SIEMENS
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Academic

Thomas More University of Applied Sciences

Belgian university uses Siemens solutions for comprehensive product design and manufacturing education

Products

NX, Simcenter, Teamcenter

Business challenges

Teach product development and production

Empower students to master the entire product creation process

Instruct students to create new products from scratch

Keys to success

Use NX for all design and manufacturing work

Use Simcenter for design verification

Use Teamcenter for manufacturing information management

Results

Provided students with product creation skills using digital twins

Enabled students to manufacture products combining various methods

Empowered students to manage and carry out complex manufacturing processes

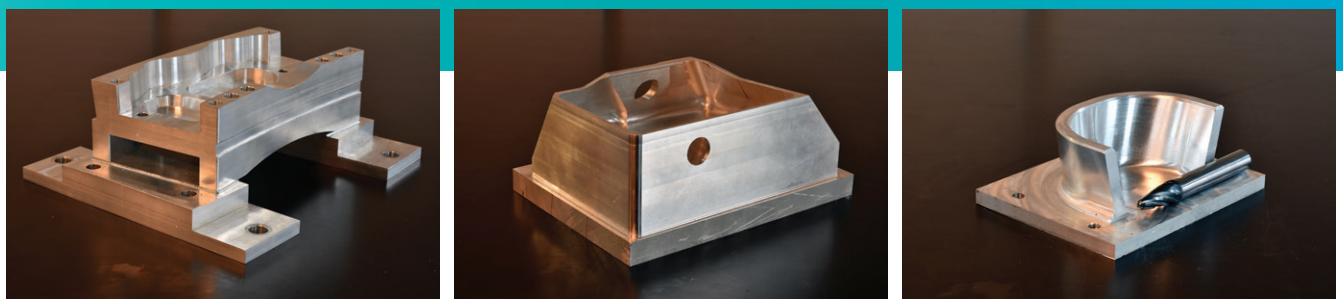
Using NX, Simcenter and Teamcenter, Thomas More students acquire the skills and knowledge required to master the entire product creation process

Education from first idea to finished product

Thomas More is the largest University of Applied Sciences in the Belgian region of Flanders with seven campuses, most of which are located in the Antwerp province. It is a partner in the wider academic and educational network around KU Leuven, the country's leading university. Providing a more practical education on an academic level, Thomas More offers students three-year courses they finish with professional bachelor degrees.

"The industry seeks technically skilled people who are able to design a product and to lead the production of the desired parts rather than just programmers for NC

At the De Nayer campus that Thomas More University of Applied Sciences shares with KU Leuven University, students learn how to use sophisticated CNC machine tools to manufacture complex parts.



Using NX, Thomas More students programmed a 5-axis NC milling center to automatically produce parts with complex geometries, often for use in aerospace applications. Taking into account the capabilities of parabolic milling tools in their programming, they reduced milling time of the part on the far right from 30 to three minutes.

"Our students used NX CAM across all the steps required to produce the metal bottle combining various additive and subtractive production methods and the use of robotics. Consistent use of that comprehensive software empowers them to manage and carry out complex manufacturing processes from end to end."

Jeroen Mingneau
Design and production consultant
Thomas More

machine tools," says Ing. Jeroen Mingneau, professor for design and production at Thomas More. "This is why we provide students with the skills and knowledge required to master the entire product creation process."

At the De Nayer campus near Mechelen that Thomas More shares with KU Leuven, masters students from that university work hand in hand with Thomas More design and production technology students on projects covering the entire product creation process chain.

"Some way into the course, students can decide whether to put a greater focus on design or on production, follow the design track or the industrial track," says Mingneau. "Any way they go, they are permanently challenged to push the boundaries."

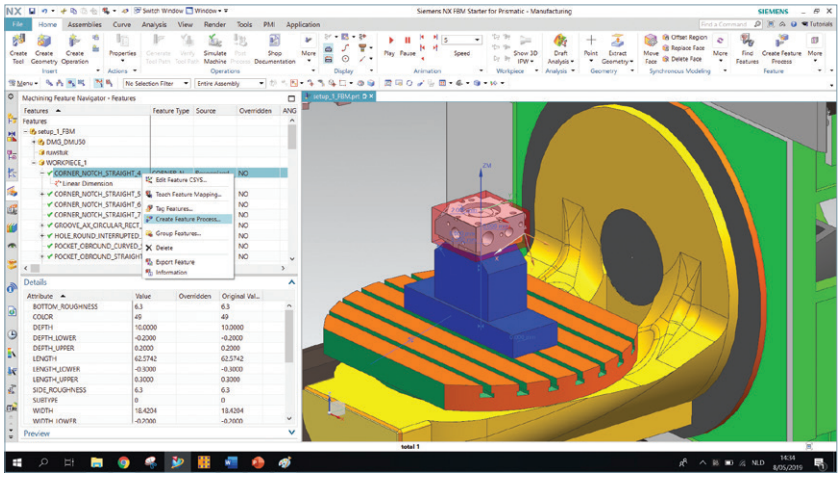
The training takes students all the way from the first idea to the finished product. Each year, students get assignments to create a new product from scratch as a team, turning the theory they have learned in lectures into practice. They set out with nothing more than a requirement, a task, a budget and a deadline.

Computer-aided education

All students in the design and production technology course use NX™ software, an integrated solution for computer-aided design, manufacturing and engineering (CAD/CAM/CAE) from Siemens Digital Industries Software. They start by creating digital designs, which they challenge and verify in the virtual world. Depending on the characteristics of the design at hand, they use either NX or software from the Siemens Simcenter™ portfolio for this task.

