

SIEMENS

Ingenuity for life

Automotive and transportation

Magna Steyr

Two bodyshell types built on the same line

Product

Tecnomatix

Business challenges

Shorten production line planning time

Support a body-in-white, mixed production line; reduce hardware cost by re-using tools

Improve manufacturing process efficiency

Diminish down-time of a running production line, while introducing a new car model

Keys to success

Advanced planning methodology with Tecnomatix tools in a virtual environment

Integration of facility design and process planning

Automated transition of data from product designers to process planners

Offline robot programming

Results

Existing line almost completely re-used

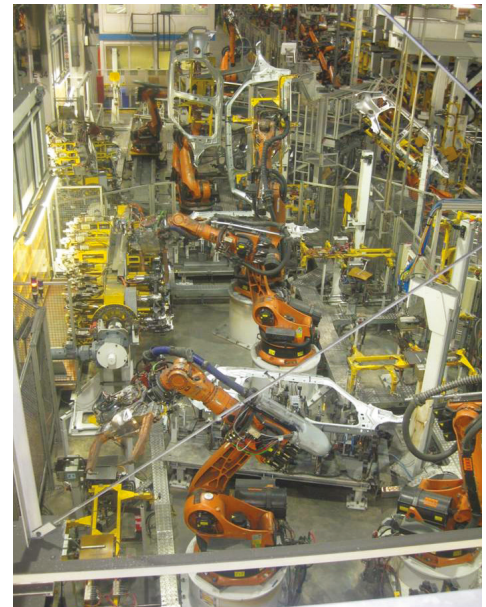
Prototype costs saved

Automobile supplier uses digital factory methods, integrates line and process planning, and masters ambitious customer tasks

Global presence, complete vehicle proficiency

The Austrian-Canadian enterprise Magna International Inc. is one of the most efficient, brand-independent engineering and manufacturing partners for automotive original equipment manufacturers (OEMs). With about 70,000 employees in more than 242 production sites across 25 countries, the supplier ranks among the sector's champions. The company's range of services includes development, engineering and manufacturing of systems, assemblies and parts. Additionally, Magna International Inc. acts on-demand as an OEM general contractor – a one-stop shop, from idea to complete vehicle development and assembly. Capabilities include comprehensive production levels – extra-low, low and high volume – as well as the ability to cater to special customer requirements, or peak shaving.

The company's current achievements – reflected by Magna Steyr Fahrzeugtechnik AG & Co KG (Magna Steyr), its Austrian subsidiary with main site in Graz – are the low-volume production of the Aston Martin Rapide and the development and manufacturing of the aluminum body for the Mercedes-Benz SLS AMG. A special



Part of bodyshell manufacturing at Graz site.

highlight includes the entire development and production of the BMW X3® – one of the most comprehensive tasks undertaken by the automotive supplier.

One line for two products

While the BMW X3 was still in production, Magna Steyr was awarded the contract to build the MINI Countryman®. Demanding specifications required a stringent re-use approach, with almost the entire bodyshell manufacturing to be set up on the already existing resources of the BMW X3. During the ongoing production, the new product needed to be planned in a way that the

Results (continued)

Higher maturity of production line and robot programs on first tryout

Shorter ramp-up time

Required manufacturing capacity reached quicker

Fewer process errors and less material waste

Increased in-house process knowledge

“The quality of the robot programs determines the quality of the line ...With Tecnomatix, we were able to master the complexity.”

Andreas Huber
Bodyshell Planner
Magna Steyr

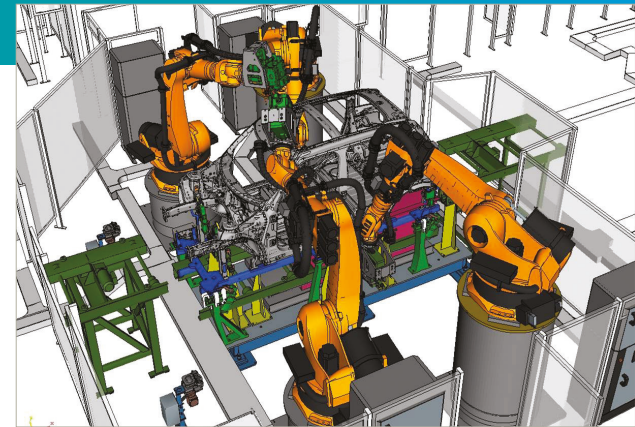
series production of the MINI Countryman could start on the same line without any significant delays. This meant that all body-in-white processes of two very different vehicle types had to run almost parallel for a certain time.

Another challenging requirement was that the prototypes should be built on this single line. The aim was to save time and money by eliminating a separate prototype production line and to achieve high compatibility with the series production. “In view of these conditions, we had to review our planning methods and processes,” says Walter Gantner, strategy planner of Simulation/Manufacturing Planning at Magna Steyr. “This task was only doable with virtual planning and simulation.”

