
T
To waste air
treatment

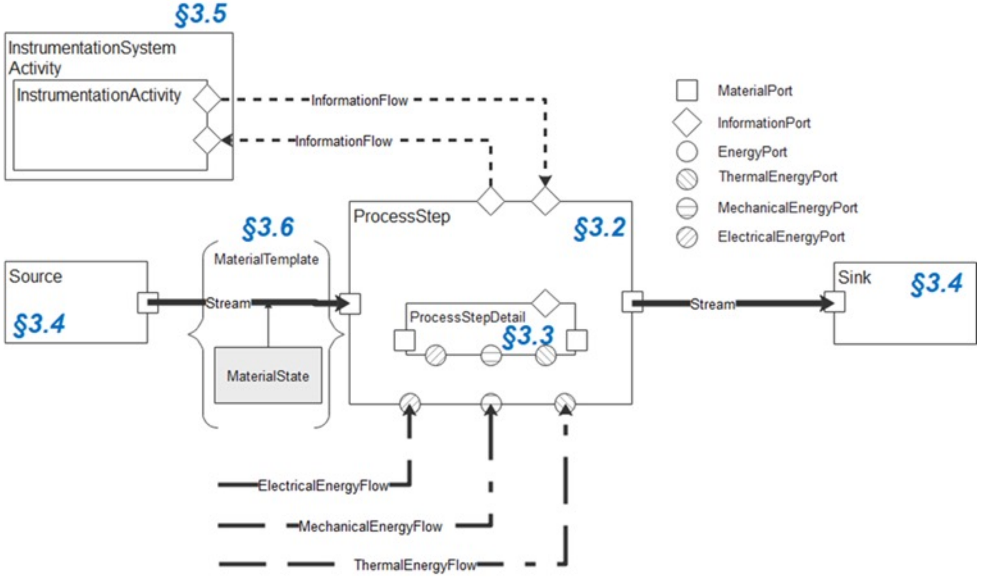


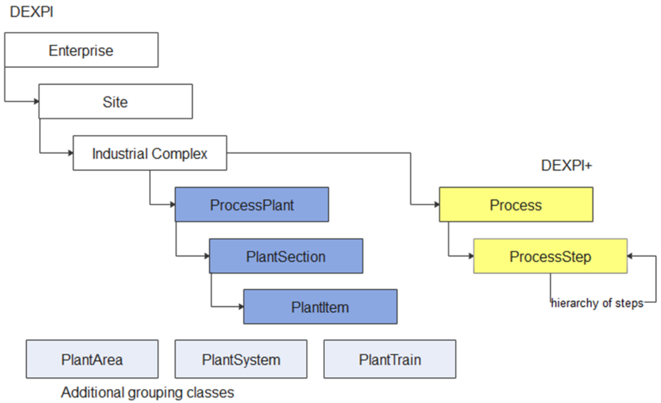
DEXPI+ provides an open industrial standard for a BFD/PFD Data Model

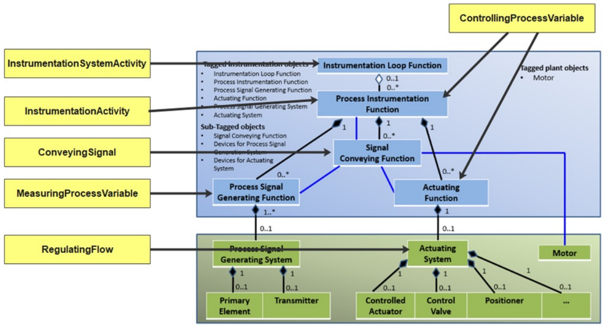
DEXPI® Data Exchange in the Process Industry

Data Model consist of:

- Metadata
- Process Step/Activities according ISO15926 part 4
- Stream model
- Instrumentation process activities

