SIEMENS

Industrial machinery and heavy equipment

ANGER MACHINING

Automotive machine tool maker uses Teamcenter to reduce engineering cycle time by 30 percent and to map engineering and manufacturing bills of materials

Products

Solid Edge, NX, Teamcenter

Business challenges

Market demand for increased productivity per shop floor area

Elevated precision requirements

Customer demand for flexibility

Dwindling batch sizes

Keys to success

Master complex mechanics

Design machines and modules using Solid Edge

Implement comprehensive simulation
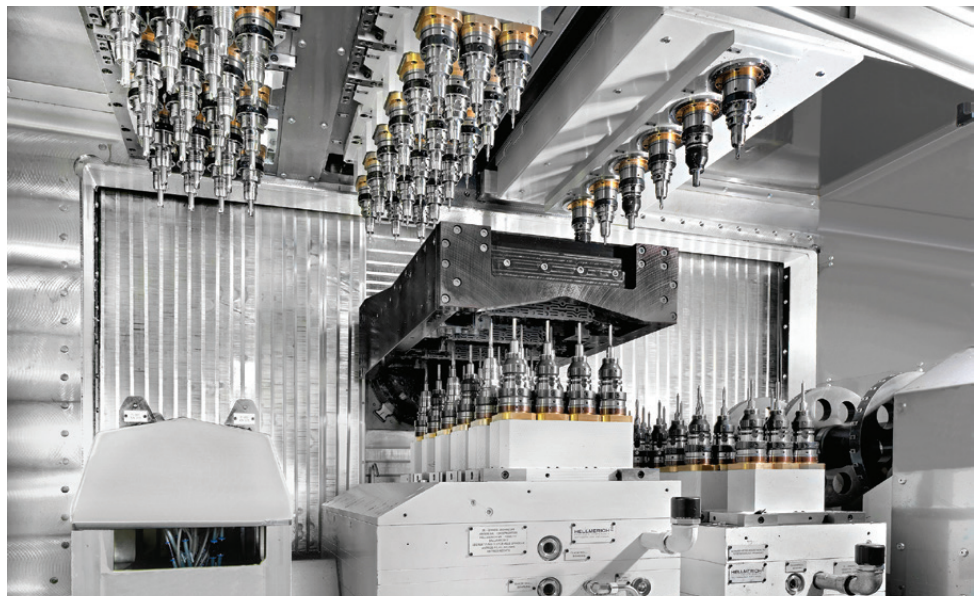
Use NX CAM for NC programming

Use Teamcenter for data and process management

Provide ERP integration

Results

Reduced engineering cycles by 30 percent

Implemented and handled a modular design principle

HCX transfer centers from ANGER MACHINING invert the logic of traditional machining centers: It is not the spindle that moves to the part. Instead, the part – mounted on a movable clamping fixture (black, center) – is moved against the spindles that are mounted on the machine's frame in part-specific groups.

Siemens PLM Software solutions enable ANGER MACHINING to deliver enhanced transfer line productivity and shorter lead times

Minimized lifecycle costs

Complex metal parts for engines and transmissions are traditionally produced in transfer lines, where they are passed from one machine dedicated to certain processing steps (turning, milling, grinding, etc.) to the next following rigid manufacturing cycles. The enormous costs of such lines can only be reduced if parts are produced in large enough quantities without any alterations. The space requirement of these lines is high and the parts transfer across stations limits the available accuracy. On the other hand, due to systematically inherent idle times, universal machining centers do not typically achieve the required high level of productivity. Their tool spindle configuration – meant as a compromise for handling various machining operations – also results in a loss of precision.

