DEXPI Data Exchange in the Process Industry

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DEXPI Data Exchange in the Process Industry

- Common view on the plant lifecycle in the Process Industry
- Need of classification standards instead of coding standards
- Alignment between different standards: ISO, IEC, …

2023-06-15

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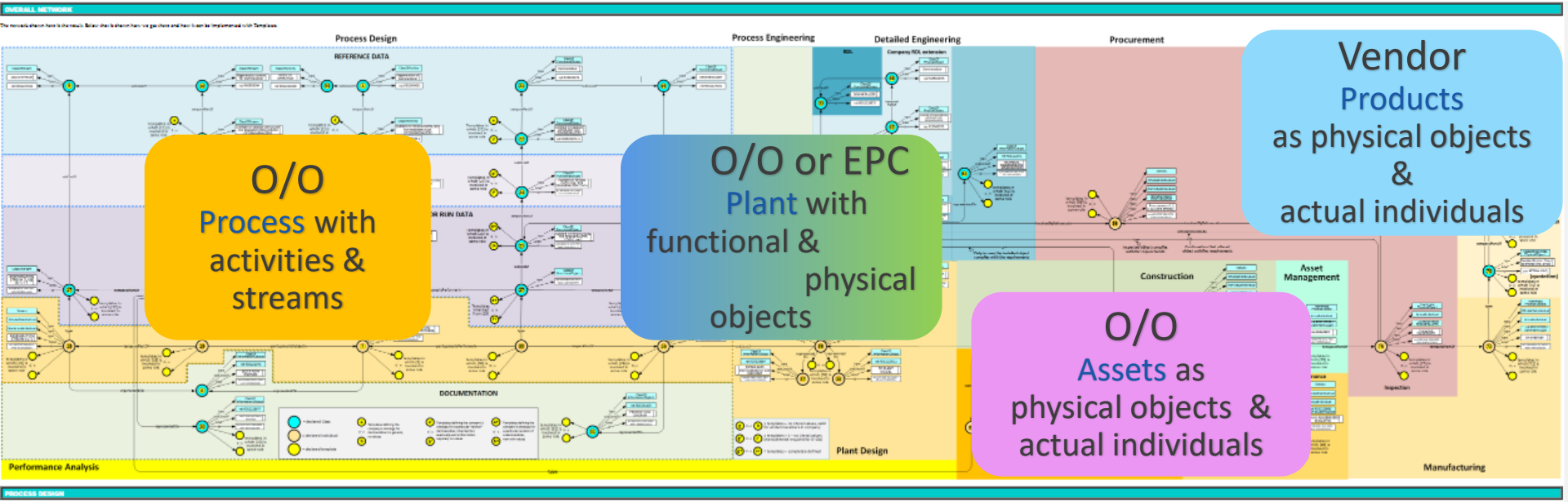
Plant lifecycle view in the Process Industry

ISO 15926 Lifecycle stages network model with pump example



PUMPING
as a process step

PUMP and CENTRIFUGAL PUMP
as a plant object

A CENTRIFUGAL PUMP
as an installed object

CENTRIFUGAL PUMPs,
which can be **bought**

DEXPI lifecycle model – 3 structures, 4 aspects

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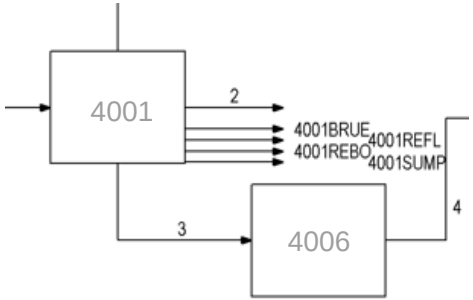
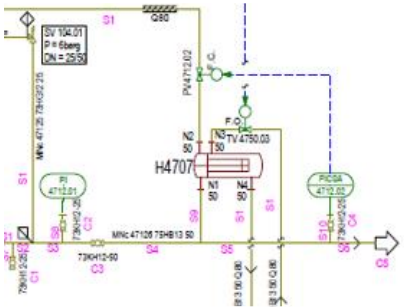
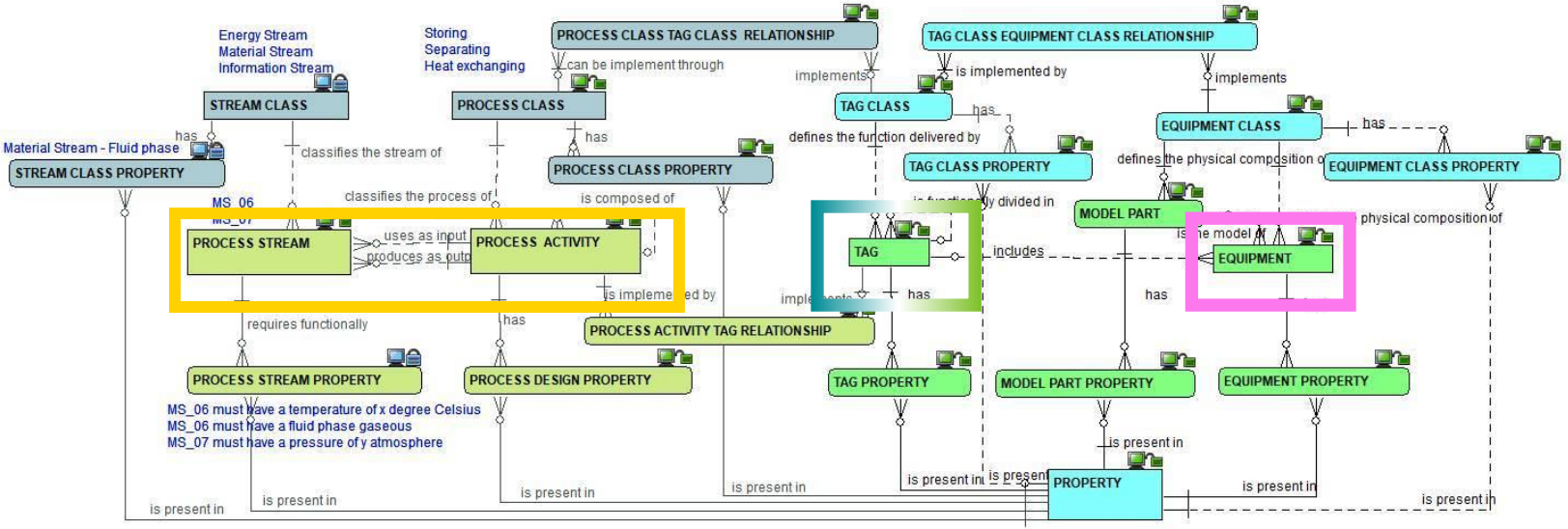
Functional Requirements → **Functional Design** → **Asset Specification** → **Asset in Operation**