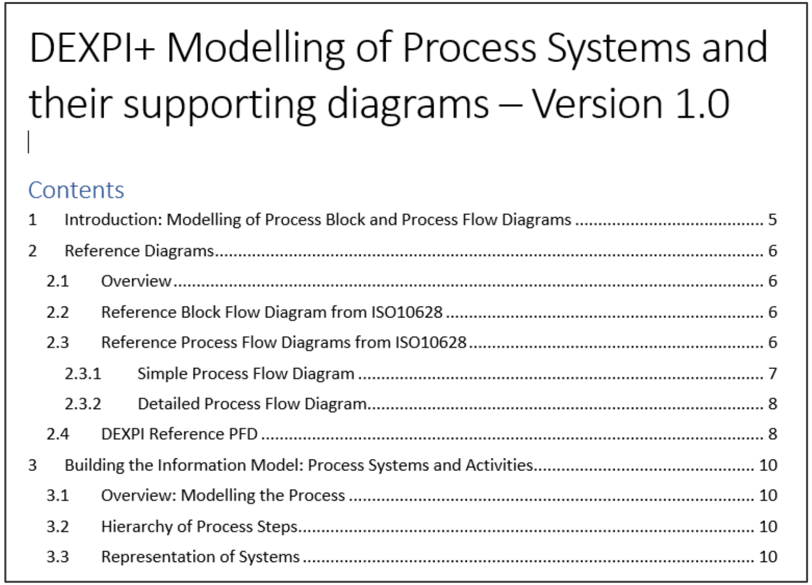

§3.5
InstrumentationSystem Activity
InstrumentationActivity
InformationFlow
InformationFlow
§3.6
MaterialTemplate
ProcessStep
§3.2
Source
§3.4
Stream
MaterialState
ProcessStepDetail
§3.3
Stream
Sink
§3.4
MaterialPort
InformationPort
EnergyPort
ThermalEnergyPort
MechanicalEnergyPort
ElectricalEnergyPort
ElectricalEnergyFlow
MechanicalEnergyFlow
ThermalEnergyFlow


DEXPI
Enterprise
Site
Industrial Complex
ProcessPlant
PlantSection
PlantItem
DEXPI+
Process
ProcessStep
hierarchy of steps
PlantArea
PlantSystem
PlantTrain
Additional grouping classes


ControllingProcessVariable
InstrumentationSystemActivity
InstrumentationActivity
ConveyingSignal
MeasuringProcessVariable
RegulatingFlow
Tagged instrumentation objects
Instrumentation Loop Function
Process Instrumentation Function
Process Signal Generating Function
Actuating Function
Process Signal Generating System
Actuating System
Sub-Tagged objects
Signal Conveying Function
Devices for Process Signal Generation System
Devices for Actuating System
Tagged plant objects
Motor
Instrumentation Loop Function
0..1
0..*
Process Instrumentation Function
1
1
0..*
1
Signal Conveying Function
0..*
0..*
Process Signal Generating Function
Actuating Function
1..*
0..1
1
0..1
Process Signal Generating System
Actuating System
Motor
1
1
0..1
0..1
1
1
1
1
0..1
0..1
0..1
0..1
Primary Element
Transmitter
Controlled Actuator
Control Valve
Positioner
...

DEXPI+ Open Standard Version 1.0 is available on DEXPI-Homepage www.dexpi.org

DEXPI® Data Exchange in the Process Industry



DEXPI+ Modelling of Process Systems and their supporting diagrams – Version 1.0

Contents

1 Introduction: Modelling of Process Block and Process Flow Diagrams 5
2 Reference Diagrams 6
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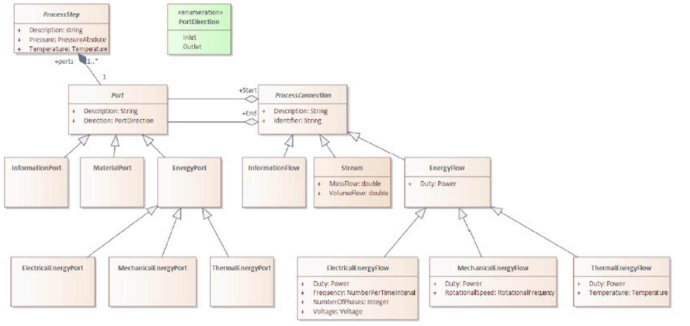
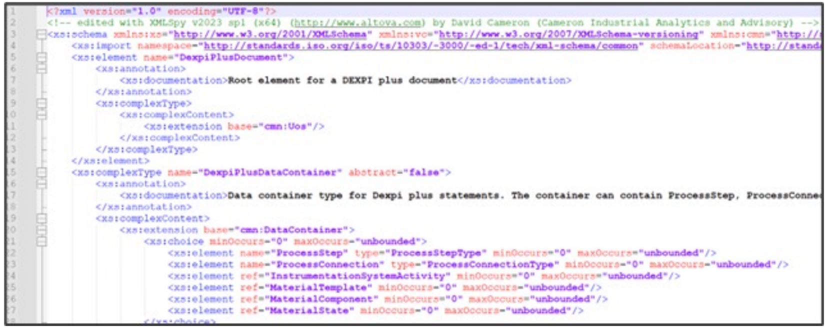
    2.3.2 Detailed Process Flow Diagram 8
  2.4 DEXPI Reference PFD 8
3 Building the Information Model: Process Systems and Activities 10
  3.1 Overview: Modelling the Process 10
  3.2 Hierarchy of Process Steps 10
  3.3 Representation of Systems 10