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Results *(continued)*

Lowered design costs by 20 percent

Achieved 100 percent collision freedom

Accelerated project lead time
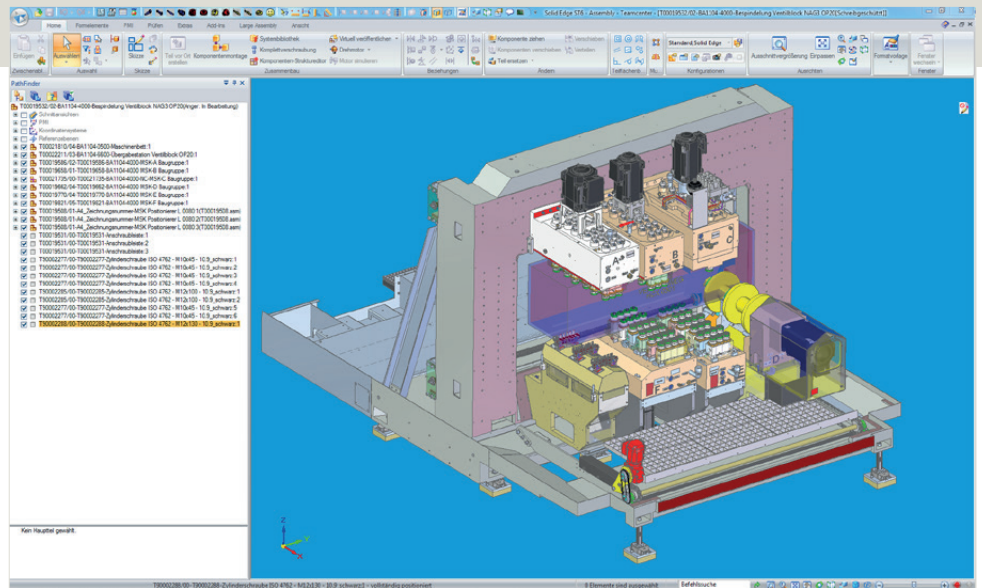
These complex machines were designed using Solid Edge.

ANGER MACHINING GmbH (ANGER) transfer centers combine the benefits of transfer lines and machining centers. In the machine concept invented by the company in 1984, it is not the spindle that moves to the part. Instead, the part is moved against many spindles, each of them optimized for its specific task: The spindles are mounted in part-specific groups, which enable several machining steps to occur simultaneously. This optimization and faster part movement within only one machine greatly reduces cycle time. Due to the spatial concentration, a transfer center can replace two to eight conventional machining centers, minimizing installation area, energy consumption and maintenance, consequently reducing lifecycle costs. This is why the revolutionary machine concept is well established in the automotive industry around the world.

Productivity and flexibility combined

"Ever shorter innovation cycles and the advancing individualization of final products result in reduced quantities and shorter production lifecycles of the individual parts," says Dietmar Bahn, general manager of ANGER MACHINING. "This creates significant challenges for companies investing in new machinery, especially in the automotive sector."

Recognizing this, ANGER designed a new series of flexible transfer centers for medium- to large-volume manufacturing. Two of these ANGER HCX transfer centers were ordered by a Japanese customer for the machining of valve bodies. The multi-spindle heads and turret revolver heads of these machines are not mounted directly onto the machine frame, but on replaceable carrier modules. Without compromising precision or machining speed, this and an automatic tool changer as well as a zero point clamping system make it easier to reconfigure the machine for new parts, combining the benefits of the successful transfer center technology with maximum investment protection.
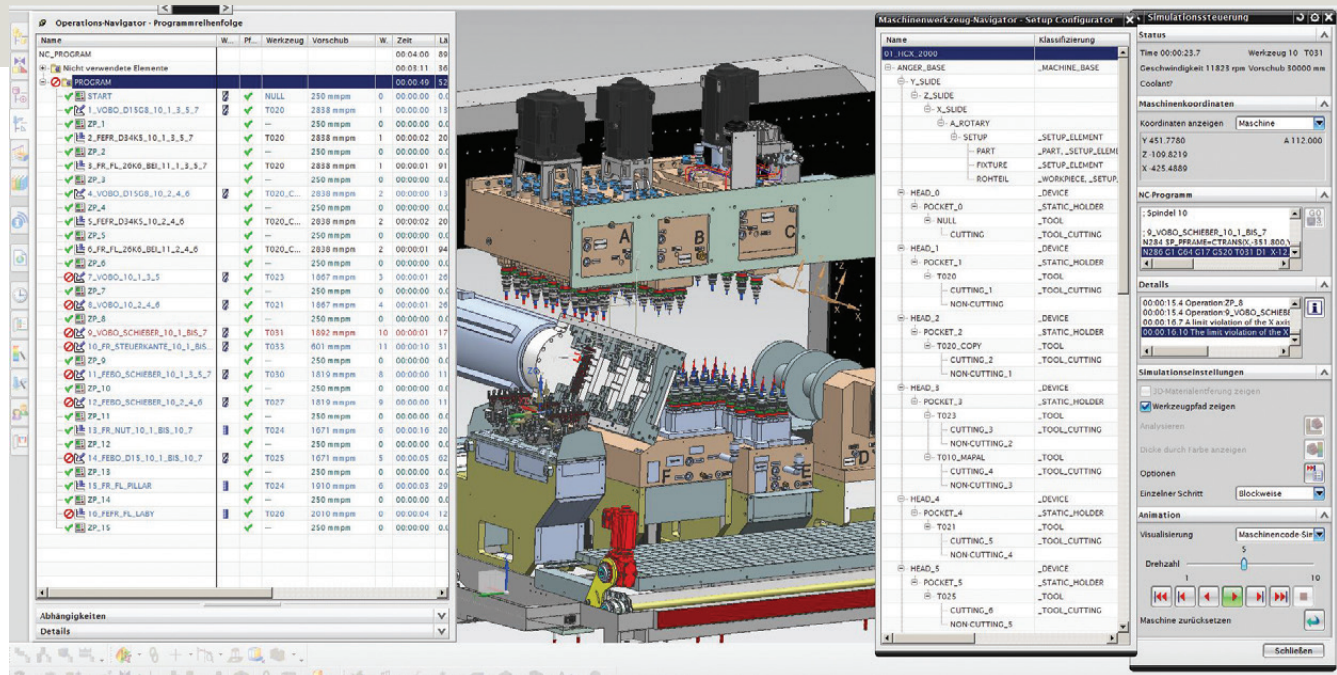
Engineering utilizes comprehensive 3D process simulation via NX CAM.