Process Structure | **Plant Structure** | **Asset Structure**

Lifecycle in CFIHOS data model 1.5



- Tags, Equipments, Model parts
- Process was added

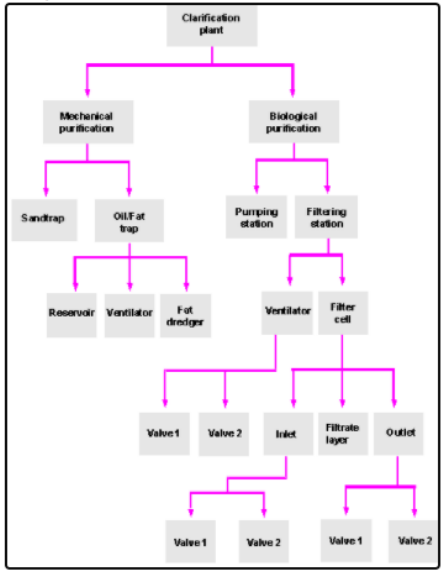
SAP Plant Maintenance

Functional location

Definition

The business object functional location is an organizational unit within Logistics, that structures the maintenance objects of a company according to functional, process-related or spatial criteria. A functional location represents the place at which a maintenance task is to be performed.

Example of a Function Location: Clarification Plant

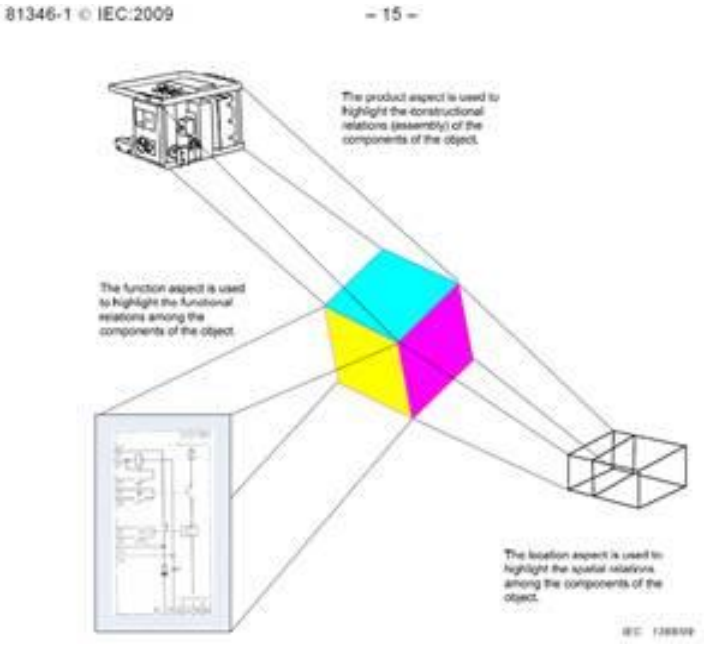


Equipment

Definition

The business object "Equipment" is an individual, physical object that is to be maintained independently. It can be installed in a technical system or part of a technical system.
You can manage all types of device as pieces of equipment (for example, production utilities, transportation utilities, test equipment, production resources/tools, buildings, PCs).
Since many of these physical objects are managed as "assets" in Asset Management, the term "piece of equipment" was chosen for objects defined from a technical perspective, in order to avoid confusion with the activated tangible assets.
You define and manage each piece of equipment in the *Plant Maintenance (PM)* System in a separate master record and can set up an individual maintenance history for each one.

ISO / IEC 81346 – lifecycle approach



Major aspects

- function
- product
- location

ISO 15926 part 11 - Simplified industrial usage of reference data based on RDFS methodology