ProcessStep
+ Description: string
+ Pressure: PressureAbsolute
+ Temperature: Temperature
«enumeration» PortDirection
Inlet
Outlet
+ports
1..*
1
Port
+ Description: String
+ Direction: PortDirection
+Start
+End
ProcessConnection
+ Description: String
+ Identifier: String
InformationPort
MaterialPort
EnergyPort
InformationFlow
Stream
+ MassFlow: double
+ VolumeFlow: double
EnergyFlow
+ Duty: Power
ElectricalEnergyPort
MechanicalEnergyPort
ThermalEnergyPort
ElectricalEnergyFlow
+ Duty: Power
+ Frequency: NumberPerTimeInterval
+ NumberOfPhases: Integer
+ Voltage: Voltage
MechanicalEnergyFlow
+ Duty: Power
+ RotationalSpeed: RotationalFrequency
ThermalEnergyFlow
+ Duty: Power
+ Temperature: Temperature

UML model



```xml
<?xml version="1.0" encoding="UTF-8"?>
<!-- edited with XMLSpy v2023 sp1 (x64) (http://www.altova.com) by David Cameron (Cameron Industrial Analytics and Advisory) -->
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:vc="http://www.w3.org/2007/XMLSchema-versioning" xmlns:cmn="http://
    <xs:import namespace="http://standards.iso.org/iso/ts/10303/-3000/-ed-1/tech/xml-schema/common" schemaLocation="http://standa
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        <xs:annotation>
            <xs:documentation>Root element for a DEXPI plus document</xs:documentation>
        </xs:annotation>
        <xs:complexType>
            <xs:complexContent>
                <xs:extension base="cmn:Uos"/>
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        </xs:complexType>
    </xs:element>
    <xs:complexType name="DexpiPlusDataContainer" abstract="false">
        <xs:annotation>
            <xs:documentation>Data container type for Dexpi plus statements. The container can contain ProcessStep, ProcessConne
        </xs:annotation>
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                    <xs:element ref="MaterialComponent" minOccurs="0" maxOccurs="unbounded"/>
                    <xs:element ref="MaterialState" minOccurs="0" maxOccurs="unbounded"/>
```

XML schema/ serialization (PoC)

DEXPI® Data Exchange in the Process Industry

Asset lifecycle information management

Content:

1. Integrated Engineering Process
2. Asset Lifecycle Information Model
3. The white spot ”Process Model” – DEXPI+
4. **Global initiatives and alignment**

ACHEMA2022

22 - 26 August 2022 | Frankfurt, Germany

PIDMIC

Process Industry Data Model Integration Congress

ACHEMA2022
22 - 26 August 2022 | Frankfurt, Germany
PIDMIC
Process Industry Data Model Integration Congress
DEXPI®
Data Exchange in the Process Industry

DEXPI® Data Exchange in
the Process Industry

Data Model Eco System in Process Industry

DEXPI® Data Exchange in the Process Industry

Process design
Functional Requirements

Plant Design
Functional Design

Tag / Asset
Specification

Equipment
Asset in Operations

FEL1
Study

FEL2
Conceptual
Engineering

FEL3
Basic
Engineering

Detail
Engineering

Procurement/
construction
commissioning

Operations

PLATTFORM INDUSTRIE4.0

Industry 4.0 Asset Administration Shell

Industry data exchange framework

OPC FOUNDATION

International standardization

ISO

International Electrotechnical Commission IEC

P&ID

DEXPI Data Exchange in the Process Industry

Hand over EPC

CFIHOS Capital Facilities Information HandOver Specification

CII Construction Industry Institute®

Procurement
specification

JIP33 JOINT INDUSTRY PROGRAMME Standardizing procurement specifications

USPI UITGEBREID SAMENWERKINGSVERBAND PROCESINDUSTRIE NEDERLAND

3D

USPI

Detail/
Procurement

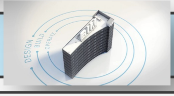
ECLASS

PCA POSC Caesar Association

automation

MIMOSA

NAMUR



BIM building

Asset life cycle

THTH

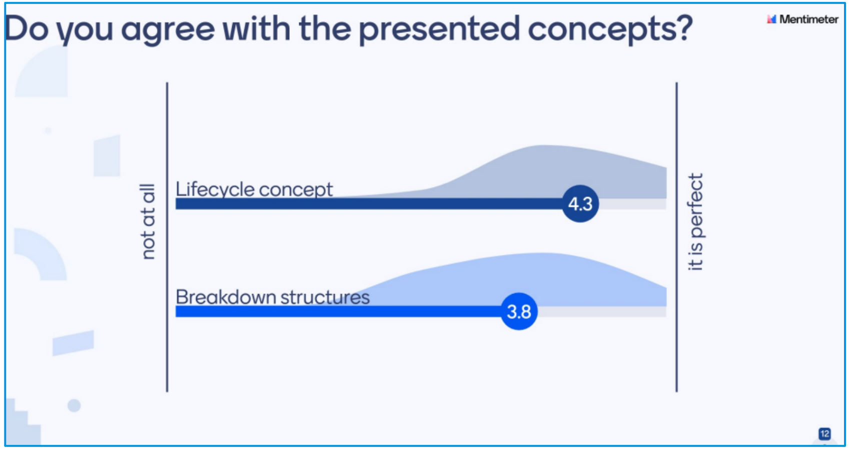
SEIIA.SE Swedish Industrial Interoperability Association