The result was a strategy change. Overall project planning would now be executed almost completely using in-house resources; only portions would be managed by external partners. In using this approach, Magna Steyr aimed to increase its own expertise, and to make processes more efficient. To achieve this, Magna Steyr chose Tecnomatix® software from Siemens Digital Industries Software. The choice was based on experiences the company had already gained on smaller projects using Siemens’ digital factory solution. Now, all bodyshell manufacturing processes for the MINI Countryman would be digitally planned and simulated with Tecnomatix.

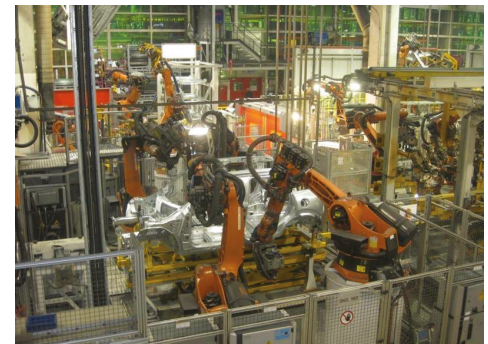
Setup of the virtual world

Magna Steyr needed an accurate image of the real production for the virtual planning environment. In a first step, the manufacturing line of the BMW X3 was captured with 3D scanners. Then, all stations and robots were defined by geometry and dynamic behavior and stored in digital libraries. Various object libraries of Tecnomatix supported the setup of the virtual line. All elements within the hall were mapped in the virtual planning envi-



Tecnomatix facilitates robot programming.

ronment, within an accuracy of +/- 5-10 millimeters – significantly more precise than using conventional 2D methods. On this basis, the four-man team (responsible for bodyshell manufacturing of the BMW X3/MINI Countryman) planned the main line and the sub-line for the side frame. External service providers did the line building for the car’s front and top.



The bodyshell line includes approximately 180 robots.

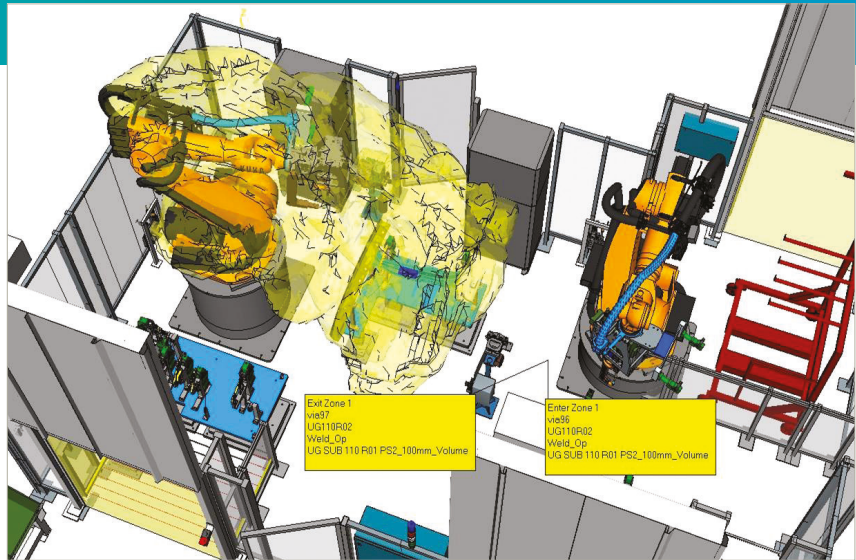
Tecnomatix played a decisive role in creating, simulating and optimizing programs for robot control. The bodyshell line at Magna Steyr includes around 180 robots with a level of automation of more than 98 percent. The planners had to consider 280 welding guns, 100 grippers and corresponding tool change systems. The interaction of up to six robots, with all degrees of freedom within a confined space, had to be coordinated in detail. All weld spots had to be arranged throughout the individual manufacturing stations within the required cycle time. “The quality

of the robot programs determines the quality of the line,” explains Andreas Huber, bodyshell planner and a key Tecnomatix user at Magna Steyr. “Without being able to test programs on the real line, we could only master this complexity with external programming and simulation.” He notes, “With Tecnomatix, we were able to master the complexity.”

Faster and more flexible robot programming

After the engineering department had provided the new vehicle model, including all geometry data and weld spots, the bodyshell planners defined the welding sequence in Tecnomatix and evaluated potential re-use of existing welding guns for all weld spots throughout the line. The Tecnomatix solution enabled them to accomplish the required tasks. Precise, comprehensive reachability studies, cycle time analysis and collision simulations not only supported quick turnaround, but also improved the quality of the result. “The low demand – only five percent new welding guns – astonished all persons involved,” notes Huber. “The high degree of re-use of the existing line is very remarkable given the wide differences between the vehicle types.”