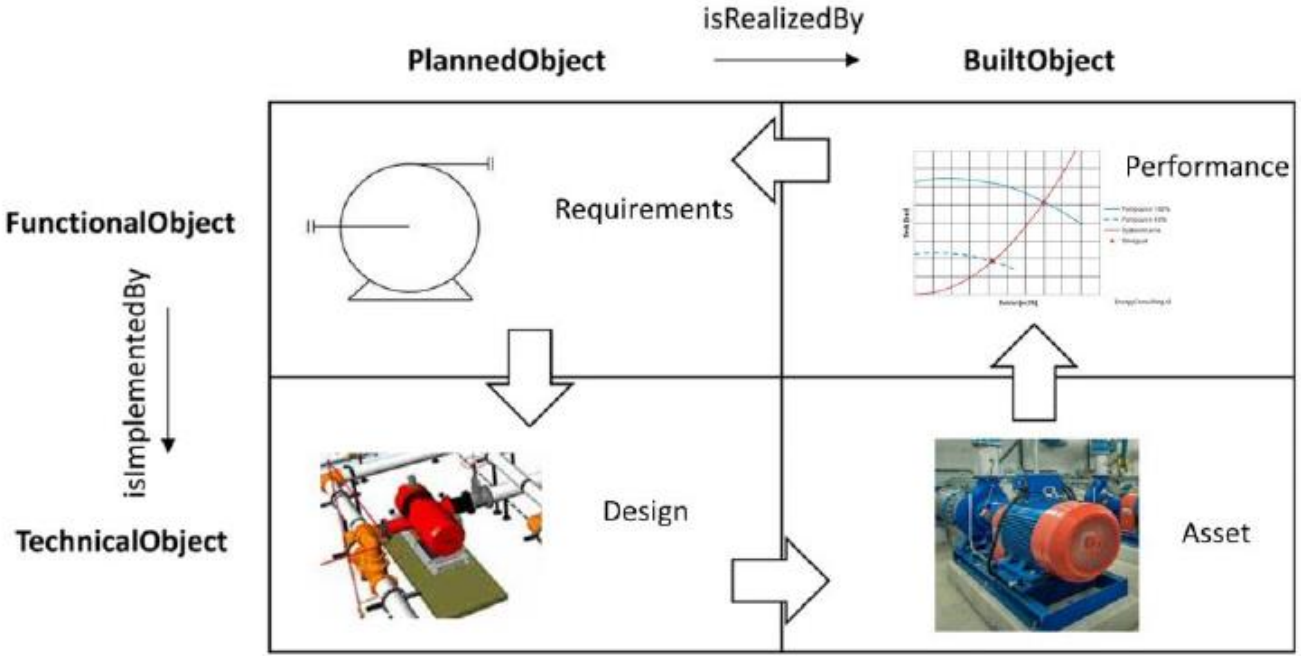
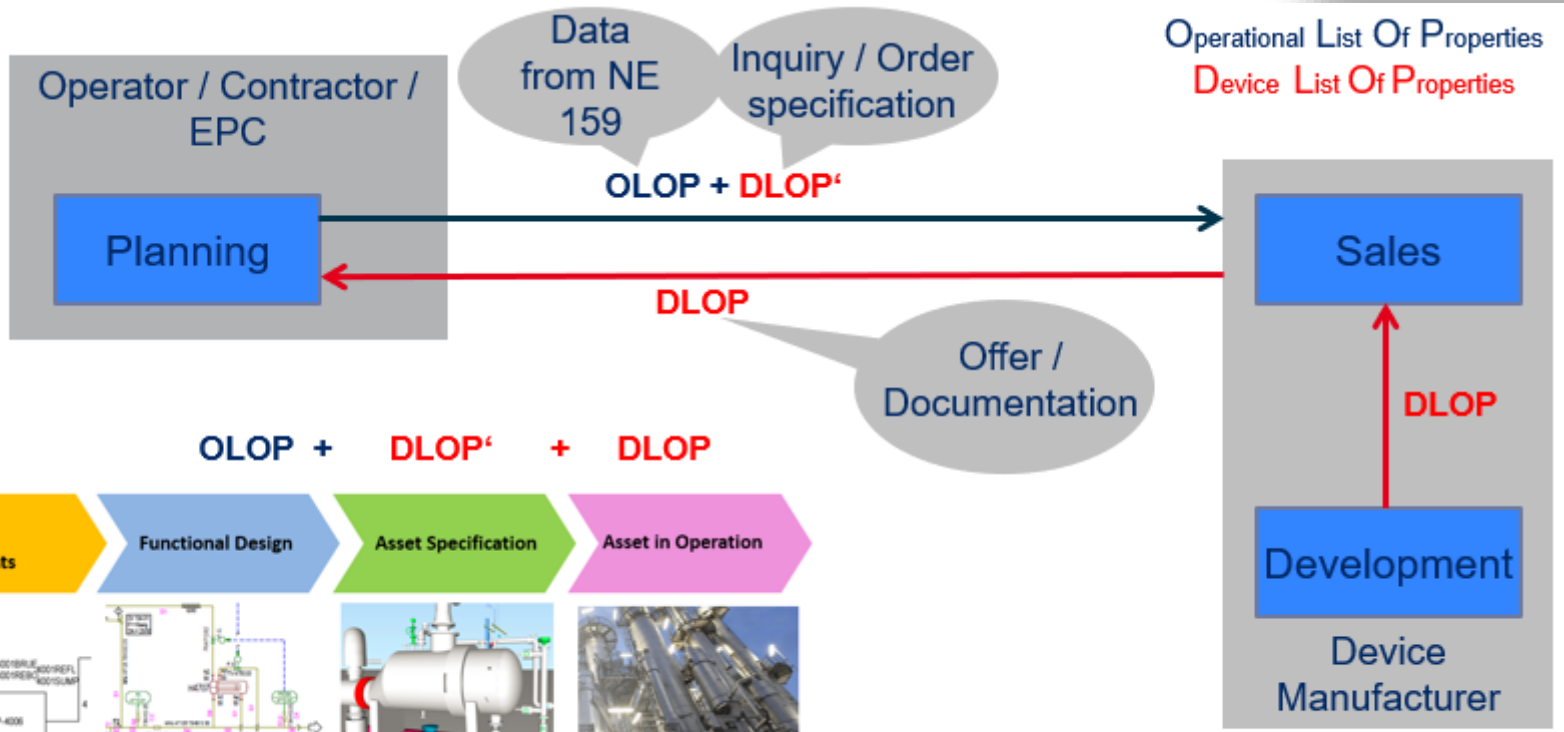
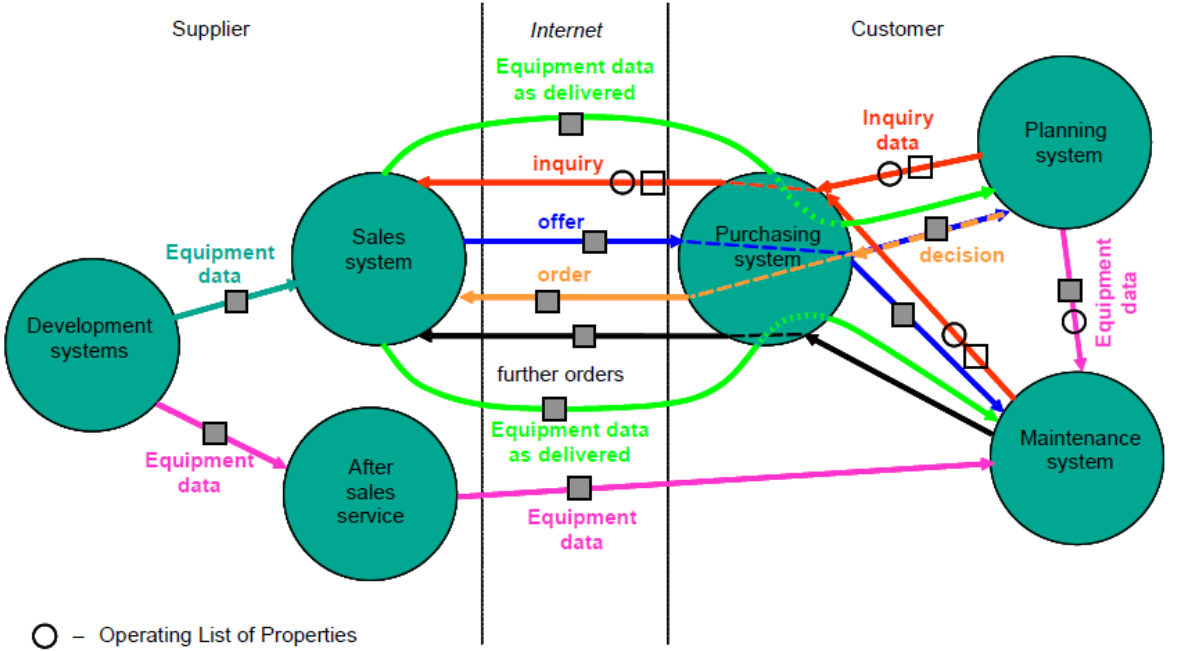