Integrating and
Extending standards

Applying and integration of standards

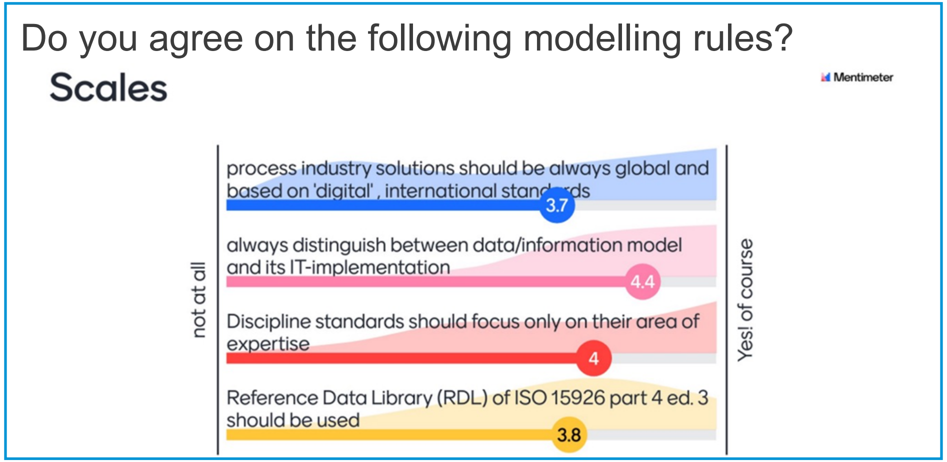
Organizations agreed on a common view of the lifecycle and modelling rules (PIDMIC)

DEXPI® Data Exchange in the Process Industry



Do you agree with the presented concepts?

Mentimeter
not at all
it is perfect
Lifecycle concept
4.3
Breakdown structures
3.8
12



Do you agree on the following modelling rules?

Scales

Mentimeter
not at all
Yes! of course

process industry solutions should be always global and based on 'digital', international standards

3.7

always distinguish between data/information model and its IT-implementation

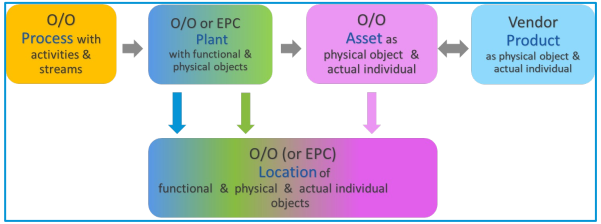
4.4

Discipline standards should focus only on their area of expertise

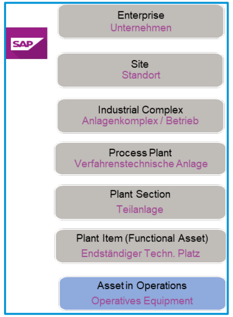
4

Reference Data Library (RDL) of ISO 15926 part 4 ed. 3 should be used

3.8

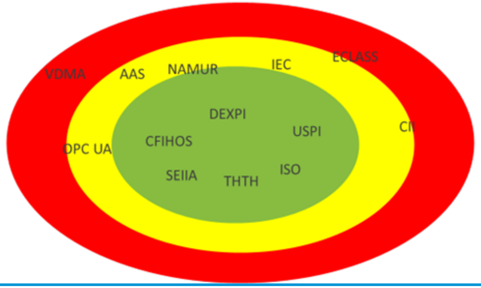


O/O
Process with
activities &
streams
O/O or EPC
Plant
with functional &
physical objects
O/O
Asset as
physical object &
actual individual
Vendor
Product
as physical object &
actual individual
O/O (or EPC)
Location of
functional & physical & actual individual objects



SAP
Enterprise
Unternehmen
Site
Standort
Industrial Complex
Anlagenkomplex / Betrieb
Process Plant
Verfahrenstechnische Anlage
Plant Section
Teilanlage
Plant Item (Functional Asset)
Endständiger Techn. Platz
Asset in Operations
Operatives Equipment

