The CEN ORCHID Roadmap

Standardising Information in the Plant Engineering Supply Chain

Implementation Guide
Overview

Key Implementation Steps for Information Standardisation

STEP 1:
Understand key standardisation principles and the information standards relevant to the business

STEP 2:
Assess the company's position on the CEN ORCHID Roadmap

STEP 3:
Establish realistic targets for where the company wants to be on the CEN ORCHID Roadmap

STEP 4:
Plan and implement improvement measures

Quick Wins

ORCHID Contacts
The ORCHID (Orchestration of Industrial Data) Group is a network of European companies and consortia dedicated to standardising information across the process industry engineering supply chain to build competitive advantage.

This document is a simple guide for companies on how to standardise and exchange plant engineering information. It aims to help companies achieve the following benefits of standardisation:

- More reliable plants
- Improved safety and environmental performance
- Faster time to market
- Lower costs
- Greater flexibility

The overall goal is to progress the industry toward the following vision of “interoperability”:

“Companies in process industries shall be able to share and/or exchange electronically the information needed to design, build, operate and maintain process and power plants using internationally accepted standards.”

The key implementation steps are:

**STEP 1**
Understand key standardisation principles and the information standards relevant to the business

**STEP 2**
Assess the company’s position on the CEN ORCHID Roadmap

**STEP 3**
Establish realistic targets for where the company wants to be on the CEN ORCHID Roadmap

**STEP 4**
Plan and implement improvement measures

The practical steps outlined in this document are based directly on the CEN ORCHID Roadmap, which is described in detail on the CEN website.
Step 1: Understand Key Standardisation Principles and Information Standards Relevant to your Business

**Key Principle 1: Agree and Document Core Internal Business Activities and Processes**

Companies need to codify and standardise internal business activities and processes as the first step towards standardising information for exchange internally and externally. This step alone drives significant cost reduction and efficiency improvements before any information standardisation activity is undertaken.

The CEN ORCHID Group recommends the PISTEP Activity Model in Figure 1 below to help identify the information types that are usually exchanged at each stage of activity across the plant lifecycle.

Once this is done, companies can consult the CEN ORCHID Landscape of Information Standards to identify the relevant, internationally accepted standards to use at each stage of the PISTEP Activity Model. Companies, application developers, service developers and standards development groups, are encouraged to use existing standards to prevent proliferation of standards and reduce complexity (see Key Principle 2).

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**Figure 1: PISTEP Plant Engineering Activity Model.**

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Key Principle 2 - Always Use Internationally Accepted Standards Where They Exist

It is critical that, wherever possible, companies must use internationally accepted standards. There are more than 50 standards in use in the process and power industries and many more proprietary and company standards. It is therefore prudent for companies to adopt common standards in use rather than apply their own.

To identify the right standard, companies are encouraged to consult the CEN ORCHID Landscape of Information Standards.

In cases where no standards exist, companies should first define the principles they will apply to augment standards to bridge the gap to an existing standard. Subsequently, these additions should be passed on to standards organisations to help the industry progress towards common definitions.

Key Principle 3 - Agree on a Standardised Dictionary of Classes

Companies must agree a standardised dictionary of classes to ensure that specification and definitions used in internal and external data exchanges are completely unambiguous. This is particularly important because:

- Terminologies and definitions vary widely both within companies and externally
- Rigorous precision is needed to ensure the integrity and efficiency of assets
- Most exchanges today are digital, which means that data can only be shared accurately if class definitions are identical
- Mapping tables are often ineffective as one-to-one relationships are often impossible.

This rationale also applies to Key Principles 4, 5, and 6 on the content of information to be exchanged.
Key Principle 4 - Agree Standardised Attribute Definitions

Once the dictionary of classes is agreed, the definitions of “attributes” linked to those classes must also be agreed. This means having common definitions for the dimensions and properties of equipment. For example, this will include definitions for the capacity, throughput or maximum operating temperature of a pump. The level of granularity for these attributes will vary depending on the ultimate purpose of the information being exchanged, to ensure that technical and business needs are met. Companies need to agree the appropriate level of granularity for attributes to ensure that the information exchanged is clear and meets needs, without being unnecessarily detailed.