Figure 5 – Fundamental lifecycle quadrants supporting Systems Engineering

IEC 61987 – lifecycle approach

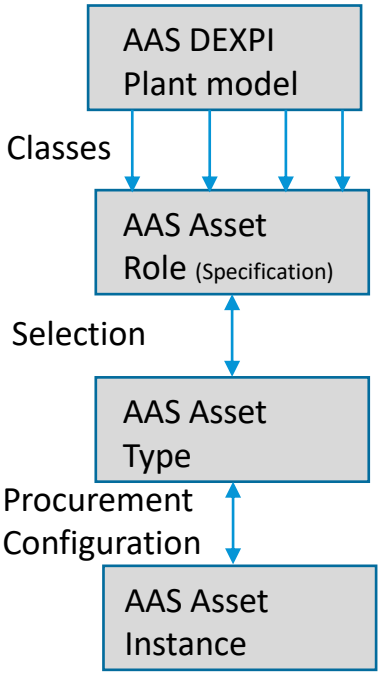


Using AAS DEXPI-Plant Model to manage detail engineering and procurement process



From IEC 61987 part 10

Figure C.4 – Data exchange throughout the life-cycle of a device



Location structure via BIM - IFC

- Enterprise
  - Site
    - Building
      - Storey
        - Room
          - …
    - x, y, z coordinates