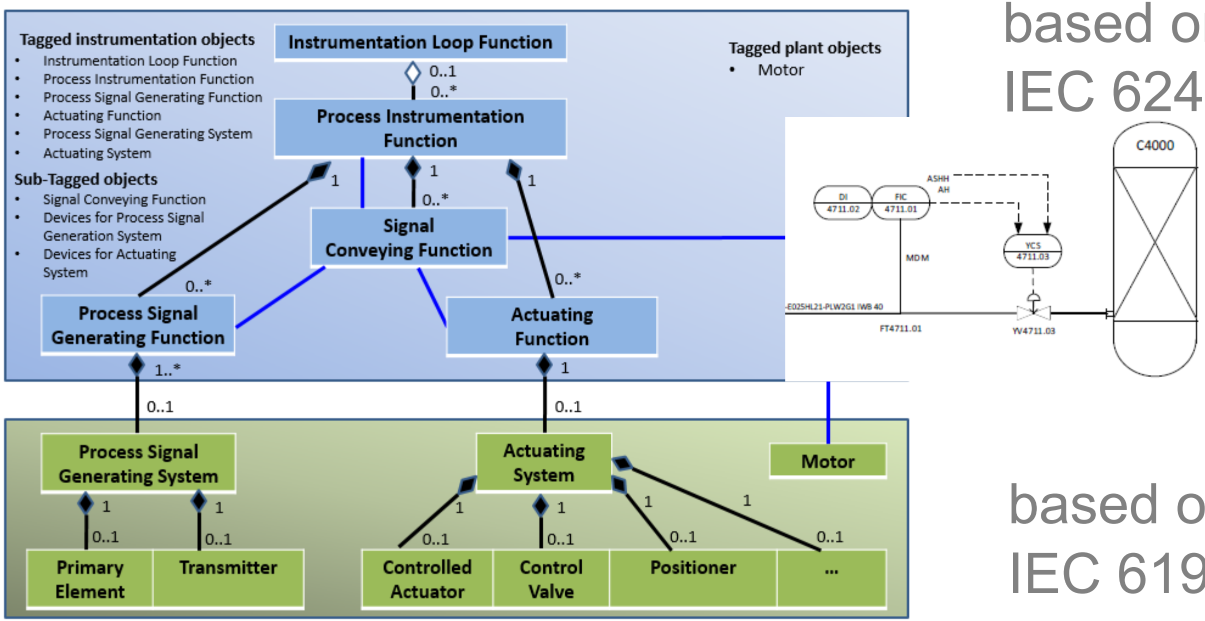
Level of alignment



VDMA
AAS
NAMUR
IEC
ECLASS
DEXPI
OPC UA
CFIHOS
USPI
CII
SEIIA
THTH
ISO

DEXPI – Instrumentation Model covers functional design and basic asset specification

DEXPI Data Exchange in the Process Industry



Tagged instrumentation objects
- Instrumentation Loop Function
- Process Instrumentation Function
- Process Signal Generating Function
- Actuating Function
- Process Signal Generating System
- Actuating System

Sub-Tagged objects
- Signal Conveying Function
- Devices for Process Signal Generation System
- Devices for Actuating System

Tagged plant objects
- Motor

Instrumentation Loop Function
0..1
0..*
Process Instrumentation Function
1
1
0..*
1
Signal Conveying Function
0..*
0..*
Process Signal Generating Function
Actuating Function
1..*
1
0..1
0..1
Process Signal Generating System
Actuating System
Motor
1
1
1
1
1
1
0..1
0..1
0..1
0..1
0..1
0..1
Primary Element
Transmitter
Controlled Actuator
Control Valve
Positioner
...
C4000
ASHH
AH
DI 4711.02
FIC 4711.01
YCS 4711.03
MDM
-E025HL21-PLW2G1 IWB 40
FT4711.01
YV4711.03

