SIEMENS

AUTOMOTIVE AND TRANSPORTATION

Bosch Group

Using a standard library to speed up modeling efforts for material flow simulation by 50 percent

Product

Plant Simulation

Business challenges

Deliver efficient material flow simulation for globally distributed production sites

Use digital factory simulation to plan new production facilities and optimize existing production lines

Recruit and qualify new experts expeditiously for factory simulation

Keys to success

Use the Plant Simulation object-oriented environment

Develop a standard for simulation models by creating a library

Provide training and education for simulation experts

Bosch leverages Plant Simulation to simplify and standardize factory simulation

Changing mobility concepts with digital solutions

As a leading international technology and services company, the Bosch Group (Bosch) employs about 421,000 associates worldwide. They generated sales of €88.2 billion in fiscal year (FY) 2022. Bosch's activities are divided into four business sectors: mobility, industrial technology, consumer goods and energy and building technology. As a leading internet of things (IoT) provider, Bosch offers innovative solutions for smart homes, Industry 4.0 and connected mobility.

Bosch pursues sustainable, safe and inspiring mobility. With its expertise in sensor technology, software and services as well as its IoT cloud, the company can offer customers connected and cross-domain solutions from a single source. Bosch's strategic goal is to offer solutions and products for connected life that either have artificial intelligence (AI) or are developed or manufactured using AI. Bosch provides innovative and inspiring products and services that improve the quality of life worldwide.

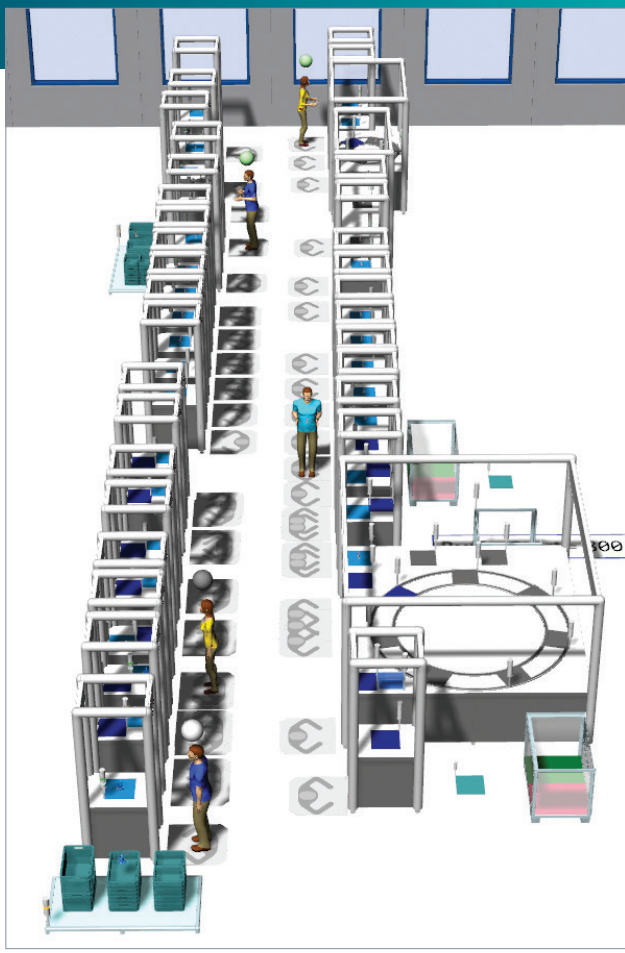
Results

Used standard library to reduce modeling time by over 50 percent

Simplified factory simulation by using a generic standard library for production systems

Expanded the network of simulation experts, including training 30 in one year

Provided expert training with five blocks up to certification



The central working group of Digital Production at Bosch manages the simulation of production systems. “We evaluate, improve, standardize and establish key solutions in the context of simulation, both for new and existing series production,” says Tobias Lechler, who has led the working group since 2022.