Thomas More students then make the move to production. Using part designs created in NX, design and production technology students use the software's CAM capabilities to program code for numerical control (NC) machine tools. They read and analyze the codes created automatically by postprocessing to obtain a deeper understanding of the various machining codes for different machines as well as neutral formats such as the ISO code. From an early stage onward, students simulate the machining operations based on the digital twins of both their designs and the machines using NX and the machines' built-in simulation capabilities.

In their second year, students get more advanced, starting with 3-axis simultaneous machining and 5-axis positioning.



In her internship, a Thomas More student studied the software functionality and the specific machine language NX uses for feature-based machining with definitions of the designed space and PMIs.

Thomas More students used NX software for design and verification of parts to be manufactured combining various additive and subtractive production methods and the use of robotics.

"Every year, the Eco Drive Team tries to make the vehicle lighter and thriftier. They design and produce all machined parts as well as the carbon fiber components in-house using NX."

Jeroen Mingneau
Design and production consultant
Thomas More

Simulation is again involved. They need to do all the work preparation, including tool and clamping selection and they work with tolerances as tight as 2/100 mm. Within a one-day assignment, they have to produce a finished, quality-controlled part or a plan detailing how to finish the work they have started.

In the expert phase, students use 5-axis simultaneous machining to manufacture highly complex lightweight parts for aerospace applications with tight requirements for precision and surface quality. There is a focus on collision prevention and the use of specific G-codes for advanced machining technologies such as adaptive and trochoidal milling. "We cooperate closely with tool manufacturers, developing new milling strategies and the software required to implement them," explains Mingneau. "In some of our projects, our more advanced students achieved significant speed gains, cutting machining time for a complex part from 30 to three minutes."

Advanced manufacturing

In addition to NX for CAD and CAM and Simcenter for various simulation tasks, the students also use software from Siemens' Teamcenter® portfolio, notably functionalities such as shop floor connection, tool management, the integrated process planner or the resource library. "Teamcenter for manufacturing is really the information backbone in our production laboratories," says Mingneau. "Using Teamcenter, our students automatically acquire a future-oriented approach to manufacturing data management."

"NX users can greatly reduce the time needed for CNC programming."

Jeroen Mingneau
Design and production consultant
Thomas More

Students on the Thomas More Eco Drive Team use Siemens Digital Industries Software systems to design, simulate and build extremely fuel-efficient vehicles to participate in the Shell Eco Marathon in London.

Although employers in the manufacturing industry show a vivid interest in Thomas More professional bachelor graduates, many students stay to pursue higher degrees. On its De Nayer campus, the university investigates new manufacturing trends. Advanced students get to work with the latest technologies, machines and tools including 3D printing or combining subtractive and additive manufacturing methods.

Thomas More students used NX software to design and verify parts to be manufactured combining various additive and subtractive production methods and the use of robotics. In several steps they made a metal look-alike of a famous Belgian beer brand's bottle, a product everyone understands. The first step was wire-arc additive manufacturing (WAM) using a robot for multi-axis material deposition. The bottle was then separated from its carrier plate using a wire cut electric discharge machine (EDM). After finishing the part's surface by turning in a lathe, it subsequently went into a 5-axis milling center to have the brand mark engraved on the bottle's curved surface.

"Our students used NX CAM across all the steps required to produce the metal bottle combining various additive and subtractive production methods and the use of robotics," says Mingneau. "Consistent use of that comprehensive software empowers them to manage and carry out complex manufacturing processes from end to end."

Using NX, Thomas More student Mahé Thielemans wrote a course on feature-based machining (FBM) for future students in her four-month internship. The technology unique to NX automatically determines the machining process for a wide range of features. NX uses product and manufacturing information (PMI), such as tolerances and surface finish call-outs attached to the 3D model, to drive the machining method selection. "For parts with complicated geometries, feature-based machining automatically generates up to 80 percent of the tool paths," says Mingneau. "NX users can greatly reduce the time needed for CNC programming." Thielemans studied the software functionality and the specific machine language NX uses to automate machining based on feature recognition. The result of her work can be used as a course and an implementation guideline for companies.

Thomas More students used NX software to optimize the geometry of a component of the Eco Drive vehicle's braking system.

Solutions/Services

NX
siemens.com/nx

Simcenter
siemens.com/simcenter

Teamcenter
siemens.com/teamcenter

Customer's primary business

Thomas More is the largest university of applied sciences in Flanders, offering more than 30 Dutch-taught and a range of English-taught bachelor degree programs in the province of Antwerp, Belgium. Thomas More also offers exchange programs in English for students from partner universities.
www.thomasmore.be

Customer location

Sint-Katenlijne-Waver
Belgium

Students on the Thomas More Eco Drive Team use Siemens Digital Industries Software systems to design, simulate and build extremely fuel-efficient vehicles. They regularly participate in the Shell Eco Marathon in London with 166 teams from 25 countries. "Every year, the Eco Drive Team tries to make the vehicle lighter and thriftier," says Mingneau. "They design and produce all machined parts as well as the carbon fiber components in-house using NX." The current model achieves a mileage of 160 kilometers per liter (377 miles per U.S. gallon).

The students use NX capabilities to optimize component design for weight. They optimize and prepare components for additive manufacturing using the convergent modeling design paradigm within NX. "Using this advanced technology, we can create parts with optimal weight-to-strength ratios in a very short time," says Mingneau.

"Using Teamcenter, our students acquire a future-oriented approach to manufacturing data management."

Jeroen Mingneau
Design and production consultant
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