based on:
IEC 62424

based on:
IEC 61987

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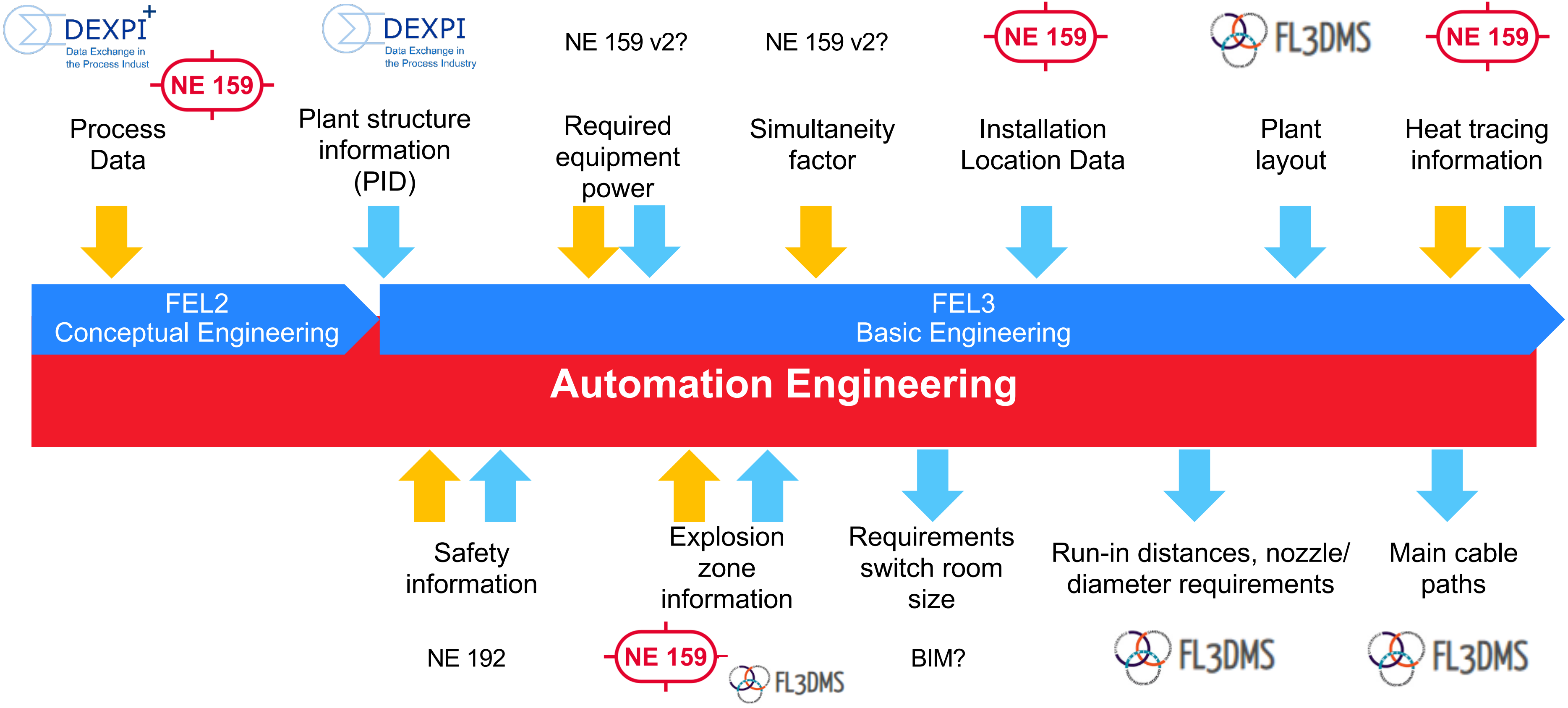
Sitz des Vereins: Leverkusen Eintragung: Amtsgericht Köln, VR 18371

Integrated Automation Engineering (FEL2+FEL3) alignment with process engineering

NAMUR



DEXPI+ Data Exchange in the Process Indust
NE 159
Process Data

DEXPI Data Exchange in the Process Industry
Plant structure information (PID)

NE 159 v2?
Required equipment power

NE 159 v2?
Simultaneity factor

NE 159
Installation Location Data

FL3DMS
Plant layout

NE 159
Heat tracing information

FEL2
Conceptual Engineering

FEL3
Basic Engineering

Automation Engineering

Safety information
NE 192

Explosion zone information
NE 159
FL3DMS

Requirements switch room size
BIM?

Run-in distances, nozzle/ diameter requirements
FL3DMS

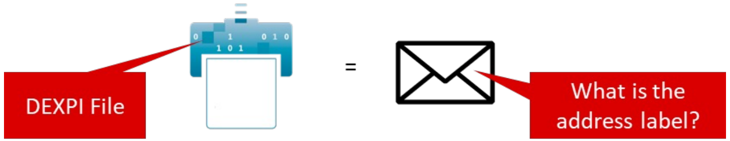
Main cable paths
FL3DMS

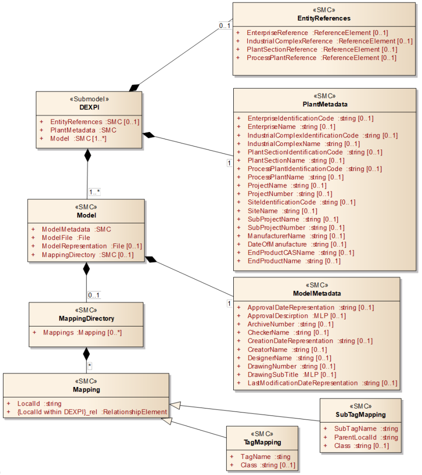
DEXPI has been implemented as submodel of AAS

