PLM for manufacturing

SIEMENS

White Paper

Full traceability of product data from design through manufacturing

If you are looking for ways to connect all domains of the design/build lifecycle, consider a manufacturing process management (MPM) solution. This provides an enterprise-scalable foundation that allows you to perform product design, while simultaneously optimizing manufacturing processes. This means that you can better manage lifecycle cost, meet launch dates and maintain product quality targets. However, some manufacturers are unable to gain the full benefits of MPM because they are still relying on a disconnected set of tools to manage their product, process and production information.

There is still a debate about whether manufacturing process planning should or should not be part of a product lifecycle management (PLM) solution. Manufacturing process planning is defined as creating a general sequence of steps with associated manufacturing resources required to build a product. Manufacturers and software vendors argue that such information of how to manufacture a product with the right set of inputs does not have to be part of a PLM system. At Siemens PLM Software, our view is that product lifecycle management is an overarching system that can, and should, be integrated with the manufacturing process planning functions.

Manufacturing and PLM

What is our view of the extent of the PLM concept?

Any and all data needed to create a final product falls into the PLM domain. But, this hypothesis is often debated. Proponents of ERP/MRP and vendors who have developed point solutions have argued that PLM is only for product design data collection, visualization and management. However, the debate should be more focused on what constitutes product data, or what kind of readiness is required before producing the first article.

The evolution of PLM started with the early successes of product data management (PDM) tools in the Nineties. The purpose of these PDM applications was to track and control product data. This usually involved the technical specifications of the product, such as the CAD/CAM/CAE models, 2D drawings and related metadata. Because of PDM, manufacturers witnessed significant improvement in communication between all product stakeholders. As manufacturers started seeing the benefit of the PDM concept and its impact on product cost, quality and time-to-market goals they started expanding its application to all stages of the product lifecycle, which led to the evolution of PLM.

PDM was initially more focused on managing the bill of material (BOM) data that included CAD data, visualization, configuration, change detection and workflow. The need to increase the traceability of product design information to every stage of the product development process led to the introduction of PLM. We know that the product development process culminates when manufacturers begin production of the first article or the first batch.

The extension of the PLM concept to manufacturing process management (MPM) – such as process planning, process simulation, process line balancing and so forth – is facing resistance from some groups. They argue about the validity of these disciplines within the realm of PLM. Many manufacturers have developed in-house process planning tools and think that PLM is not a necessary tool for them.

Let's look at two of the most common myths that will give us a better perspective on why some manufacturers are still reluctant to embrace manufacturing planning as part of the PLM system.

Myths about PLM in manufacturing

Myth #1

Performing process planning doesn't require any PLM implementation Manufacturers with a heavy focus on managing their manufacturing processes with "home grown" systems, have argued that effective MPM does not need any PLM system. They say, if they can manage their product data and identify all product design and manufacturing issues well in advance, they don't need a PLM system. However, we ask, how effective are manufacturers in disseminating the design data to the manufacturing planning and the shop floor departments? If all the product design data is being fed to their MPM tools efficiently and seamlessly they have, in fact, an MPM system within a PLM environment. But, we observed that such cases are far from reality because the complexity of design and manufacturing data is too big of a problem to solve with disconnected, home-grown tools.

It needs to be understood that the benefits of MPM are not disconnected from the benefits of PLM. MPM does provide exclusive process planning benefits, such as the complete sequence of steps for manufacturing, re-use of existing process plans, time and cost rollups, sharing of units of operations, etc. However, the major benefits of MPM, such as time savings, design traceability and change management cannot be accomplished if the link between design and manufacturing is weak. If process plans are not changing with the changing needs of product design, we might end up manufacturing a product that doesn't reflect the latest design changes. That may lead to cost overruns and launch delays.

In addition, poor communication between process design and product design groups will prevent manufacturers from validating no-build conditions early in the design stages. If designers can validate several different design alternatives early in the lifecycle and eliminate concepts that cannot be fabricated, they can significantly decrease their product development risks. A closed-loop, process-driven product design information flow can ensure that manufacturers make the right decisions before they go to production.

Case study

A major automotive company was using Teamcenter® software for design data storage, BOM management and collaboration within their product engineering group. They had a home-grown process planning system to perform assembly sequencing, time management, work instruction creation and more. Initially, the information flow from product engineering to manufacturing was accomplished using a set of customized interfaces and manual tools. Over the implementation cycle, the company realized that the communication of BOM information to the process planning tools was really an enterprise-wide phenomenon and that the tighter the connection, the better the advantages. So, the company finally started leveraging their manufacturing BOM data in Teamcenter, which increased their process planning productivity. This implementation drastically reduced the cycle time for information exchange from engineering to manufacturing and thereby reduced the overhead associated with maintaining a number of disconnected systems.

Myth #2

It is cost effective to have MPM and PLM tools as two separate, loosely-connected systems Manufacturers have long maintained that MPM and PLM are functionally independent; they can coexist, but have separate functions and hence there is no need for tight system integrations. Any information flow required between these systems can be achieved manually or using custom developed tools and interfaces.

This is a myth because any standalone tool in an enterprise environment is not cost effective and such tools will require more interfaces and more IT support. These interfaces are always expensive to implement, maintain and upgrade. In fact, more and more manufacturers are complaining that their users struggle to communicate using multiple systems. This leads to serious issues of data fidelity between systems and the onus for resolving these issues falls on the user and the IT organization.

We believe that an MPM system that is part of an enterprise PLM system is the best way to move forward. This will provide an environment that supports a flexible process plan capable of reflecting any changes to the product design or requirements. This might be called a single window for enterprise data management – a single application that supports the complete lifecyle of product data in an enterprise environment. The main idea is to provide users with one platform for all their data management needs. Teamcenter PLM software is the only comprehensive system that provides a platform in which users can conduct all their data management needs from engineering to manufacturing to execution.

Case study

For a major aerospace company, Siemens PLM Software implemented MPM as a set of independent tools per the customer's request because they wanted to focus just on process planning and process simulation. They perceived the cost of implementing an enterprise-wide tool to be too risky. The tools did satisfy their initial goals, but they realized that they could gain further benefits if they could effectively manage their changing manufacturing and engineering needs. This could be achieved only through an integrated enterprise system. It is true that rolling out an enterprise-wide system has an impact on implementation cost, but the cost of implementing standalone tools and then integrating them to a range of disconnected systems is far higher. So, now the company is implementing Teamcenter as a single source for all of their needs from design to engineering to manufacturing.

Conclusion

MPM should be part of PLM systems to ensure that companies can reap the full benefits of capturing, tracking and managing all product data from initial concept through manufacturing, service and end-of-life. While MPM systems cannot provide all the functionality and benefits of PLM systems, both systems complement rather than conflict with each other.

Manufacturing planning	Process validation	Production execution
How the designed product will be built?	Is it the most productive process?	How to execute the manufacturing operations?
Tools, machines, labor, plants	Time analysis, workplace analysis, robotics and automation feasibility	Work instructions, equipment status

Typical manufacturing process planning activities.

About Siemens PLM Software

Siemens PLM Software, a business unit of the Siemens Industry Automation Division, is a leading global provider of product lifecycle management (PLM) software and services with 7 million licensed seats and more than 71,000 customers worldwide. Headquartered in Plano, Texas, Siemens PLM Software works collaboratively with companies to deliver open solutions that help them turn more ideas into successful products. For more information on Siemens PLM Software products and services, visit www.siemens.com/plm.

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