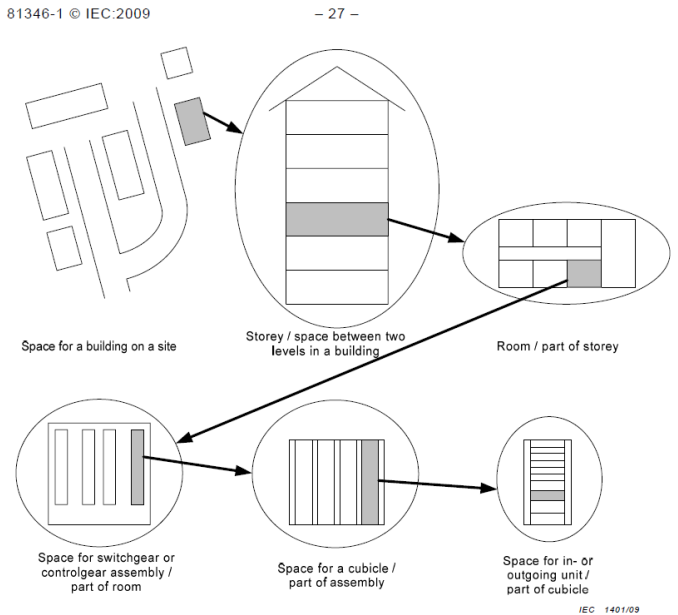
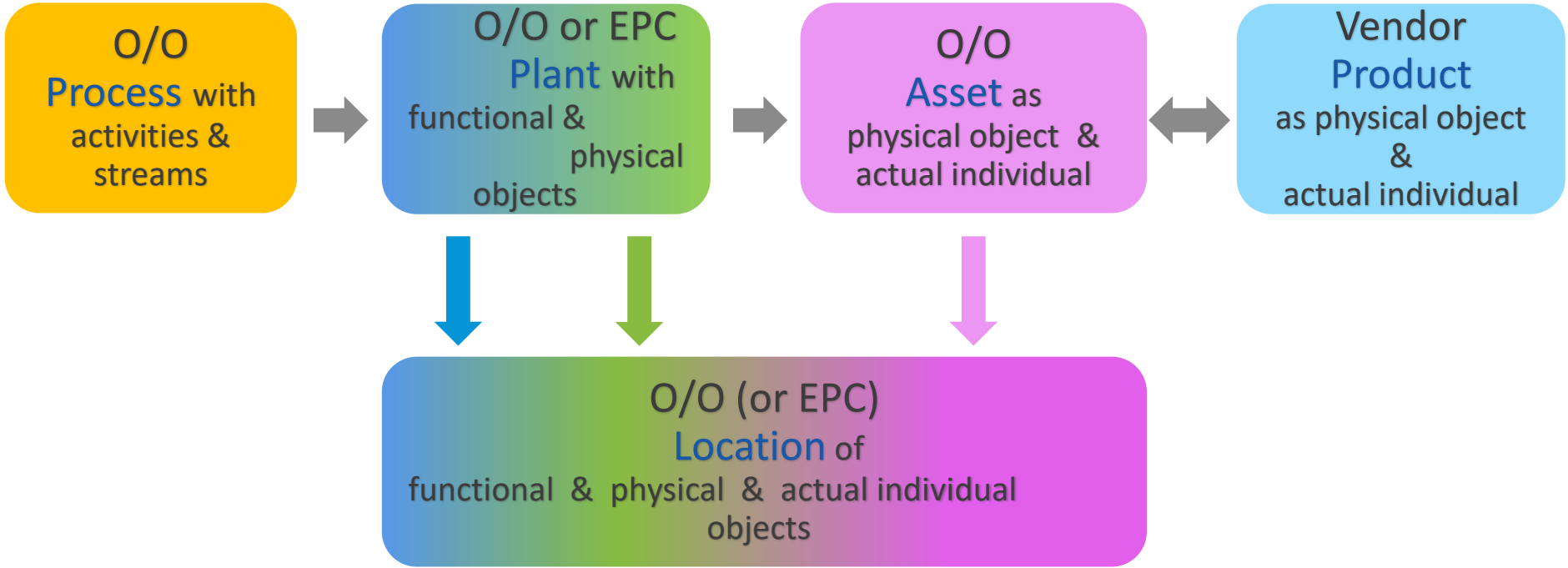


Figure 16 – Illustration of a location-oriented structure

A common view!?



Conclusion: Plant lifecycle view in the Process Industry

Many standards fit together:

- ISO 15926 Lifecycle Model
- CFIHOS
- DEXPI
- SAP/PM
- …

ISO 15926 part 11 fits nearly with the standards above

ISO / IEC 81346 has only two aspects (function and product) for 4 structures and is not aligned with the standards above

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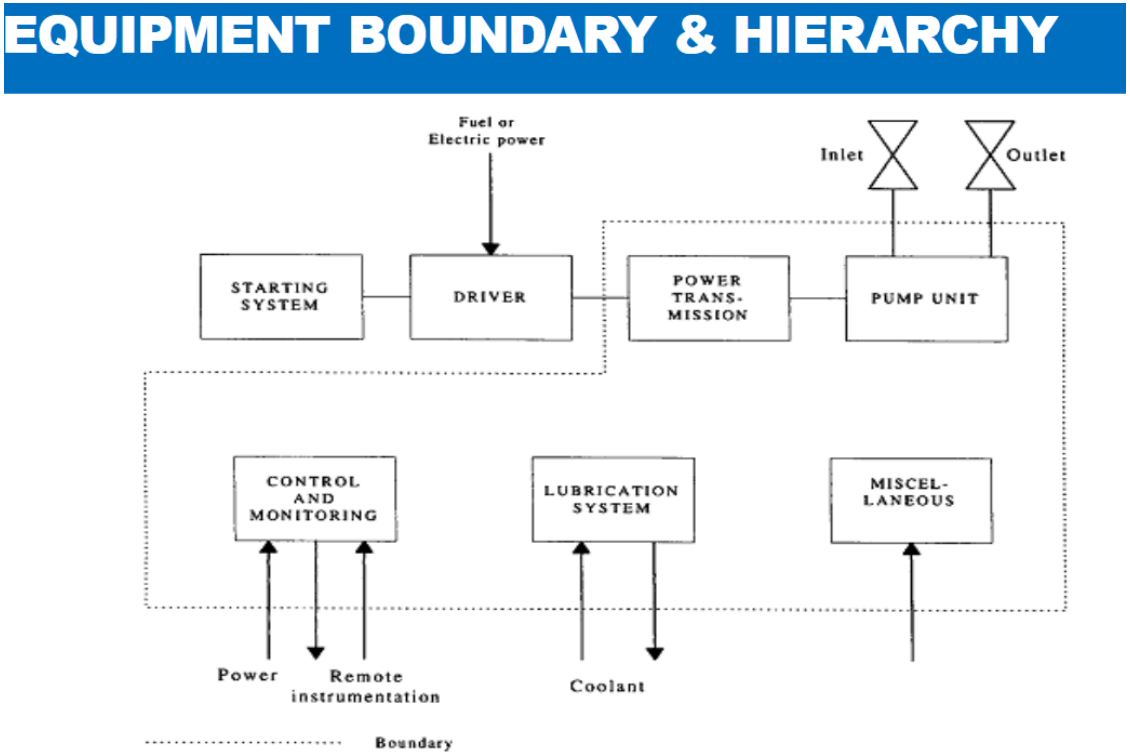
Classification and coding - 2 examples

