SIEMENS

Tecnomatix

EDAG Group

Reducing truck cab weight lowers costs and saves energy

Industry

Automotive supplier

Business challenges

Develop lightweight construction technologies

Increase energy efficiency and payload

Accelerate development processes

Reduce tool costs

Keys to success

Early integration of production engineering into product development

Collaborative development of product, tools and production plants

End-to-end process planning and simulation using a common database

Results

Reduced weight of cab bodywork for commercial vehicles by up to 20 percent

Reduced tool costs for the product by 13 percent

Reduced weight of handling gripper by 40 percent

EDAG uses Tecnomatix to optimize manufacturing of commercial vehicles

Creating optimized solutions for sustainable mobility

Starting in 1969 as a four person design office, EDAG GmbH & Co. KGaA (EDAG Group or EDAG) has grown into one of the world's leading independent engineering partners. Today, some 5,000 employees support manufacturers in the automotive, commercial vehicles, aviation, rails and renewable energies industries. Services include product development and production development through manufacturing of tools and bodywork systems. In delivering its services, the company provides a holistic understanding of vehicles and manufacturing systems. In cooperation with FFT, its sister company, EDAG also delivers complete production plants, operating as a turnkey partner.

The EDAG Production Solutions department provides an outstanding interface within the EDAG Group between vehicle development and plant construction. Thanks to a holistic understanding of vehicles and production plants, the EDAG Group provides leadership and added value in fusing product and production, from development through to implementation.

This means that developments are well-coordinated, taking into account

production-related requirements and restrictions. Throughout the process, both vehicle developers and plant constructors are advised by the organization's digital engineering specialists, who use virtual models and simulations to improve productivity. As a result of this highly collaborative process, manufacturing-optimized products are defined, and the vehicle designers informed of the prospective benefits offered by new production technologies.

Moreover, the EDAG Group provides comprehensive services along the supply chain directly related to the production processes involved in creating a new manufacturing plant. Services range from project management, planning, quality management consulting, design, the digital factory, instrumentation and control engineering, robotics and safety-related

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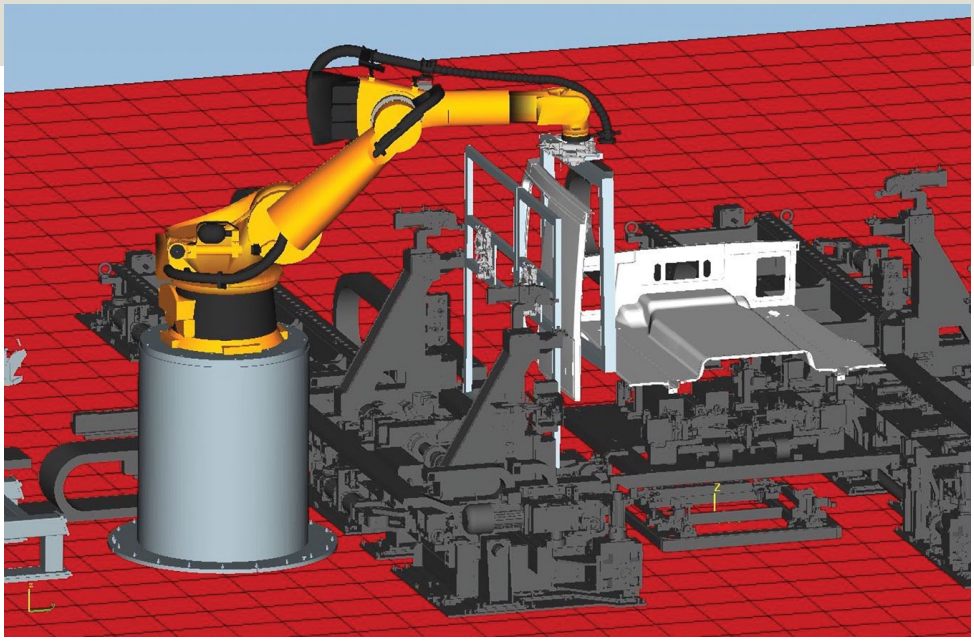
Jana Speidel
Digital Factory Engineer
EDAG Production Solutions
GmbH & Co. KG



services, through to the virtual start-up of the production facilities, technical documentation and product cost management.