"Teamcenter helps us depict a comprehensive digital value chain."

Dipl.-Ing. Roland Haas
Head of Technology and R&D
ANGER MACHINING

Simulation and reality
"We took a leading role in the transfer segment in terms of control technology as well when we introduced the current HCX transfer center series to the market in 2007," says Roland Haas, head of technology and research and development (R&D) at ANGER MACHINING. "When you have parts moving as fast as lightning only a fraction of a millimeter away from up to 100 tool tips, and massive parallel machining operations, it is a necessity to perform a full virtual 3D process simulation, and not just for collision prevention."

**Data consistency decisive for software choice**
The software for virtual production control was meant to simplify mechanical and process-related operations and provide a comfortable and safe programming

environment. The selected technology needed to be able to adapt to the unconventional architecture of ANGER machines, and import computer-aided design (CAD) data directly to the simulation without custom programming. For many years, ANGER machines have been comprehensively designed using Solid Edge® software from product lifecycle management (PLM) specialist Siemens PLM Software.

"Because complete data consistency is important to us, and because, in a business based on long-lived investment goods such as ours, a future-proof system with reliable support from its manufacturer is decisive, NX computer-aided manufacturing software from Siemens PLM Software won that race against five other systems," Haas recalls. "Support by the software supplier extended all the way to

"With comprehensive simulation of the machining processes based on NX CAM from Siemens PLM Software, we offer our customers improved efficiency and process reliability and were able to significantly improve our competitiveness."

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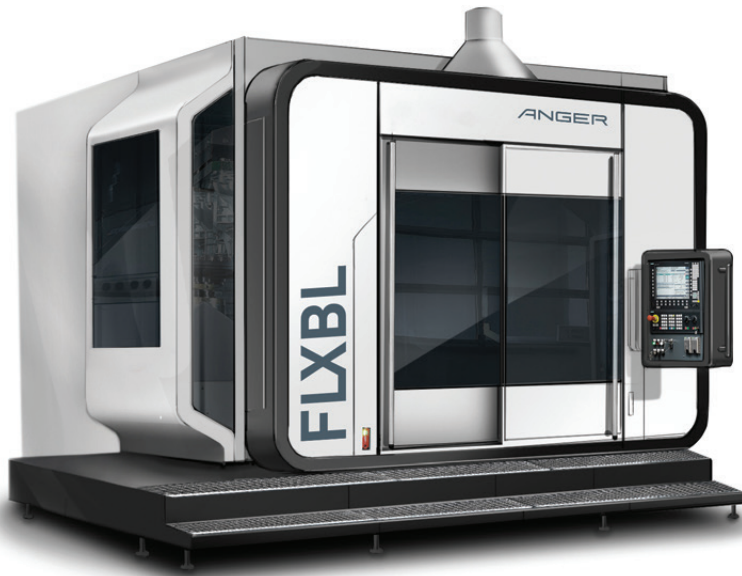
The modular Anger FLXBL is the first transfer center that can be reconfigured within a few hours and is perfectly suited for the machining of workpiece variants. With a pallet loading unit, replaceable multi spindle heads and an automatic tool changer, it makes it easier to reconfigure the machine for new parts. Without compromising precision or machining speed, it is suitable for production in smaller quantities or shorter production life cycles. It is controlled using a SINUMERIK 840D sl from Siemens.