Classification instead of coding: example 1: ISO 14224



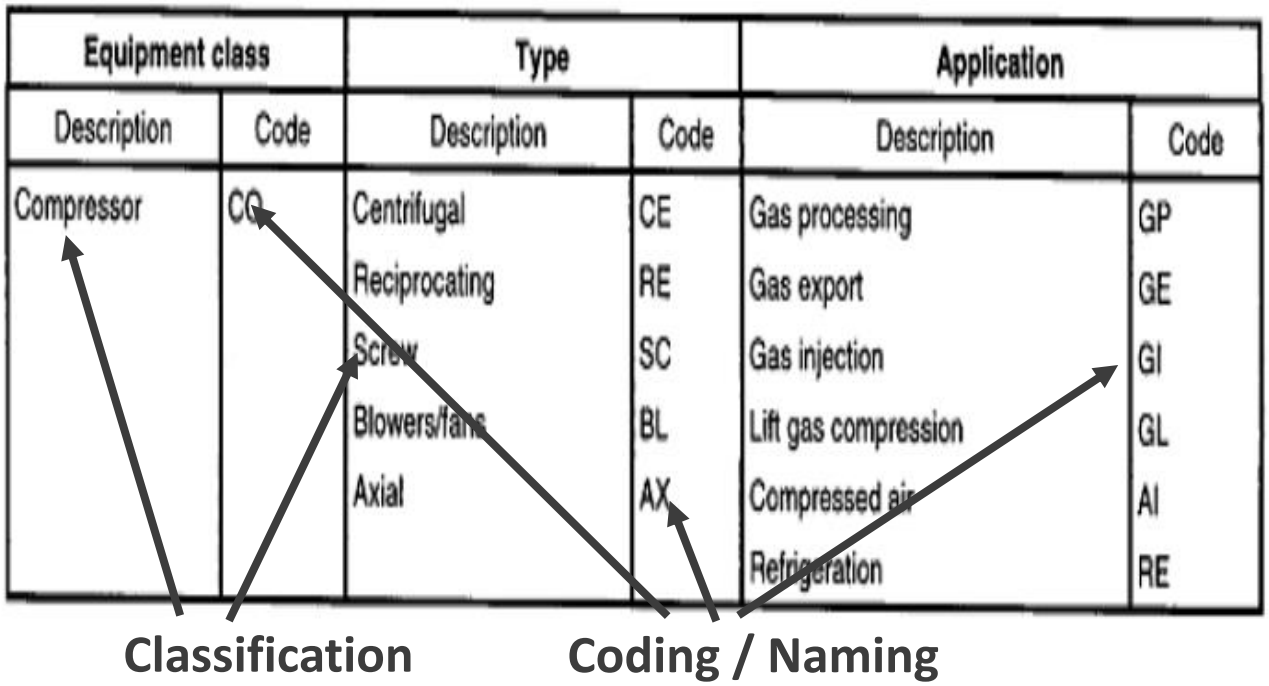
Pump boundary diagram

Important boundary and maintainable item concepts

Classification and coding: example 1: ISO 14224

TAXONOMY CLASSIFICATION: COMPRESSOR

Equipment class		Type		Application	
Description	Code	Description	Code	Description	Code
Compressor	CO	Centrifugal	CE	Gas processing	GP
		Reciprocating	RE	Gas export	GE
		Screw	SC	Gas injection	GI
		Blowers/fans	BL	Lift gas compression	GL
		Axial	AX	Compressed air	AI
				Refrigeration	RE



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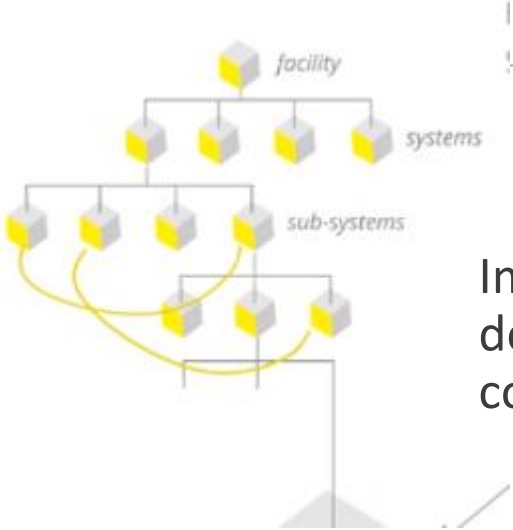
Classification and coding: example 2: ISO / IEC 81346

International Standard IEC/ISO 81346 series "Industrial systems, installations and equipment and industrial products – structuring principles and reference designations" [1] defines the rules for reference designation systems (RDS). It is published as a double logo standard prepared by IEC technical committee 3: Information structures and elements, identification and marking principles, documentation and graphical symbols,[2] in cooperation with ISO technical committee 10: Technical product documentation. The 81346 series replaces the deprecated IEC 61346:1996.

Contents [edit]

- Part 1: Basic rules (IEC 81346-1:2022) [3]
- Part 2: Classification of objects and codes for classes (IEC 81346-2:2019) [4][5]
- Part 10: Power Systems (ISO/IEC 81346-10:2022) [6][7]
- Part 12: Construction Works (ISO/IEC 81346-12:2018) [8]



Important decomposition concept

Classification and coding: example 2: ISO / IEC 81346

IEC 81346-2:2019

Industrial systems, installations and equipment and industrial products — Structuring principles and reference designations — Part 2: Classification of objects and codes for classes

Abstract

Preview

IEC 81346-2:2019 establishes classification schemes with defined object classes and their associated letter codes, and is primarily intended for use in reference designations and for designation of generic types. The classification schemes are applicable for objects in all technical disciplines and all branches of industry. IEC 81346-2:2019 is a horizontal publication also intended for for use by technical committees in preparation of publications related to reference designations in accordance with the principles laid down in IEC Guide 108. IEC 81346-2:2019 cancels and replaces the first edition published in 2009. This edition constitutes a technical revision. This edition includes the following significant technical changes with respect to the previous edition: a) The entry classes of the classification scheme have been defined to reflect the "inherent function" of the object classified; b) The classes are defined to align with the principles of ISO 22274 and ISO 704; c) A three-level classification scheme has been defined, which provides a greater flexibility for the designer in some technical fields; d) Classes are defined by their definition and provided with a preferred term. Examples are provided if needed; e) A separate classification scheme for spaces has been provided.