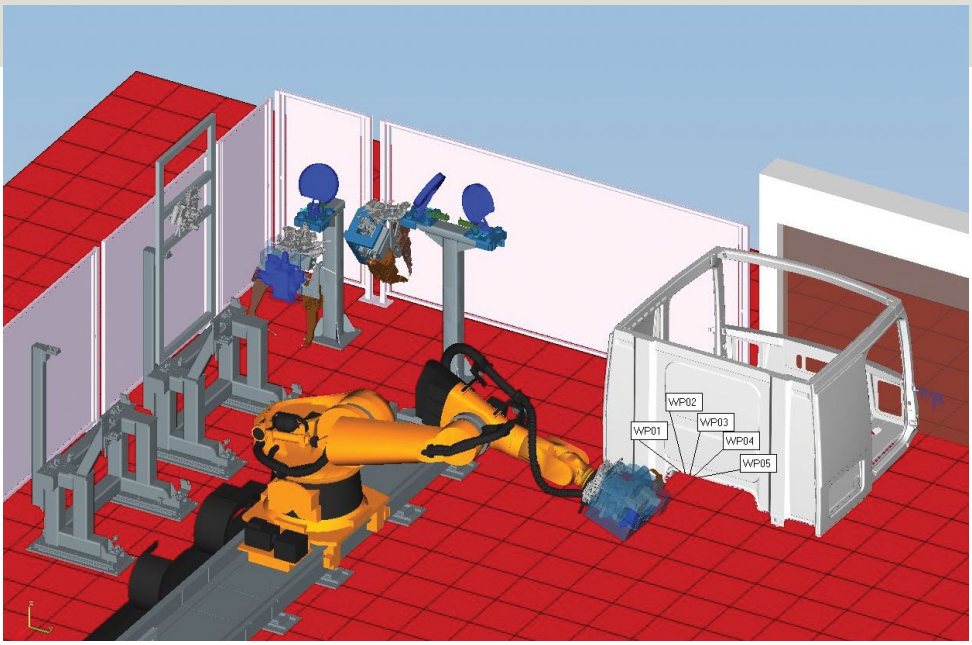
By linking product and production as early as possible in the product development process, EDAG creates optimized manufacturing solutions for sustainable mobility. For example, the EDAG LightCAR concept study won international recognition. This innovative open-source project set marks in electromobility and lightweight construction, two of EDAG's strategically important fields of expertise.

EDAG LightCAB design reduces costs

Another of the company's business objectives is to transfer automotive-driven innovations to other industries. One example is the EDAG LightCAB, a truck cab concept for commercial vehicles that includes elements of the innovative lightweight construction technology used in the LightCAR. Strict security and stability requirements have to be considered. By reducing cab weight, EDAG helps customers such as MAN, DAF and Daimler Trucks achieve important objectives, such as higher energy efficiency and larger payload. However, innovative materials and technologies can sometimes be costly. By using fewer parts and an intelligent modularity of product and production cells, lightweight construction technology can be cost-effective.

In order to complete such a project successfully, the collaboration of the product, production and tool development departments has to be intensive and must begin early in the process. Within the production solutions department, as the virtual product concept is released, the process planning team starts manufacturing planning using digital manufacturing methods. As an independent service provider, EDAG Production Solutions uses the solution it considers optimal for the project, or as applicable, the solution the customer prefers. This includes product lifecycle management (PLM) technology, such as the Tecnomatix® portfolio from Siemens PLM Software. EDAG Production Solutions uses the Process Designer solution in Tecnomatix for digital planning and the Process Simulate solution in Tecnomatix for robot simulation and programming.

Process Designer supports the conventional tasks of manufacturing planners, including planning individual assembly sequences, defining parts usage estimates



"In order to achieve a closer interaction of planning and simulation, we used the common database of the Tecnomatix software on a persistent basis. We recognized that this consistent source of information has enormous potential, especially for a service provider like us."

Karina Schaefer
Director
Digital Factory and Project Manager
EDAG Production Solutions GmbH & Co. KG

for production, analyzing cycle times and planning a preliminary layout. The planned production can be validated based on existing data, imported 3D models or data chosen out of components library. Tasks such as the actual robot and gun selection, reachability analyses and collision tests, or the definition of welding and handling paths, lead to an accurate, in-depth 3D layout, until the digital factory concept is released, one of the major milestones of the process.

In this project, the EDAG Production Solutions "Digital Factory" team wanted to support the increased requirements with a new approach. "In order to achieve a closer interaction of planning and simulation, we used the common database of the Tecnomatix software on a regular basis," says Karina Schaefer, digital factory and project manager at EDAG Production Solutions. In the past, a considerable amount of in-depth information and model files had to be collected repeatedly and updated with every change to the product or production plant. Now, in this pilot project, all data were captured once and all the engineers involved in the planning and simulation were able to access changes easily."

