

Standardization of Product Data Exchange

Modelling the full product lifecycle using Information Modelling Framework on a gearbox example

IMF

Information Modelling Framework (IMF) is being developed as an engineering friendly method to model engineered systems and assets. IMF aims to bridge the gap between ontologies and industrial system data by

- Implementing ISO/IEC 81346-1 in RDF
- Explicitly representing aspects (function, product, location) of the asset along its lifecycle
- Using ontology vocabularies in definition of types
- Alignment with Industrial Data Ontology (former ISO 15926-14)

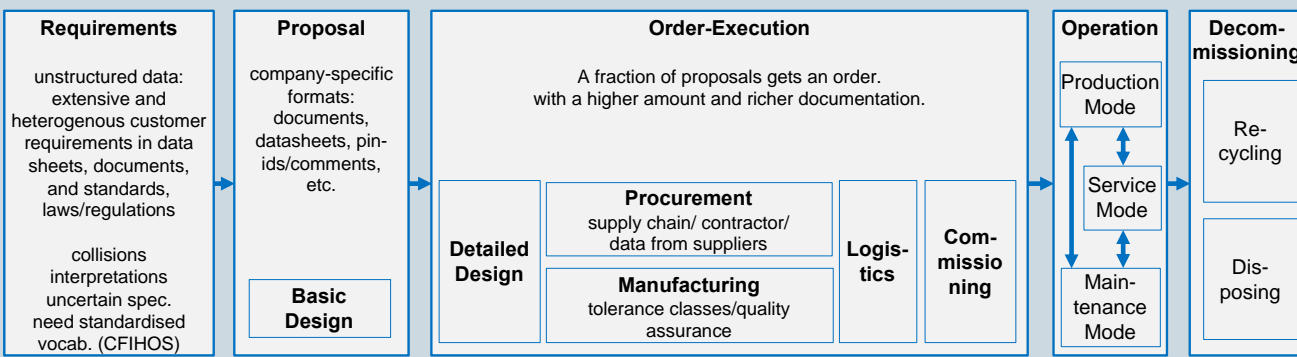
1 Today's challenges

Transformation/Ambiguity issues (Consolidation): Technical information is exchanged without shared semantics and data structures, often using unstructured documents or datasheets: both between companies (clients and suppliers) and internal teams, many different formats need to be unified

Long value-chain information lost (Provenance): e.g., numerous copies of the same data fields, many intermediate steps: lack of transparency and data quality

Integrity issues (Automation): manual requirement verification, which is error-prone

Siemens Energy: "Business suffers from data quality issues such as: unknown data validity and tolerance ranges, inconsistent, incomplete or inaccessible and siloed data"

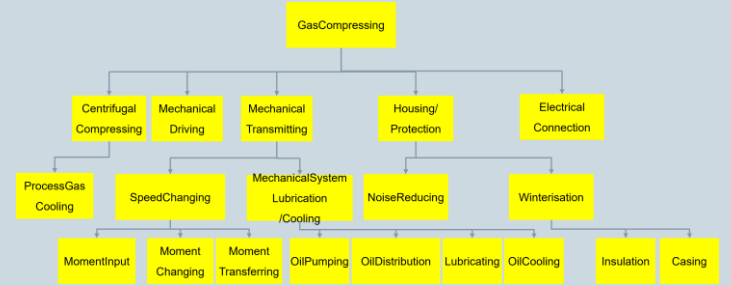


2 Gearbox example

A gearbox is a common component of a turbo-compressor train, interconnected with many other components, supplied by external suppliers and incorporated into solutions provided by Siemens Energy

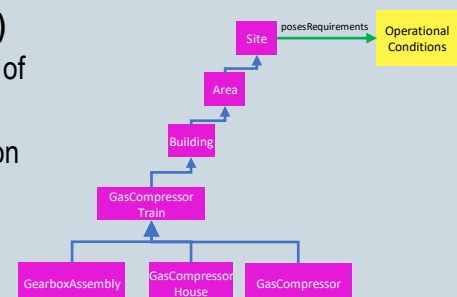
Function Aspect (excerpt)

Functional requirements are defined by the client.



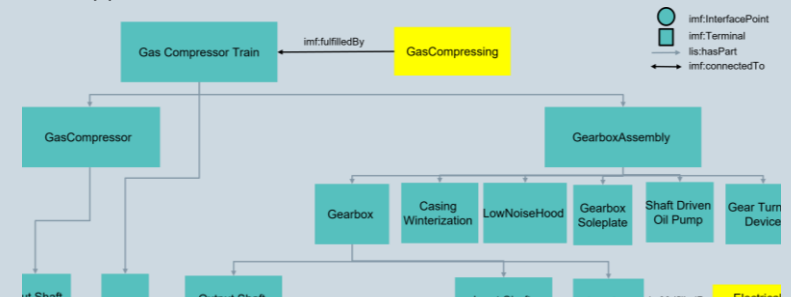
Location Aspect (excerpt)

Locations are descriptions of the customer site and the product spatial extension and pose requirements to operational conditions and spatial relations.

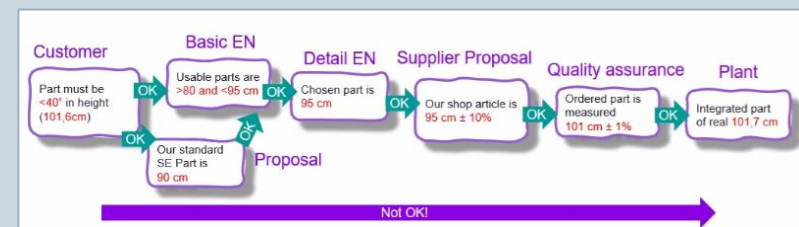


Product Aspect (excerpt)

Product assembly breakdown fulfilling the requirements defined by the supplier:



Attributes with specified values and ranges are attached to the aspect objects. Preserving information across the attribute lifecycle is essential in quality assurance.



3 Shared semantics

- Semantics of objects, relations, and attributes is defined in shared IMF models and ontologies, between the stakeholders: clients, Siemens Energy, suppliers
- These also include standardized specifications, such as attribute qualifiers, description of a product lifecycle and milestones, solution documentation
- Reasoning and data validation are done using OWL reasoners and SHACL engines

"With good data quality and standardized data models, we could reduce non-conformance cost, improve productivity (less time spent on search and confirmation) in projects, increase application and data re-use in IT and administration, shorten cycle time of projects, and improve reaction times to third parties."

4 Outlook

- IMF provides "lingua franca" between organizations
- Different pieces of tooling available
 - Mimir, Tyle (by Equinor) as starting point as user interface
 - DoE (by Siemens Energy) for ontology administration
- End-to-End tooling awaits development
- Shared ontologies mapped to standards needed
- An ecosystem of industrial information modelling is being built