Kennbuchstabe	Funktion (nach IEC 81346-2)	Beispiele für Begriffe, die die Funktion von Objekten beschreiben	Beispiele für typische Komponenten nach ihrer inhärenten Funktion (Anwendung im Produktaspekt)
F	Schutz vor den Auswirkungen gefährlicher oder unerwünschter Bedingungen Einschließlich Systeme und Ausrüstung für Schutzzwecke Schutzgeräte siehe Kennbuchstabe B.	Absorbieren Bewachen Verhindern Schützen Sichern Bewehren	Abschirmung Berstplatte Brandschutzwand Fehlerstromschutzschalter Kathodischer Korrosionsschutz Leitungsschutzschalter Ölausdehnungsgefäß Schutzgitter Sicherheitsventil Sicherung thermischer Überlastauslöser Überspannungsableiter Überspannungsbegrenzer Überwachungsanlage Varistor
G	Initiieren eines steuerbaren Flusses	Erzeugen	Aufzug Brennstoffzelle Generator Kran Lüfter Primärbatterie (nicht wiederaufladbar) Pumpe Signalgenerator Solarzelle
H	Behandeln von Material oder Stoffen	Montieren Brechen Demontieren Zerkleinern Material abtragen Mahlen Mischen Herstellen Pulverisieren Urformen	3D-Drucker Abscheider Elektrolyseur Elektrostatischer Filter Geschirrspüler Mischer Montageroboter Mühle Zentrifuge

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Coding / Naming

Classification

Classification and coding

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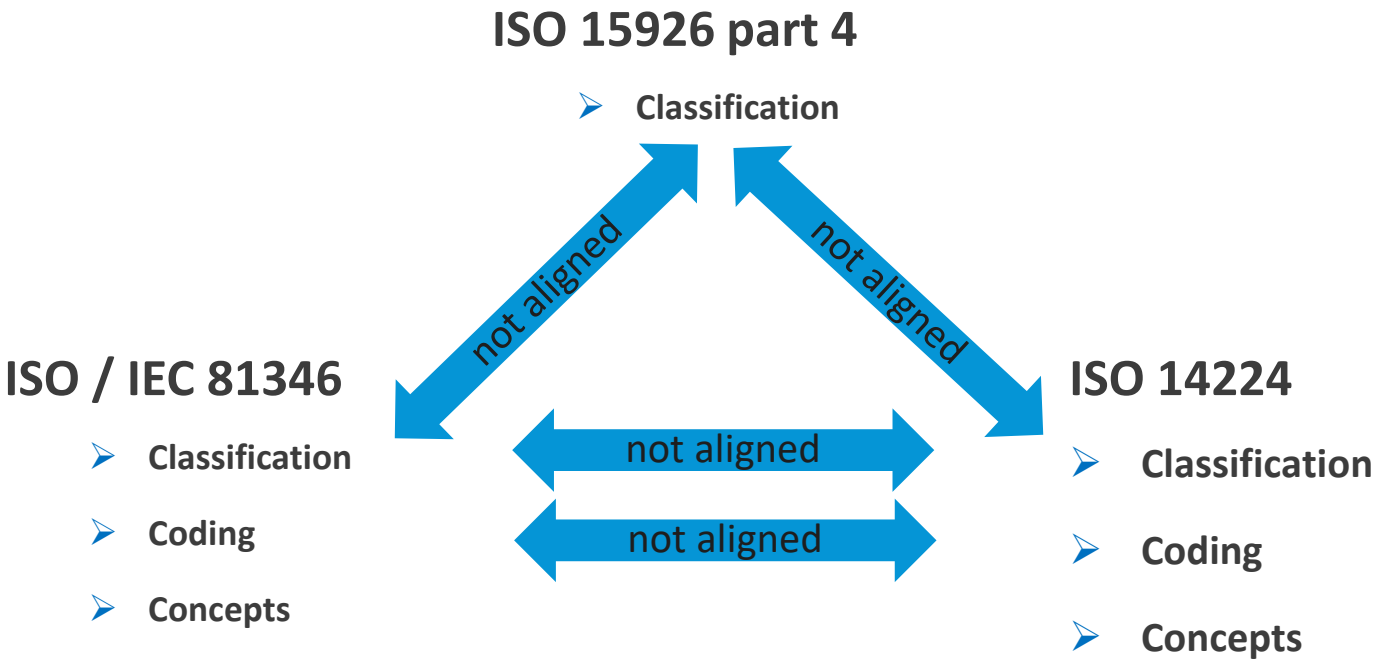

Coding standards

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- Every plant needs a coding standard
- Every company should have one for new plants
- A coding standards supports the engineers

-

- Many companies have plants with different coding standards
- It is a big challenge to implement and maintain coding standards in software
- Coding standards are often language dependant
- There are many incompatible coding standards