Key Principle 5 - Agree on Units of Measure

There are great variations within companies and between companies, sectors, and even geographies in the way that units of measure are used (mass, length and time). This results in unnecessary complexity and errors in information being shared. For example, capacity for a small pump may be measured in litres/minute, whereas a large capacity pump is measured in metres$^3$ per hour. In many cases, units of measure appear almost identical, but are actually quite different. For example, in the measurement of pressure, the use of absolute versus gauge can easily be misinterpreted. It is therefore vital that units of measure are standardised and agreed internally and externally.

The key to preventing misunderstanding is to provide clarity on what is requested/communicated, and to use common definitions/units of measure in the information exchange process.

Key Principle 6 - Agree on the Collection of Attributes for the Class to be Used For Any Given Activity

Once the attribute definitions are agreed, companies also need to agree the collection of attributes for the class to be used during the exchange of information. This is important because it narrows the potential universe of attributes that can be applied to an equipment class, based on the way that a stakeholder will use equipment.

Key Principle 7 - Agree on Additional Attributes for Use by Stakeholders Across the Supply Chain

Once small groupings of attributes are agreed (see Key Principle 6 above), it is also important for all other stakeholders to agree on the additional attributes they may require for their specific activities. In the pump example, when owner operators define their needs for electrical drives, then electrical manufacturer stakeholders need to agree their incremental attribute requirements. Quite separately, steam turbine manufacturers will need to agree their incremental attributes. These sub-sets of attributes can be integrated as required, rather than creating an unnecessarily large number of attributes from the outset.

Key Principle 8 - Agree on a Standardised Delivery Envelope for Exchanging Information

After information content elements have been agreed, the information delivery envelope (also known as the “mechanism for exchange”, or “hand-shake”) must be agreed. For example, companies or departments exchanging information need to decide whether they will both use XML for the exchange.

It is important to note that complex IT systems are not essential for effective information exchange. Most IT systems in use today have adequate functionality to accommodate information exchange.

In summary, companies will need to move from a multiplicity of naming conventions and formats for information to common and integrated classifications for information, based on internationally accepted standards.
Step 2 Assess the Company’s Position on the CEN ORCHID Roadmap

The ORCHID Roadmap Information Maturity Model in Figure 3 below helps companies identify stages of progression on information standardisation internally or externally.

![The ORCHID Roadmap Information Maturity Model](image)

**Figure 3: The ORCHID Roadmap Information Maturity Model.**
There are two aspects to assessing a company’s position. Firstly, identification of the one or more phases where the company is operating on the Roadmap (see Figure 3). Secondly, assessing the company’s progress or “maturity” within each of the above phases. This is done by evaluating the company on the following five business dimensions as they apply to management of information:

- Business Processes
- Strategic Alignment
- People and Organisation
- Plant Lifecycle Information
- ICT Technology & Infrastructure

See the tables on pages 6 and 7 for actions to drive improvements in these areas within each phase.

Companies should note that phases can and very often do overlap in time. Some activities associated with a certain phase are also prerequisites to the following phase. The maturity level associated with a phase is the subset of requirements of this phase, which in turn needs to be fulfilled before the next phase can reasonably be started.

Please note: assessment of a company’s level on the Roadmap and maturity within that level are qualitative and subjective assessments, based on the knowledge of those involved. The CEN ORCHID Roadmap phases and the maturity dimensions are in fact part of a continuum. They are guideposts to support progress, and should not be treated as having absolute boundaries.

