Global competition in the manufacturing industries is steadily gaining ground. More and more players are entering the markets, while fabrication processes are becoming increasingly dynamic and complex as a result of emerging changes in technology. In future, the industry has to deliver more efficient products at constant prices, but these products must also be increasingly customized to meet changing customer demands.

In addition, the German initiative “Industry 4.0” will trigger another industrial revolution driven by the Internet of Things (and services) and autonomous, embedded systems connecting people, products, and production plants.

In fabrication facilities, so-called Cyber-Physical Production Systems (CPPS) will grow up, combining intelligent machines, storage systems and resources to independently exchange information and control each other independently of human control. CPPS create Smart Factories, the core of Industry 4.0 in which a completely new production logic rules the world: the products are clearly identifiable, locatable at any time and know their own history, current status as well as alternate paths to the final one. The embedded production systems are vertically linked to business processes in factories and enterprises and horizontally to distributed, real-time controllable value chains — from order to delivery.

To make this brave new world happen the complete product description must be made available. For this purpose it is necessary to collect all the data from the product development period (and, ideally, from the operational phase as well) and suitably relate them with each other in a process known as "product modeling". Data can be generated and managed with different (authoring) tools: idea management, various CAD applications, data management, requirements management, service management, etc. In the scope of this management, questions such as: What was the original idea that led to a certain functionality? or How did different markets respond to that functionality overall? might be answered holistically.

SAP to boost integration efforts

The merging of MCAD and ECAD data in a common backbone can be regarded as an important step towards this new dimension of traceability. In an effort to help discrete manufacturers increase efficiency in engineering and manufacturing, SAP AG based in Walldorf, Germany, announced shortly before Hanover Fair 2014 its new plan for authoring tool integration, including a strategy to simplify and expand its offering by integrating authoring tools into the SAP Product Lifecycle Management application. The SAP Engineering Control Center (ECTR) integration tool is designed to help companies deliver innovative products and services to market in a shorter time and aimed at supporting a new way of developing products. This ties in with the broader aim of “idea to performance”, a holistic business approach to managing the entire lifecycle of a product. The vendor regards ECTR as a tool to provide a 360-degree product view, including mechanical and electronic information, and later also software and simulation information, offering total transparency across engineering disciplines and promoting the visibility of new product introduction process criticality.

SAP recently announced its extended CAD integration initiative. This should be seen as part of the bigger picture of Industry 4.0 scenarios.

SAP CAD interfaces provided today:
- Bidirectional exchange of meta-data
- Management of all file relations
- Integration into materials, BOM, and change management
- Storage of CAD files in distributed content and cache servers.

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heterogeneous authoring tool landscape into SAP Product Lifecycle Management (PLM) for fewer interfaces and consequently a reduction in maintenance costs. “Using this new integration tool and integrating data from several authoring tools directly into the product development process is envisioned to enable companies to benefit from faster innovation cycles and simplified R & D processes and handover to manufacturing,” said Thomas Ohnemus, Vice-President Solution Marketing with SAP in a background discussion, adding, “with this planned offering, manufacturing companies will be able to generate consistent product designs and achieve higher product quality. The tool integration framework is intended to help companies to create a holistic product description, ensure data consistency and reduce operating costs of their IT landscape.”

The completion of the digital product description in the development phase is achieved via a connector level, called the CAD Service Layer. The goal is to integrate all tools in the same quality with SAP PLM, while particular attention is paid to the maximum scalability of the system architecture. No matter what authoring system is connected, the user can work with a uniform interface. To this end, the interface will be standardized. In addition, there will be new functionality that was not previously offered. However, Mr Ohnemus emphasized that this is not the primary goal. Harmonization of the integration of authoring systems is at the top of the agenda.

Charming enrichment

Certainly, a picture is worth a thousand words, but how to (front-)load digital product description into the PLM process? Through the SAP Visual Enterprise (VE) portfolio, you can link (lightweight) geometry information and business data intelligently
together and thus generate added value to downstream processes, for example for the procurement or, as described later, for fabrication. A SAP Info Day held in Walldorf at the end of May made this evident. At this content-rich event, the PLM vendor explained the motivation for its new “idea to performance” approach in response to the changing conditions in the addressed markets. Presentations of prominent clients were given to illustrate different aspects, for instance Osram (for Portfolio Management) and Mahle (Integrated Product Development).

In their presentation on the benefits of SAP VE, Catharina Wegener and Christian Budnik asked the astonishing question why the extended usage of 3D content visualization of makes sense outside the R & D departments too. Some impressive figures derived from empirical studies gave an instant answer: Increased learning success through animation and graphics because more information can be remembered (up 10 percent) and the learning curve sustainably shortened overall (minus 50 percent).

So far, so good. But as mentioned before, pictures are worth thousands of figures. That’s why Mrs Wegener and Mr Budnik demonstrated a typical application with

- SAP VE Generator
- SAP VE Author
- SAP VE Viewer.

SAP VE Generator is the server component used to generate the neutral formats. The role of SAP VE author is primarily to create animations and renderings. SAP VE Viewer can be integrated into various systems, either in SAP PLM or in your own web front-ends. To convert an EBOM into an MBOM, you have to imagine the data processing as follows: The CAD data are imported via the SAP VE upload client. Mr Budnik showed this for a motocross bike using a selection for the head assembly. The individual sub-assemblies and components are automatically resolved in a VE batch process. Of course, you can also select configurations if available. SAP VE automatically provides a document BOM that matches the assembly structure, each with a visualization file of each (resolved) component and material information assigned. All the meta-data that were linked with the geometry information via the CAD system can be displayed with SAP VE Viewer. Finally, SAP VE Planner is used to convert the EBOM into a MBOM. In the demonstrated example this is not done based on material numbers, but is visually supported: 3D parts can be dragged & dropped intuitively into the BOM. With an export command, the data then is synchronized with the SAP system and corresponding operations can be defined. Also possible is the generation of assembly instructions with animated assembly sequences, but no work order can be published. This has to be done within SAP ERP.

Animations are generated with SAP VE Author, for example in the streaming format .vds for very large files. For performance reasons, only 2D information is then shown, which is immediately visible, but there are no hidden objects.

Industry 4.0 requires unique data representations

It is obvious that future Industry 4.0 scenarios are calling for increased effort in product documentation. It really matters whether the final product is completely serialized or not. Thomas Ohnemus explained. Complete serialization means that each of product’s component is provided, for example, on parts where sensors or actuators are mounted. Thus, it is quite clear which components have been used to build a machine and where this machine is located in the world.

Conclusion

The SAP Engineering Control Center should be regarded as part of the vendor’s broader effort to support upcoming Industry 4.0 scenarios and to strengthen relationships with its integration partner eco system, enabling companies to address even the most complex customer challenges. SAP Engineering Control Center is designed to leverage the experience of DSC Software (1), a long-established development partner of SAP, while other CAD integration partners, including Cenit (2), Cideon (3) and .Riess Engineering (4), intend to leverage this platform to provide new interfaces to leading authoring tools.

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(2) www.cenit.de
(3) www.cideon-software.com
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