

In addition to highly stressed medium-sized structural parts for air-frame, landing gear and wings as well as pylons and engine mounts of airplanes, Böhler manufactures turbine blades for gas and steam turbines as well as special forgings. (Photos: Böhler)

Secure under extremely taxing conditions

In conjunction with the implementation of SAP PLM, Böhler Schmiedetechnik switched its engineering method to assembly-based 3D modeling in NX and aligned its assembly structures with the specifications of its forging and processing operations. As a result, the company has not only made its work processes more efficient but is now also able to consistently and transparently document all of its product development and processing steps.

“Most of our forgings are developed on a project-oriented basis in partnership with our customers. We have long-term and intensive cooperative relationships with many of our clients”, reports Marcus Facco, Product and Processing Technology Engineer with Böhler Schmiedetechnik GmbH & Co. KG. In Kapfenberg, Austria, the enterprise manufactures premium quality die-forged parts made from titanium and nickel-based alloys as well as high, medium and low allow steels for extreme conditions – primarily for use in airplane components, as well as turbine blades, commercial vehicle parts and special forged parts for ship diesel engines. These products, which have to meet highly sophisticated technology standards, are produced in low quantities. Upon performing an analysis of the CAD/PDM processes, the experts in Kapfenberg arrived at the conclusion that new modeling methods would yield significant optimization potential. This was even more

relevant given the fact that the tooling specialists at Böhler are increasingly being involved in forging development of their customers. “The goal is to implement forging processes that are close to the finished contour with the assistance of what we call netshape technology”, Marcus Facco explains. Even before the tools are engineered, this requires close coordination with the customer. Böhler works with 3D data in all of its related processes and utilizes the NX CAD/CAM/CAE system by Siemens PLM Software.

Consequently, in conjunction with the implementation of SAP PLM, the company placed a lot of emphasis on the NX assembly structures as well as simultaneous engineering and fast provision of models for mechanical production. Böhler saw a lot of potential especially in the use of customer models and their integration into process-oriented assembly structures, since the development process at this company starts with the pro-

vision of the 3D finished part by the customer. "Because many of our customers are utilizing Catia V4 or V5, we have to initially convert their data into NX before we can even process them any further", Facco comments. "We subsequently engineer the forging, the swage and all other essential tools on the basis of the 3D finished part."

That's why data administration and process integration are also important issues. The ability to document product development and manufacturing processes of each individual component completely convinced Böhler to implement SAP PLM with direct NX integration. Consequently, NX data is now available company-wide in its reviewed and valid format, along with the documentation of all relevant changes. SAP ECC 6.0 is now being used as a central ERP and PLM system by about 160 users. In the engineering department 16 NX work stations are already directly integrated into the SAP environment. However, all NX users in the calculation and CAM departments are to be slated to use this solution in the future as well. The CAD data is archived in a file-based SAP content server in Kapfenberg. A conversion solution creates additional PDF files of drawings and JT files from 3D models as secondary formats in the event of defined SAP status changes.

Automation speeds up development processes

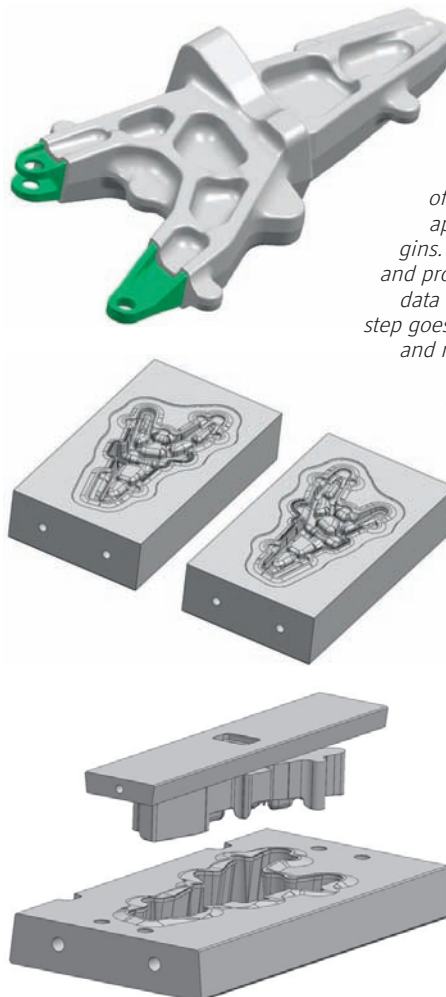
Much of the work that was handled manually in the past has been automated. A product engineer now works in NX 90 percent of the time, and only spends the remaining 10 percent in SAP. The jobs are controlled by the 3D model – a master model is used for the assembly based development. Both, the engineering method and the data model have been re-defined in NX for this purpose. The benefit: The CAD user is in a position to get an instant overview of the model and the tools at any time.