### Actions to Drive Information Maturity Improvements within Each Internal Phase

<table>
<thead>
<tr>
<th>INTERNAL</th>
<th>Work Process Standardisation</th>
<th>Sub Process Optimisation</th>
<th>Internal Process Integration</th>
<th>External Process Integration</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BUSINESS PROCESSES</strong></td>
<td>Standardise processes across a department.</td>
<td>Standardise company-wide on best practice business processes.</td>
<td>Adopt a holistic approach on company-wide best practice business process standardisation. Optimise each process and interrelationships.</td>
<td>Agree and align the information to be exchanged, and the process for exchanging it.</td>
</tr>
<tr>
<td><strong>STRATEGIC ALIGNMENT</strong></td>
<td>Agree and align the information to be exchanged, and the process for exchanging it.</td>
<td>Complete standardisation and classification activities for the domain.</td>
<td>Complete cross company standardisation and classification activities.</td>
<td>Align classifications across the external interface and agree how to deal with exceptions.</td>
</tr>
<tr>
<td><strong>PEOPLE &amp; ORGANISATION</strong></td>
<td>Develop staff skills and competencies required to implement processes.</td>
<td>Build capabilities for process ownership and change management within the subprocess.</td>
<td>Ensure overall process ownership, and implement cross process governance processes.</td>
<td>Clearly define roles and responsibilities for internal and external information management.</td>
</tr>
<tr>
<td><strong>PLANT LIFECYCLE INFORMATION</strong></td>
<td>Define standards for one or more departments for information, document management.</td>
<td>Adopt international and internal standards at business unit level, including some classification norms. Agree formats for some interdepartmental information exchange.</td>
<td>Implement company-wide information quality management systems, and adoption of classification systems.</td>
<td>Publish internal rules for classifying information. Classify information according to internationally accepted standards.</td>
</tr>
<tr>
<td><strong>ICT TECHNOLOGY &amp; INFRASTRUCTURE</strong></td>
<td>Provide a secure personal computing infrastructure. Manage some work with IT systems securely.</td>
<td>Develop IT application governance structure per domain. Rationalise and standardise IT applications supporting standard business processes.</td>
<td>Establish a governing body for IT applications. Integrate IT applications between domains.</td>
<td>Provide secure connections to external parties. Adopt application connectors to external exchange standards.</td>
</tr>
</tbody>
</table>
## Actions to Drive Information Maturity Improvements Within Each External Phase

<table>
<thead>
<tr>
<th>EXTERNAL</th>
<th>One to One Exchange of Information</th>
<th>Closed Communities</th>
<th>Open Communities</th>
<th>Maturing Supply Chain Exchange</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUSINESS PROCESSES</td>
<td>Accommodate/adjust processes and operations for identified interoperability barriers on a case by case basis.</td>
<td>Agree a common process model for participating companies. Connect this common structure to the entity specific process structure.</td>
<td>Agree a common process model and standard contracts for participating companies. Connect this common structure to the entity specific process structure for all exchanges.</td>
<td>Implement assurance model for consistency of processes used across the supply chain. Ensure automated processes are in place for exchanging information according to international (or de-facto) standards.</td>
</tr>
<tr>
<td>STRATEGIC ALIGNMENT</td>
<td>Adopt policy and procedures to agree case by case information exchange.</td>
<td>Agree a shared vision and policies between participating companies to manage information exchange at a project level. Make incentive based information exchange contracts.</td>
<td>Agree a shared vision between participating companies to manage information exchange at a company level. Ensure standard contracts are in place.</td>
<td>Agree a shared strategic vision across the supply chain on the use of internationally agreed information standards. Ensure that work methods, procedures and contracts follow international standards.</td>
</tr>
<tr>
<td>PEOPLE &amp; ORGANISATION</td>
<td>Ensure skills are available to identify, define and exchange information as agreed contractually.</td>
<td>Ensure relevant skills are available and mobilised to: - Connect common process models to internal processes. - Exchange information in closed communities.</td>
<td>Ensure relevant skills are available and mobilised to: - Connect common process models to internal processes. - Exchange information in open communities.</td>
<td>Develop relevant knowledge and skills on internationally agreed information management standards, data quality and exchange processes.</td>
</tr>
<tr>
<td>PLANT LIFECYCLE INFORMATION</td>
<td>Agree definition of handover points case by case.</td>
<td>Agree information standards to be used, and common, explicit definitions of handover points, and content for each exchange.</td>
<td>Use agreed lifecycle data standards to specify standardised handover points and standardised content across open communities.</td>
<td>Use available internationally agreed life cycle information standards to define and dynamically exchange all content. Ensure that explicit status information and provenance is available for all content.</td>
</tr>
<tr>
<td>ICT TECHNOLOGY &amp; INFRASTRUCTURE</td>
<td>Establish interoperability by mapping corresponding input and output files manually. Develop policy and infrastructure to automate future exchanges.</td>
<td>Use secure IT systems to automate mapping between input and output files using a meta-level structure. Inconsistencies resolved by manual interventions.</td>
<td>Use secure IT systems to automate mapping between input and output files using a meta-level structure. Inconsistencies resolved by manual interventions.</td>
<td>Use secure IT systems for automated exchange and/or mapping between input and output files using: - A standardised meta-level structure - Internationally agreed standards Inconsistencies resolved automatically by validation mechanism.</td>
</tr>
</tbody>
</table>