Simulating material flow as a service

Simulating material flow plays an important role in this area. When planning new production lines and locations, planning scenarios are validated, production processes and layouts are optimized and the routes and distribution of automated guided vehicles (AGVs) as well as many other parameters are checked. To improve existing production environments, simulation-based predictions support production planning, relocation concepts are validated and improvement concepts are developed. Carsten Meyer began these tasks in 2018 as a simulation expert in the Bosch Central Engineering and Production Services department. He has carried out simulation projects in 16 factories and seven divisions of the company.

“After an evaluation phase, we decided to use Plant Simulation throughout,” says Meyer. “The scope of services and the user-friendliness convinced us.” Plant Simulation in the Tecnomatix® portfolio is from Siemens Digital Industries Software, a long-time partner of Bosch.

Simulating a production plant in Plant Simulation, which is part of the Siemens Xcelerator business platform of software, hardware and services, begins by creating a model. Using the standard objects available in Plant Simulation for production and logistics units, complex production systems can be configured and placed in a layout to obtain a 2D or realistic 3D representation of the plant. “With this structure, the system offers many possibilities and allows a lot of freedom,” says Lechler.

“We have found that Plant Simulation is the best solution for our tasks.”

Tobias Lechler
Leader, Working Group
Digital Production
Bosch Group

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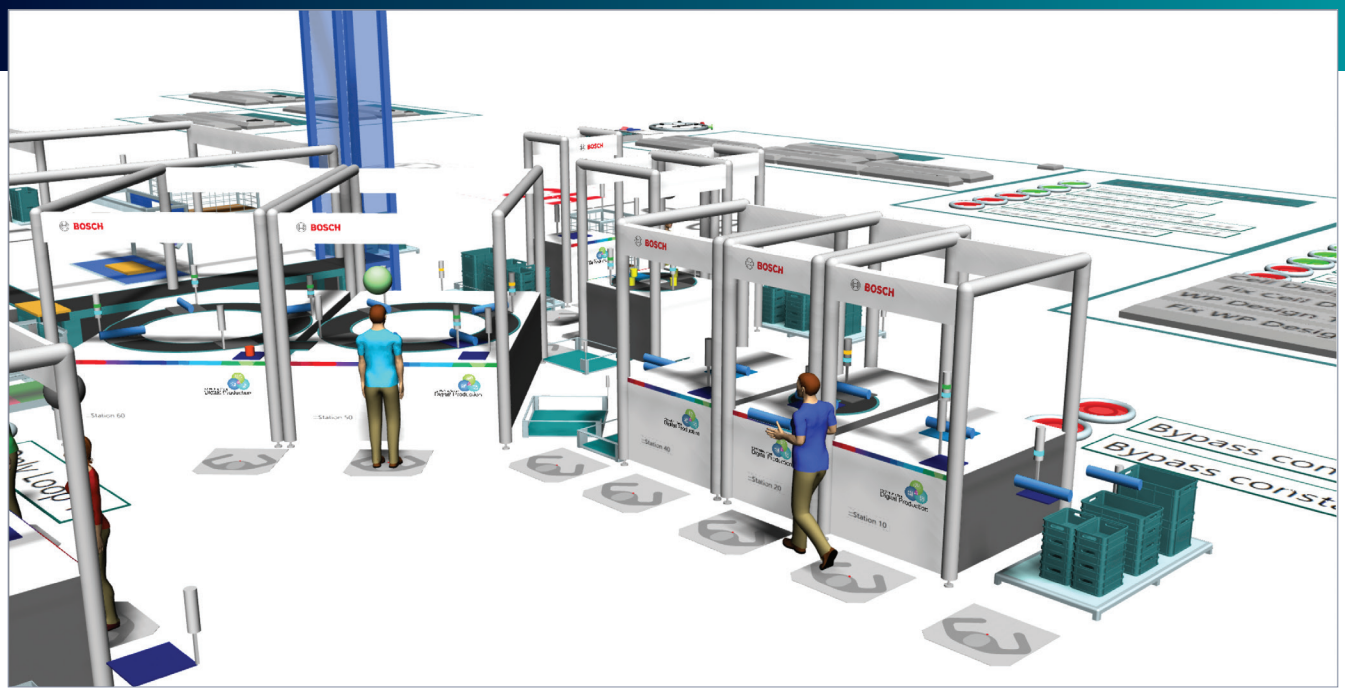