Schaefer notes, "We recognized that this consistent source of information has enormous potential, especially for a service provider like us. We aimed to return actual manufacturing feedback to product development earlier in the process. We also wanted to prevent errors and duplication of work, which sometimes happened in our previous methodology, due to inconsistent data."

Early involvement of the manufacturing department in the development process pays off

Use of Tecnomatix enabled an exciting new way of working together at EDAG Production Solutions, and the benefits continue to appreciate with its use. A good example is the early optimization of the three-part cab floor. Broadening the middle part enables the common sheet metal manufacturing of the two narrower side parts, plus improved material utilization at the same time. Now, a smaller standard weld gun can be used to connect the side parts to the middle part. Tool costs for the base plate can be reduced by about 13 per cent; part costs can also be reduced. If you assume an output of 30,000 cabs per year, the total benefit would sum up to approximately €3 million over ten years.

Using digital, lightweight construction technology early in the process also generates comprehensive benefits for the design of operating materials. For example, in the manufacturing cell, the weight of a handling gripper for the cab rear wall could be reduced from 147 to 47 kilograms. With the improvement, a smaller standard robot can take over the task, replacing a more costly, special-purpose robot. Reducing the weight of the operating material by 68 percent not only lowers investment costs, but also saves energy.

The collaborative engineering of product and production, using Tecnomatix, characterizes the entire cab concept. "Because product and production teams cooperate early and intensively, we were able to provide important insights regarding feasibility and assembly sequence," says Jana Speidel, digital factory engineer at EDAG Productions Solutions GmbH & Co. KG.

Flexible framing enhances advanced process planning and simulation tools usage

EDAG Productions Solutions also developed the Geotack 2010, a flexible framing solution that meets the requirements of the EDAG LightCAB. It provides flexible, robot-guided clamping frames for a wide range of model varieties. The entire framing assembly of the Geotack – including sub-structure, rear wall, both side walls and window frame – is manufactured using resistance spot welding.

The cell is primarily used for processing two parts at the same time, but single tooling is also possible. Segmented clamping frames and the high flexibility, with cycle times of 117 seconds per Geotack cell, guarantee that up to 30 variants can be manufactured.

During the simultaneous engineering phase, these concepts were created using Process Designer. Digital planning covers processes that include creating cycle time diagrams and designing 3D layouts. Process Simulate is used to further detail and simulate such data. Cycle time diagrams provide the groundwork for reachability analyses and robot programming. During the process, 3D layouts were enhanced to create functioning manufacturing concepts, including the exchange of robot types, changes of base heights or selection and integration of weld guns and grippers.

New working method – new challenges

As an integrated system for process planning and simulation utilizing a single, consistent database, the use of Tecnomatix also helps enhance organizational operations. For example, Process Designer and Process Simulate share some capabilities. "For some of the engineering tasks, depending on availability of staff members and resources, we can choose whether we want to carry out actions in the planning or in the simulation environment," says Speidel. "The methodology of digital planning using Tecnomatix provides considerable engineering advantages."

By using Tecnomatix, redundant tasks (such as preparing joint sequences in different systems) are eliminated. Using the previous approach, the product joint sequences were created using Process Designer and the manufacturing assembly sequences were defined using Robcad™ software in the Tecnomatix portfolio. In the new process, this task is done only once, leading to less effort as well as higher quality.

The earlier that processes for product development and manufacturing planning are synchronized, the more influence production issues have on the product concept. Therefore, it makes sense that all changes and optimizations are captured

Solutions/Services

Tecnomatix
www.siemens.com/tecnomatix

Process Designer

Process Simulate

Robcad

Customer's primary business

EDAG Production Solutions GmbH & Co. KG is the world's largest independent engineering partner, and develops ready-for-production solutions to ensure the mobility of the future.
www.edag-ps.de

Customer location

Fulda
Germany

within a single data source and all the engineers involved in process planning and simulation have direct access to it. Another benefit is not creating any redundant data.

A step forward into the future

EDAG Production Solutions wants to use its new experiences to further boost the high potential of collaborative engineering based on a common database. For Schaefer, one opportunity is the use of Teamcenter® software, also from Siemens PLM Software, for end-to-end product lifecycle management. "Our customers are already into that," she says. "So, of course, it is also very interesting for us." In future projects, Schaefer wants to recommend the company's new integrated working method to its original equipment manufacturer (OEM) customers. "We want to share the good practice we have gained," she says. "That's why we are advertising the new process within our customer communication. The good results we have achieved using Process Designer and Process Simulate have led us to increasingly offer these tools to our customers."

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