DEXPI® Data Exchange in the Process Industry

Use Case 1: Handover of DEXPI Models for P&D Diagrams

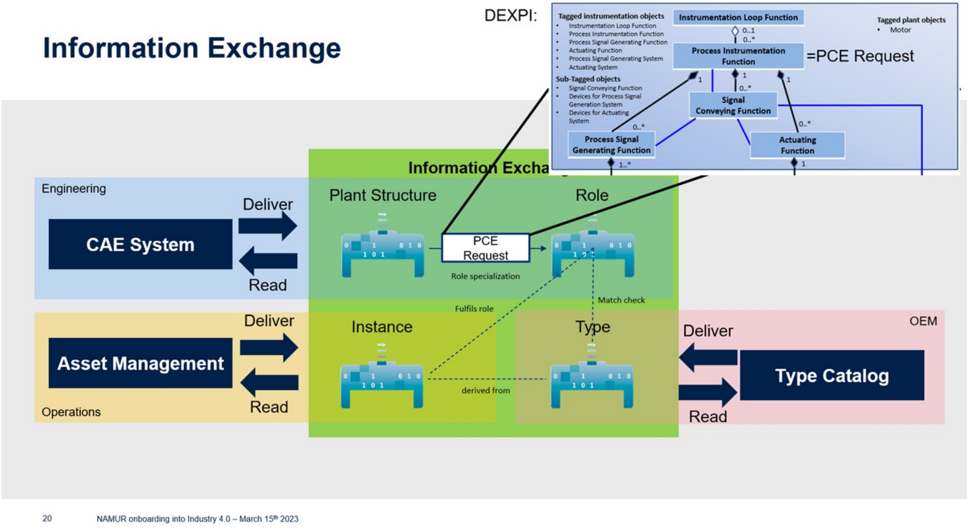
- Challenge is how to specify the identity of the P&ID and the asset it is referring to


DEXPI File
0 1 0 1 0 1 0 1
=
What is the address label?


«SMC»
EntityReferences
+ EnterpriseReference :ReferenceElement [0..1]
+ IndustrialComplexReference :ReferenceElement [0..1]
+ PlantSectionReference :ReferenceElement [0..1]
+ ProcessPlantReference :ReferenceElement [0..1]
0..1
«Submodel»
DEXPI
+ EntityReferences :SMC [0..1]
+ PlantMetadata :SMC
+ Model :SMC [1..*]
«SMC»
PlantMetadata
+ EnterpriseIdentificationCode :string [0..1]
+ EnterpriseName :string [0..1]
+ IndustrialComplexIdentificationCode :string [0..1]
+ IndustrialComplexName :string [0..1]
+ PlantSectionIdentificationCode :string [0..1]
+ PlantSectionName :string [0..1]
+ ProcessPlantIdentificationCode :string [0..1]
+ ProcessPlantName :string [0..1]
+ ProjectName :string [0..1]
+ ProjectNumber :string [0..1]
+ SiteIdentificationCode :string [0..1]
+ SiteName :string [0..1]
+ SubProjectName :string [0..1]
+ SubProjectNumber :string [0..1]
+ ManufacturerName :string [0..1]
+ DateOfManufacture :string [0..1]
+ EndProductCASName :string [0..1]
+ EndProductName :string [0..1]
1
1..*
«SMC»
Model
+ ModelMetadata :SMC
+ ModelFile :File
+ ModelRepresentation :File [0..1]
+ MappingDirectory :SMC [0..1]
«SMC»
ModelMetadata
+ ApprovalDateRepresentation :string [0..1]
+ ApprovalDescirption :MLP [0..1]
+ ArchiveNumber :string [0..1]
+ CheckerName :string [0..1]
+ CreationDateRepresentation :string [0..1]
+ CreatorName :string [0..1]
+ DesignerName :string [0..1]
+ DrawingNumber :string [0..1]
+ DrawingSubTitle :MLP [0..1]
+ LastModificationDateRepresentation :string [0..1]
1
0..1
«SMC»
MappingDirectory
+ Mappings :Mapping [0..*]
*
«SMC»
Mapping
+ LocalId :string
+ {LocalId within DEXPI}_rel :RelationshipElement
«SMC»
SubTagMapping
+ SubTagName :string
+ ParentLocalId :string
+ Class :string [0..1]
«SMC»
TagMapping
+ TagName :sting
+ Class :string [0..1]

Use Case 2

Using plant model (P&ID) to specify roles/ requirements for all assets


Information Exchange
DEXPI:
Tagged instrumentation objects
Instrumentation Loop Function
Process Instrumentation Function
Process Signal Generating Function
Actuating Function
Process Signal Generating System
Actuating System
Sub-Tagged objects
Signal Conveying Function
Devices for Process Signal Generation System
Devices for Actuating System
Instrumentation Loop Function
0..1
0..*
Process Instrumentation Function
=PCE Request
1
1
0..*
1
Signal Conveying Function
0..*
0..*
Process Signal Generating Function
Actuating Function
1..*
1
Tagged plant objects
Motor
Engineering
CAE System
Deliver
Read
Information Excha
Plant Structure
Role
PCE Request
Role specialization
Fulfils role
Match check
Operations
Asset Management
Deliver
Read
Instance
Type
derived from
OEM
Deliver
Type Catalog
Read
20
NAMUR onboarding into Industry 4.0 – March 15th 2023