"However, this also means that simulation models quickly become extremely individual, which makes it difficult to exchange, collaborate and re-use them in larger groups."

Parameters are then added to the individual objects. These can be component size, production process times, the capacity of buffers or key figures for possible failures and changeover times. The simulation experts change the parameters in various scenarios until they reach their targets for output quantity, cycle times or overall plant efficiency. "It takes a lot of experience to use the right data in the right places," says Meyer. " However, we lacked well-trained experts and the model quality is difficult for outsiders to check."

There were two further obstacles to scaling the use of simulation: "While the experts are supposed to carry out improvement work on the value stream, they are burdened with recurring, nonvalue-added tasks when building the model," reports Lechler. Meyer adds, "Due to the wide range of tasks and variants, the training takes too long to retain all the knowledge."

Convincing experts of standards

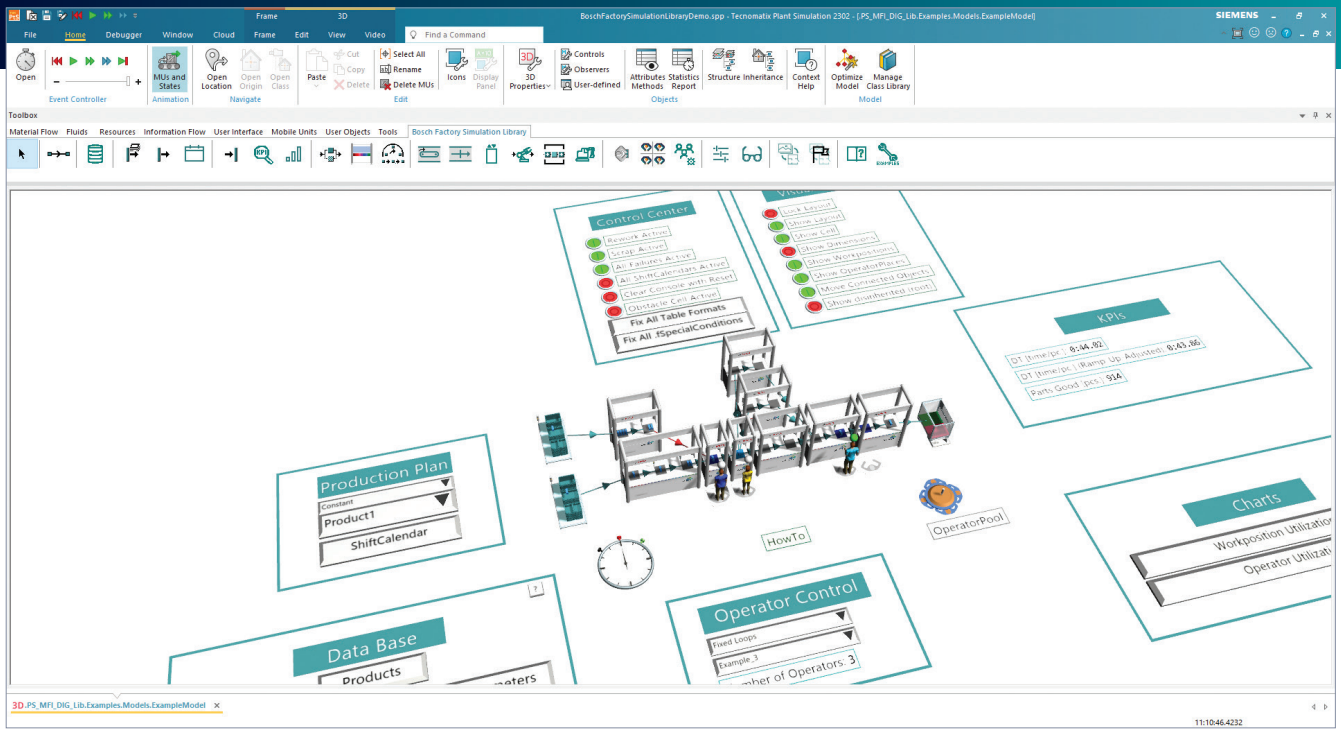
Since 2019 Meyer has supported the central working group of Digital Production at Bosch in the search for a solution to these challenges. A team of four experts, testers and developers set to work on developing a standard library for simulating production systems. The company's globally distributed experts were also involved in this process.