## Step 3 Establish Realistic Targets for Where the Company Wants To Be

Experience has shown that progression in a phase is a significant challenge because the information being exchanged is used in so many different processes in a company. To reach agreement, and change well established practices could take significant time and effort – both internally and between parties.

Once companies have completed their evaluation, they can set targets for where they would like to be in the future for:

- The internal and external Roadmap levels they could progress to
- The maturity which could be achieved within each level

Key considerations for setting targets are:
- New regulatory requirements
- Planned investment and expansion
- Competitor positioning
- New customer demands
Step 4 Based on the Targets, Plan and Implement Improvement Measures

Once targets have been set, companies can plan and implement improvements. This can be achieved by:

a. Adopting one or more of the eight Key Information Standardisation Principles in this document. Please note, it is the rigour and extent of application of these Principles, which improves maturity and therefore moves a company across a phase and up phases on the ORCHID Roadmap.

b. Consulting the CEN ORCHID Landscape of Information Standards, which provides a detailed framework for the types of standards a company may require (see Figures 1 and 2).

c. Learning from information standardisation work completed by other companies. Examples of successful implementation from the following organisations and sectors are available from the CEN web-site:

<table>
<thead>
<tr>
<th>Shell</th>
<th>Zeiss Optical Instruments</th>
<th>VdZ</th>
</tr>
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<tr>
<td>DSM</td>
<td>AT&amp;S</td>
<td>Renault</td>
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<tr>
<td>Siemens</td>
<td>Toshiba</td>
<td>Statoil</td>
</tr>
<tr>
<td>BASF</td>
<td>ABB and Alstom</td>
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<tr>
<td>Endress &amp; Hauser</td>
<td>Croon</td>
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</table>

Quick Wins

The most important action for all companies involved in the process and power industries to achieve information standardisation is to adopt a common dictionary of classes and their definitions. This would support the creation of any number of product model dictionaries. This collective standardisation action would remove the biggest barrier to interoperability internally and between parties. This goal is being pursued by the CEN ORCHID Group and would be a major step forward to drive integration of information and ultimately competitiveness of these industries.

The quickest wins for individual companies seeking to standardise their lifecycle information are to adopt the following summarised version of the Key Standardisation Principles for all internal and external exchanges of information:

- Use common definitions and terminology for all classes, attributes, units and measures
- Conform to internationally accepted information standards – use the CEN ORCHID Landscape of Information Standards to identify the standards relevant for each project
- Work with a common envelope/mechanism for exchange

These simple, practical measures will significantly help companies across the supply chain reduce costs, and improve the safety, reliability, speed and flexibility of their operations.
ORCHID Contacts

1. Review the full suite of CEN ORCHID Materials

www.cen.eu/cen/Sectors/Sectors/ISSS/Workshops/Pages/workshopORCHID.aspx

2. Contact the offices of the European groups involved in the CEN ORCHID Project

<table>
<thead>
<tr>
<th>Industry groups</th>
<th>Country of residence</th>
<th>Website</th>
</tr>
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<tbody>
<tr>
<td>USPI-NL</td>
<td>The Netherlands</td>
<td><a href="http://www.uspi.nl">www.uspi.nl</a></td>
</tr>
<tr>
<td>PROLIST INT</td>
<td>Germany</td>
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<td>eCl@ss</td>
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<td>VdZ</td>
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<td>POSCCaesar</td>
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<td>THTH</td>
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<tr>
<td>ETIM</td>
<td>The Netherlands</td>
<td><a href="http://www.etim-international.com">www.etim-international.com</a></td>
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<tr>
<td>2BA</td>
<td>The Netherlands</td>
<td><a href="http://www.2BA.nl">www.2BA.nl</a></td>
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</table>

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