"To master the high level of complexity, ANGER machines are equipped with Siemens SINUMERIK 840D sl computer numeric controls and SIMOTION drive technology, the programs which are generated using NX CAM. This assures full data consistency from the design to each single axis."

Ing. Markus Schürz
Design Engineer
ANGER MACHINING

designing the machine kinematics according to our specifications. For a comprehensive production simulation, we only need to add the contract-specific parts from Solid Edge to the basic virtual machine."

Real-time simulation reduces changeover and reconfiguration times
With comprehensive simulation of the production process, users can develop efficient manufacturing processes and generate optimized numerical control (NC) programs with automated collision detection. NX is used both for process engineering and for programming the machine tools on the shop floor. It is also used by sales during conceptual phases to provide evidence that requested functionality will indeed be fulfilled.

Integration of the 3D design model and consistent workflow management provide an optimal basis for decision making as well as fast planning and calculation results for both products and processes. In the HCX series, ANGER used comprehensive machine tool simulation to cut design costs by 20 percent and improve average lead times for a contract by 30 percent.

**Consistency from the design to the axes**
Using the 3D design model as an input, NX CAM enables ANGER's engineers to quickly generate NC programs to effectively machine these parts. Error-free machining on the shop floor is enabled by the integrated machine tool simulation using NX CAM. "The advanced machine tool simulation in NX CAM is critical to reliably program the ANGER FLXBL machines that use innovative technology for changeover and tool change," says Markus Schürz, design engineer at ANGER. "To master the high level of complexity, the machines are equipped with Siemens' SINUMERIK 840D sl controllers and SIMOTION drive technology. The Siemens software and equipment assures full data consistency from the design to each single axis."

"With comprehensive simulation of the machining processes using NX CAM from Siemens PLM Software, we offer our customers improved efficiency and process reliability," says Haas. "With NX CAM, we were able to significantly improve our competitiveness," says Haas.

Teamcenter – an important step toward the digital factory
Mastering complexity is also the goal that drove the company to install Teamcenter® software, also from Siemens PLM Software, throughout the company. "For us, adopting Teamcenter represented an important step toward the digital factory," says Haas. "The software helps us visualize the links in and between our machines and production processes, depicting a complete digital value chain. To reduce tangible complexity and be able to make the right decisions faster and on a sound foundation, we link Teamcenter with our most important software tools, from the enterprise resource planning (ERP) system to Solid Edge CAD software. Teamcenter helps us depict a comprehensive digital value chain."

Schürz notes, "For example, we pass bills of materials from Solid Edge on to the manufacturing process planning system,
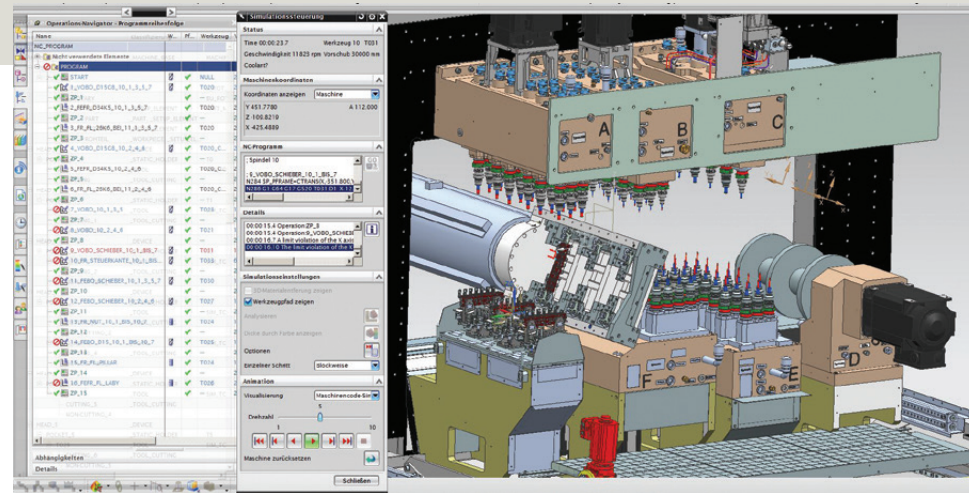
With comprehensive simulation of the production process, users can economically produce their parts early, verify them with automated collision detection and generate optimized NC programs.