Plant Simulation was used due to its object-oriented simulation environment for encapsulation, inheritance of properties and definition of hierarchies. Objects can be saved in libraries and made available to users. Central changes can then be applied to all instances of these objects. Above all, the library objects can be easily adapted to the specific requirements of an application.

"We analyzed our production systems and broke them down into their individual parts to identify the right objects for the standard library," says Lechler. "Standardized data storage was defined in the models of automated and manual production systems. Finally, we worked on how to automate the modeling process.

"By performing modeling with the standard library integrated into the training, even employees without simulation experience become familiar with the basics of Plant Simulation in multiple stages and quickly achieve advanced skills."

Carsten Meyer
Engineering and Production Services
Bosch Group



> "The combination of a standard library and standard training enables us to achieve our goal of using Plant Simulation for simulating material flow on a broad scale."

Carsten Meyer
Engineering and Production Services
Bosch Group

"We focused on user-friendly modeling and used experience from the gaming industry to 'gamify' the processes."

In about a year, 25 standard objects and 20 application examples were created to illustrate the practical use of the standard objects. The knowledge of existing experts was incorporated into developing the standard objects. Standardized storage locations and options for transferring simulation data were created.

Now for new projects (greenfield), an interface is provided to import data from a Bosch internal standard planning tool. In case there are production optimization projects (brownfield), examples are available on how to establish links to production data.

The standard library is now patronized by over 70 users throughout Bosch. In a written survey, the standard library received a very good overall rating of 4.4 out of a possible 5 points. "The experts stated they are over 50 percent faster when modeling with the standard library," says Lechler. According to the respondents, collaboration made it easier and visualization is improved. Users can more easily access the models of colleagues and reliably find the correct parameters from the production lines.

Solutions/Services

Plant Simulation
siemens.com/plantsimulation

Customer's primary business

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www.bosch.com

Customer location

Stuttgart
Germany

Rapidly achieving advanced skills

Thanks to these advantages, many simulation experts can no longer imagine using Plant Simulation without the standard library. However, to ensure success and meet the company's simulation requirements more quickly, a standard training course for new experts has also been developed. "By performing modeling with the standard library integrated into the training, even employees without simulation experience become familiar with the basics of Plant Simulation in multiple stages and quickly achieve advanced skills," says Meyer. The final step is certification, which ensures high quality standards in simulating real use cases in the company.

The virtual training meetings are so well received that many experts continue to take part even after certification. This allows them to connect with other experts who have similar tasks, exchange experiences and make valuable suggestions. In half a year, over 30 colleagues have taken part in the training program. "The combination of a standard library and standard training enables us to achieve our goal of using Plant Simulation for simulating material flow on a broad scale," explains Meyer.

"We have found that Plant Simulation is the best solution for our tasks," says Lechler. The standard library will be further optimized: "We will continue to improve the user-friendliness," says Meyer. "To this end, we are working on standardizing data input and visualization of results."

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