- Aligned classification standards are the future

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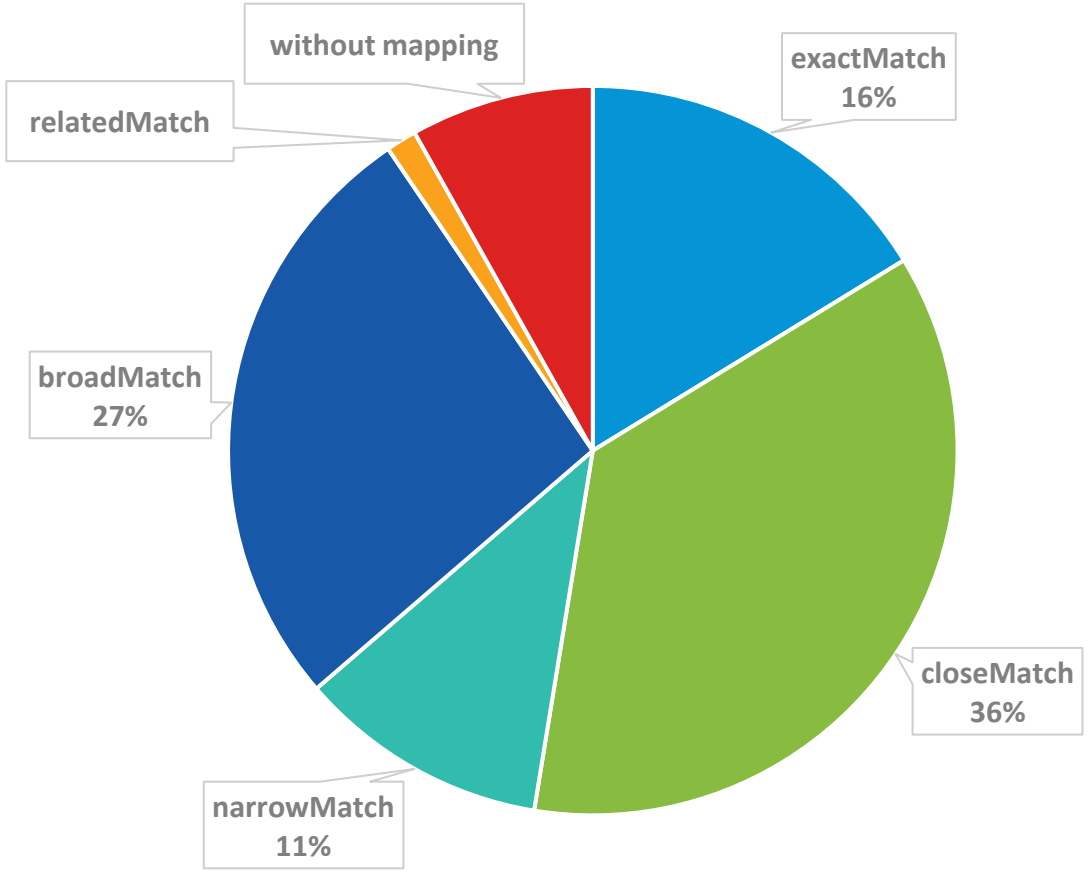
Alignment between different standards: ISO, IEC, … -

3 examples

SKOS mapping results between IEC 61987 and ISO 15926 (result of a project in 2022)

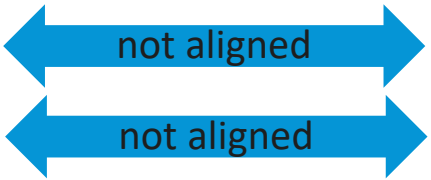


Not good enough for daily work

Alignment between ISO / IEC 81346 and ISO 14224

ISO / IEC 81346

- **Classification**
- **Coding**
- **Concepts**



ISO 14224

- **Classification**
- **Coding**
- **Concepts**

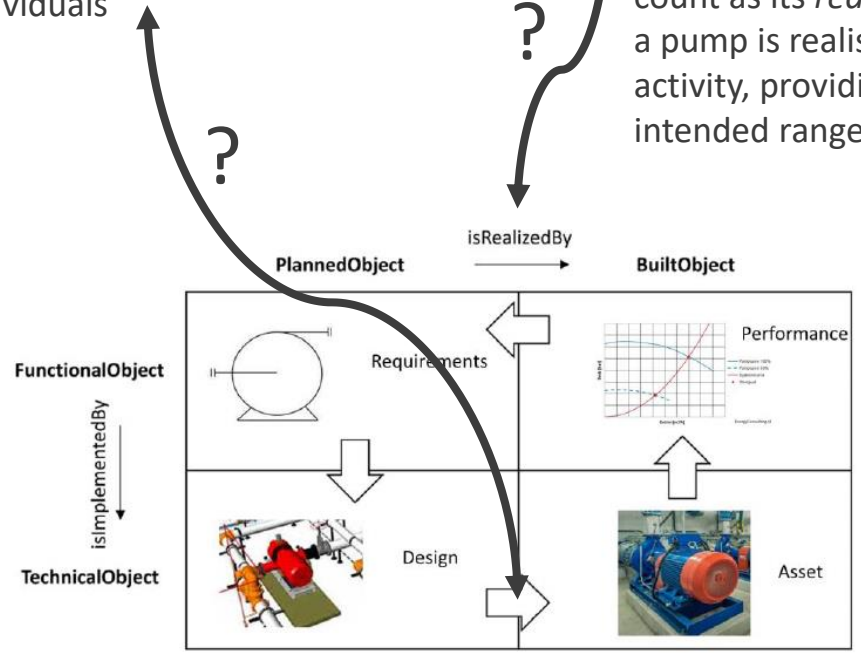
Alignment between ISO 15926 part 11 and IDO ISO ?????

IDO:

installedAs
relation between a specification individual and concrete installed individuals

realizedIn
…, we characterise a disposition (resp., capability; function) of an object by the kinds of *activities* that count as its *realisations*. For example, the function of a pump is realised when it participates in a pumping activity, providing pressure increase within the intended range

Part 11:



They should fit together

Conclusion

To enable
digitalization and interoperability
the Process Industry needs
aligned and global standards

Several standards have to be revised
(or partly withdrawn)
to get on a higher level,
e.g. to leave the coding level and
support a global classification level