In the past, NX data was administrated in the file system. A master model was not used; instead one had to use the different processing steps. Processing steps, parts and change status were managed through pertinent layers in a file. Related job specifications for the parts and layer descriptions defining the validity were used and drawing numbers were assigned through a relevant administrative tool. These numbers had to be manually entered into SAP. Now the release process has also been converted to a sta-

tus administration tool based on meta data and is no longer handled on layers within the file.

This new engineering method was developed in small engineering teams. Various options for the structure and handling of assemblies were tested during the process, which was accomplished with support from both, the Siemens PLM Software and the Karlsruhe-based DSC Software. DSC adapted the work processes of the integration solution to the methods used at Böhler by way of configuration. The focus was on the standardization of engineering as a result of a uniform assembly systematization as well as templates and rules administrated in the SAP system.

The so-called top assembly comprises all parts and interim production statuses from finished part to forging as a structure. This top assembly is a separate type of document that can only be created if linked to a material master. The finished part provided by the customer is a component of the unfinished assembly which contains the various processing states and is con-



Böhler engineers a forging on the basis of the finished part. As soon as it has been approved, the development of the tool begins. During this process, forging, preliminary and processing drawings are generated and the data is forwarded to tooling. Every processing step goes hand in hand with comprehensive tests and measuring processes. Böhler consistently uses 3D models throughout its entire development and manufacturing process.



These highly sophisticated products are made in small series lots. Among other equipment, Böhler operates screw presses with a pressing force of 35,500 and 31,500 t.

nected to the finished part via so-called wave links. The advantage of this solution is that changes made to the customer's part affect the forging as well as its components and structures directly.

Consistent SAP administration of customer inquiries

If changes are made to documents that have already been released, they are automatically updated to status "under modification." Upon release of a new version, the predecessor version is automatically assigned status "superseded" and is no longer valid. Users who do not have a CAD system at their disposal can display engineering data at any time with the Viewer integrated in the SAP system. Upon release of a top assembly or components thereof, JT data for individual parts is generated by a conversion process in the background, which is archived in SAP. The JT2Go Viewer, which is a free product, assemblies can also be dynamically visualized on the basis of neutral formats.

In conjunction with the SAP PLM implementation, a company-wide consistent document management system was also put into place. Every authorized SAP user can find the respective production drawings via material master. They are archived as PDF files. Important engineering data is recorded in a separate Excel file, which is referred to as an engineering data sheet. The latter is linked to the top assembly via object link.

The potential benefits resulting from the coupling of the PLM-managed technical documents with development and order

processing are huge. An in-house analysis identified significant cost savings in technical document management that will be yielded in conjunction with these processes. Step by step, Böhler is moving ahead with this implementation through clearly defined projects, which, for instance begin concretely with the customer inquiry process. "It is our ultimate goal to administrate all customer inquiries in the SAP system", Peter Grießer comments, who is in charge of the PLM strategy and processes at Böhler Schmiedetechnik. Commercial and technical data should be recorded for the potential development of new parts. „A high volume of documents, such as CAD data, drawings, specifications and requirements – all of which are exchanged with the customer – are generated during the inquiry phase.“ Consequently, Böhler intends to use DSC's Engineering Control Center solution for this inquiry process and related document management in the future, since the enterprise develops approximately 120 new forgings every year. A designated Excel inquiry document is to be compiled, which will be used by departments Sales, Calculation and Materials Engineering to process the inquiry.

This document will subsequently be linked to a material master as well as to important information such as customer and calculation data. A special status network is to be used to display the progress made in processing and improve the workflow – from the sales department to calculation to materials engineering and back to sales. Whenever specific status transfers occur, the affected employees will be automatically notified by the system via e-mail.

By using the latest NX modeling techniques, Böhler has already successfully improved its development process. Moreover, enterprise is profiting from complete administration of NX data and consistent use of 3D data. In the future, the new parts process will be integrated into the SAP-based development process just as readily as the production process (CAM) and the simulation for safeguarding engineering. The consistent use of data in the different processes ensures that all users are working with the same valid data.

*Böhler Schmiedetechnik GmbH & Co. KG,
Kapfenberg (Austria)
Phone: +43-3862-20, www.boehler-forging.com*

*DSC Software AG, Karlsruhe (Germany)
Phone: +49-721-9774-100, www.dscsag.com*