where data is separated to better suit production needs, and then passed on to purchasing. Ultimately, custom design and commercial order processing work are perfectly synchronized."
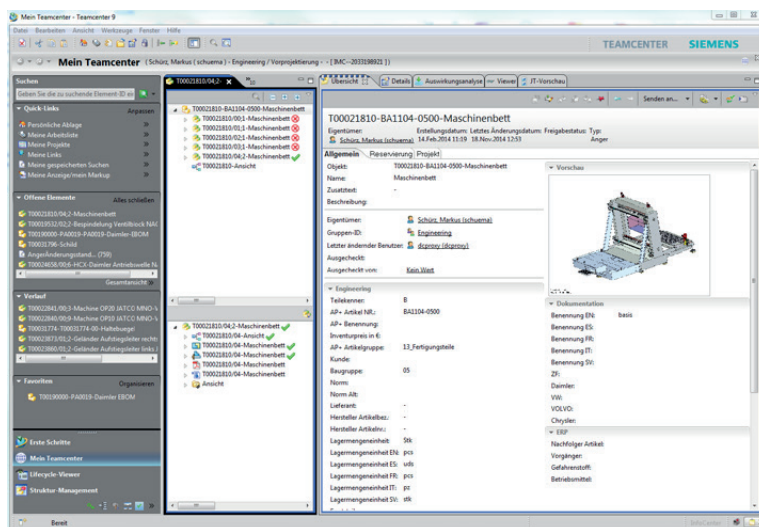
About 30 users are working with Teamcenter to develop proposals and documentation as well as workshop tasks on the basis of common data with assured validity. As a result, they expend far less effort than previously required for the search and validation of documents and for the fulfillment of ever-growing documentation requirements.

First Teamcenter project completed ahead of schedule
Teamcenter not only provides ANGER with a simple and consistent way to trace which parts were used in which machine, it also recommends existing parts and assemblies, enabling the firm to greatly increase the use of common parts.

"When we introduced Teamcenter, we obviously had to review the data and rearrange it in unaccustomed ways," says Schürz. "This has paid off nicely, though, as we were able to complete our first Teamcenter project – an HCX transfer center used for the multiple machining of valve blocks for automatic transmissions – well ahead of schedule."

"Centralized data management is the cornerstone of the globally networked systems of the future," says Haas. "For us, it makes a lot of sense to embrace Siemens PLM Software standards on a broad basis since they are already considered the state-of-the-art by our customers in the automotive industry. Aside from the technical properties of the software, a significant part of this success is owed to the problem-solving expertise of Siemens PLM Software sales partner, ACAM Systemautomation GmbH."

Since early 2013, about 30 users have been working with Teamcenter to develop proposals and documentation as well as workshop tasks on the basis of common data. With assured validity, they are able to exchange data with the ERP system. As a result, they expend a lot less effort searching and validating documents.

Solutions/Services

Solid Edge
www.siemens.com/solidedge

NX CAM
www.siemens.com/nx

Teamcenter
www.siemens.com/teamcenter

SINUMERIK
www.siemens.com/sinumerik

SIMOTION
www.siemens.com/simotion

Customer's primary business

ANGER MACHINING specializes in the development and production of Transfer Centers for the machining of serial components with especially high precision requirements for the automotive industry and related metalworking companies. With three subsidiaries in Germany, USA and Japan and numerous sales and service partners, the company has successfully established itself on the global market since its foundation in 1982.
www.anger-machining.com

Customer location

Traun
Austria

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Markus Schürz
Design Engineer
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