Main areas of alignment and follow up planning

Areas and actions

DEXPI® Data Exchange in the Process Industry

O/O
Process with
activities &
streams

- DEXPI+ (Process Model)
  - Integrate feedback on DEXPI+ 1.0 Standard
  - Develop a DEXPI 2.0 standard integrating process model (DEXPI+) and plant model (DEXPI 1.4)
  - Establish DEXPI 2.0as process/plant model in the AAS;

O/O or EPC
Plant
with functional &
physical objects

- DEXPI (Plant Model) and Asset Lifecycle Model alignment with other initiatives
  - Align Automation Engineering requirements with DEXPI/DEXPI+; NAMUR working group
  - Contribute to CFIHOS RDL working group and to ISO15926 Part 14 project MRAIL
  - USPI project “Tagging” and “FL3DMS”

O/O
Asset as
physical object &
actual individual

Vendor
Product
as physical object &
actual individual

- Alignment on content (attributes, specification)
  - Relevant associations – initiate working groups:
    - JIP33, CFIHOS, ECLASS, IEC (61987/CDD), VDMA, ISO15926 (only classes), ISO 15926 part 14, NAMUR; BIM
    - Areas of alignment:
      - Apparatus/Machines/Piping
      - Automation/Instrumentation
      - Electrical Equipment

PIDMIC 3.0
Achema June, 11th/12th,
2024

First-in-its-class Integrated Modularisation and Digital Twin Approach to realise a Next-Gen Production and Testbedding Platform

MODULARISATION

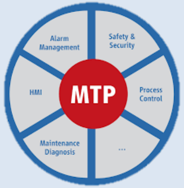
(image) Courtesy of GSK & Zeton

Multi-level modularisation

- Modular Plant
- Process Equipment Assembly
- Functional Equipment Assembly
- Components

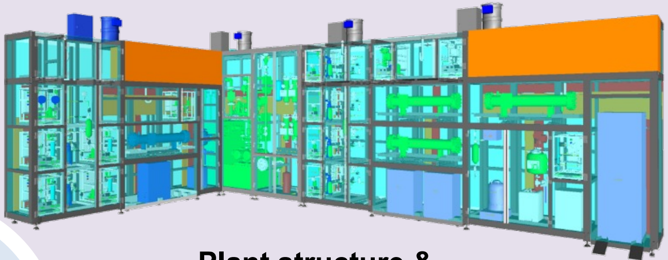
Plug & Produce Modular Automation

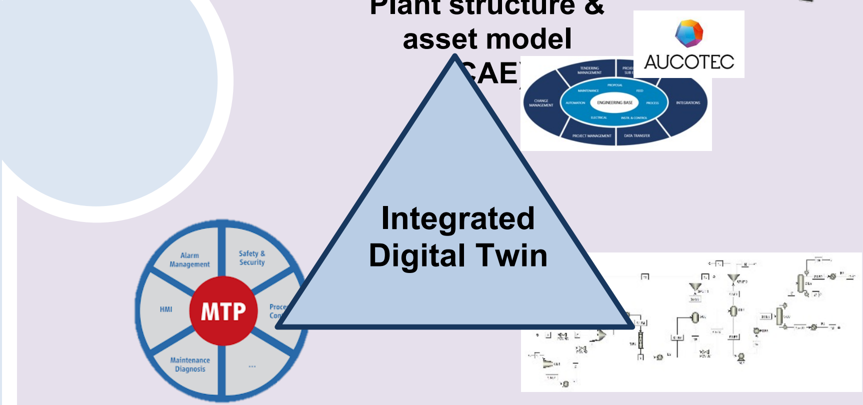
Module Type Package (MTP)


Alarm Management
Safety & Security
HMI
MTP
Process Control
Maintenance Diagnosis
...

DIGITALISATION

(image) Courtesy of GSK & Zeton




AUCOTEC
TENDERING MANAGEMENT
CHANGE MANAGEMENT
PROPOSAL
MAINTENANCE
FEED
AUTOMATION
ENGINEERING BASE
PROCESS
INTEGRATIONS
ELECTRICAL
INSTR. & CONTROL
PROJECT MANAGEMENT
DATA TRANSFER
Alarm Management
Safety & Security
HMI
MTP
Maintenance Diagnosis
...

Plant structure & asset model CAE)

Integrated Digital Twin

Operation Model (Automation)

Process Behaviour Model (Simulation)

DEXPI®
Data Exchange in
the Process Industry

DEXPI
- the Entry into Asset Lifecycle Information Management

Thank you for your attention!

Q & A