Also pivotal to project success was the subsequent offline programming of the welding programs. Live programming was not possible, because the old product was still being built 24/7 on the production



Collision analysis with Tecnomatix.

line. Using Tecnomatix, Magna Steyr’s planners were able to write and prepare all programs themselves, integrate the work of the external service providers, and simulate the environment in detail. Manfred Pichler, bodyshell planner at Magna Steyr, notes, “We reviewed everything twice. The old line had to stay functional and, at the same time, had to be useable for the new product. Every detail mattered.” For example, he says, “The extensive functionality of Tecnomatix significantly facilitated the definition and distribution of welding spots.”

The programs were defined in a way that enabled fine adjustments, including aberration compensation and zero-point shifting, as well as live tests. The work was completed over the course of several

“We want to use Tecnomatix as a standardized, universal planning tool for the entire product lifecycle.”

Walter Gantner
Strategy Planner
Simulation/Manufacturing
Planning
Magna Steyr

Solutions/Services

Tecnomatix
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Customer's primary business

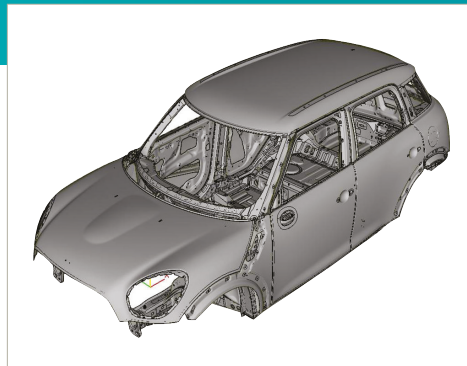
Magna Steyr is a brand-independent supplier of and partner with automotive OEMs. With highly flexible development and assembly strategies, the company offers OEMs solutions for a wide range of services – from individual systems like door modules and roof systems to complete vehicles. Magna Steyr handles various production levels (extra-low, low and high volume), as well as peak shaving.
www.magnasteyr.com

Customer location

Graz
Austria

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Bodyshell Planner
Magna Steyr



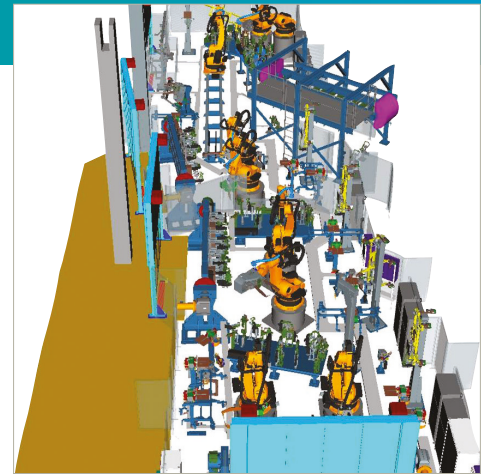
Bodyshell drawing of the MINI Countryman.

week-ends. With Tecnomatix, shorter intervention times, fast implementation and flexible, continuous program adjusting were in direct contrast to conventional planning, where program installation was only possible at production breaks during the summer and winter holidays.

Ambitious requirements entirely met

The bodyshell planners' efforts paid off. No problems occurred during the mixed phase, in which the winding down of the BMW X3 production line overlapped the start-up curve of the MINI Countryman. During this cycle, Magna Steyr was able to run the BMW X3 production line at full capacity. By using block manufacturing on the line, it was possible to switch between the two vehicle types. After a two-week holiday, Magna Steyr increased the production of the MINI Countryman from zero to two thirds of the ridge line within four weeks. “We want to emphasize that despite the temporary parallel manufacturing, we continued producing the X3 without any loss in quality,” says Gantner.

According to Huber, Gantner and Pichler, Tecnomatix passed its premiere at Magna Steyr with a brilliant performance across-the-board. The company was able to completely realize customer specifications. Ramp-up time of the new manufacturing process was shorter, and production costs were reduced due to the elimination of the prototype line and re-use of existing resources. Digital planning guaranteed a



3D layout of a body-in-white line.

higher process quality, which resulted in fewer errors and less material waste. Equally important, Magna Steyr acquired new best-practice insight with the elimination of the previous methodology whereby certain tasks between facility design and process planning were disconnected. For future projects, facility design and process planning tasks will be merged, resulting in fully integrated planning.

Series planning tool for the complete lifecycle

By using Tecnomatix for the bodyshell manufacturing of the MINI Countryman, Magna Steyr developed the necessary patterns for digital planning and laid the basis for far-reaching standardization. After completing the bodyshell manufacturing planning project, the company has set its sights on digital planning for assembly and painting. Recently, Magna Steyr started a new strategic project in close cooperation with Siemens Digital Industries Software. Tecnomatix will be expanded to become the company's comprehensive tool for series planning. The aim is to use digital planning methods beyond the start-of-production phase. Gantner explains, “We want to use Tecnomatix as a standardized, universal planning tool for the entire product lifecycle. We are working hard to achieve this.”

Siemens Digital Industries Software

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