



## Modularization in a PDM system

### Challenge

The tendency in the energy sector is that the products in question are getting larger for each generation and that the development projects are getting increasingly challenging and complex. Developing new products and upgrading existing designs requires the use of many different technologies, hundreds of engineers, and many professional disciplines, e.g. controls, hydraulics, cooling, lubrication, etc.

Two of the fundamental approaches for organizing the engineering of complex products such as power plants, are Systems Engineering and Modularization. The case company' stage gate model includes the best of both approaches. At the case company the Systems Engineering approach has a focus on ensuring that all technical systems are designed to perform optimally. The modularization is applied to ensure that the product is designed for optimal manufacturing, testing, transportation, service, etc.

For about a decade CPC has been supporting the modularization initiatives in R&D projects and has also been involved in in the development of tools and methods at the case company. Lately CPC has been involved in the implementation of a PDM system at the case company. Modern PDM systems have many capabilities which can be utilized for supporting Systems Engineering and Modularization. However, in many companies PDM systems are primarily used for file management and versioning. The primary challenge in this case has been to develop a methodology for how to manage systems and modules in a PDM system.

### Approach

It has been CPC's role to be the lead architects defining systems, modules and interfaces, in order to ensure that the structures built up in the PDM system supports Systems Engineering and Modularization. This has included development of the concept, specification of the PDM system requirement, pilot implementation and education of the organization.

In the PDM system all systems (e.g. hydraulic system) have been built up in a system structure that represents the system view. The intention of the system view is to provide the system architects, engineers and project managers with the possibility to get an overview of the product seen from a system point of view. In the system view the product is structured according to the systems. The hydraulic system for example includes all the hydraulic components, e.g. pumps, cylinders, valves, fittings etc. Each system has a bill of material (BOM) and can be visualized in 3D, showing only the components belonging to each of the systems.

### The case company

The case company is one of the world's largest manufacturers of products within the energy sector, with units installed in more than 70 countries all over the world. The business covers everything from manufacturing, sales and installation, to monitoring and service of the products.



All modules have been built up in a module structure that represents a module view which supports the modularization of the product. An example of a module is the hydraulic station. This module includes hydraulic tanks, pumps, frames, control cabinets, cooling, etc. This module is a hybrid of several systems, i.e. cooling system, hydraulic system, control system etc. In the same way as for the system view, the module view enables the engineers and the project management to view the bill of material that belongs to one module, and to visualize the module in 3D only showing the components belonging to that module.

The system- and module view are interlinked to each other. This implies that if the user is adding a component to a module it is automatically added to a system as well. Because the system- and module view are interlinked, it gives the user the possibility to trace which system and module a component belongs to.

### Results

The development and implementation of a methodology for how to manage systems and modules in a PDM system at the case company has given the following benefits and results:

- A strong tool for communication and documentation of systems, modules and interfaces
- It is now possible to do weekly reviews of the systems and modules and update the systems and modules with recent design changes, changes in responsibility etc.
- A place to link in CAD models, which enables visualization of each system and module for review purposes
- A complete system- and module structure built up in the PDM system, which enables easy navigation in a structure similar to how the systems and modules will be realized in the product. The structure also provides easy navigation to relevant documentation
- Possibility to automatically generate weekly reports on cost and weight

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