



Lean product structures

- Case: YORK



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Reasons for applying lean thinking on product structures

YORK Refrigeration is a global leader in development, manufacturing, and sales of refrigeration systems, which typically are used in cold storage warehouses, rinks, production sites, etc. An important business driver is customization, as each refrigeration system is tailor made to match the needs of the individual customer. Other important business drivers are state-of-the-art technology and short lead times.

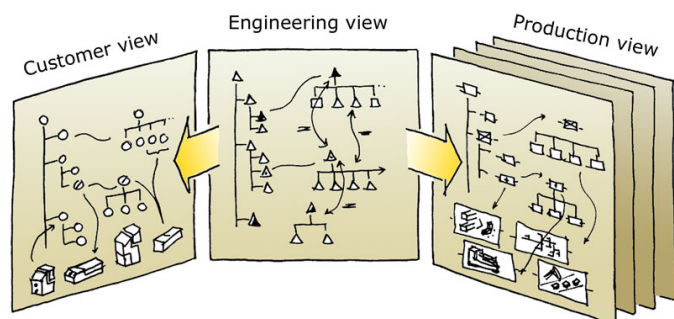
Customized products are often associated with an ever increasing complexity of the product structures. YORK has also had this experience, and the consequences of this growing complexity include:

- Difficult transformation of an order into a Bill Of Material (BOM)
- Increased amount of resources spent on BOM maintenance
- Increased amount of resources spent on CAD maintenance
- Non conformity

To turn this development around, YORK decided to implement a methodology to manage all product structures across all major IT-systems, i.e. CAD, ERP, and PDM systems.

“PFMP” – a proven methodology

The experience from many companies is that a systematic approach is required in order to successfully re-structure BOMs. Another critical issue is to ensure that the BOM structuring is closely coordinated with marketing/sales, engineering, and production. At the Institute of Product Development, the Technical University of Denmark, research on product structures has been carried out for more than 10 years. One research result, which has been verified and further developed in many industrial projects, is the methodology for re-structuring product structures – the so-called *Product Family Master Plan (PFMP)*. The power of a PFMP is that it enables mapping of an entire product family on one big piece of paper. This is done from a customer, engineering, and production point of view.



The Product Family Master Plan Methodology (PFMP)

The customer view describes what is of interest from a customer and a sales point of view, in other words, *why do customers buy our products*. The engineering view describes the functional building blocks of the product family, in other words, *how does the product works*. The production view describes how products are assembled from individual parts, in other words, *what are the productions entities and their sequences*.

The strength of the PFMP is that it enables a *lean reasoning* from customer needs to engineering and production. This means that the reasons for variety within the product family can be explained, visualized, and communicated to various stakeholders.

Making lean product structures

At YORK the PFMP has been created through a four-step procedure.

Step 1: Identification of business drivers. This means to identify and understand how the product structures were interrelated and linked to company strategies and business processes.

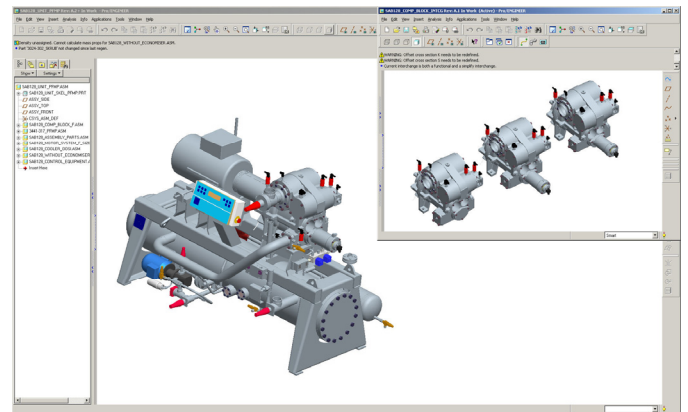
Step 2: Mapping of the existing product structures by means of PFMP. The objective was to visualize and thoroughly understand the existing product structures before these were changed.

Step 3: Designing the new product structures. In this phase the future product structures were designed. This was done in a close dialogue between sales, engineering, production and supply chain, all in order to ensure an optimal fit between their business processes.

Step 4: Implementation. In the last phase the new product structures were implemented in the company's IT-systems, i.e. sales tools, CAD, ERP, and PDM systems.

Realization

The new lean product structures were implemented in Pro/ENGINEER (CAD). The digital model in Pro/ENGINEER mapped the PFMP structures, which enabled capitalization of the PFMP in the day-to-day engineering work.



Interchange assemblies were extensively used to map the Pro/ENGINEER design structure to the PFMP framework

It was important for the implementation to ensure a CAD-model, which works for all possible product variants. Also, the model was designed to be open for modification, when changes occur due to new business needs.

Benefits

The benefits from applying lean thinking on YORK's product structures were:

- The size of the BOMs was reduced by 75%. This means that 75% of BOMs and variants of parts, assemblies, and operations were removed.
- Time to configure top level model from scratch was reduced from weeks to just one or two hours.
- Time to replace updated models on previous designs was reduced from weeks to just one or two hours.

YORK has chosen to use PFMP as a master for handling all product data. Also, business processes were defined with respect to PFMP. This means more visual product structures, clearer responsibilities, and clear business processes.