

Education

Michigan Technological University

NX gives students a taste of real-world success

Product

NX

Business challenges

Provide "first job" during senior year

Help sponsors solve real-world design challenges

Keys to success

Investigation of multiple design alternatives

3D digital models used for design reviews

NX CAD-CAM integration

Interactive preview of cutting operations

Results

Student design exceeded sponsor's expectations

11-cent average cost reduction per roller

Potential savings of \$1.85 million annually

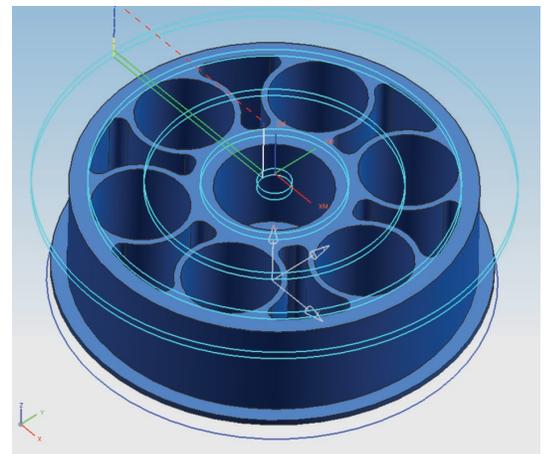
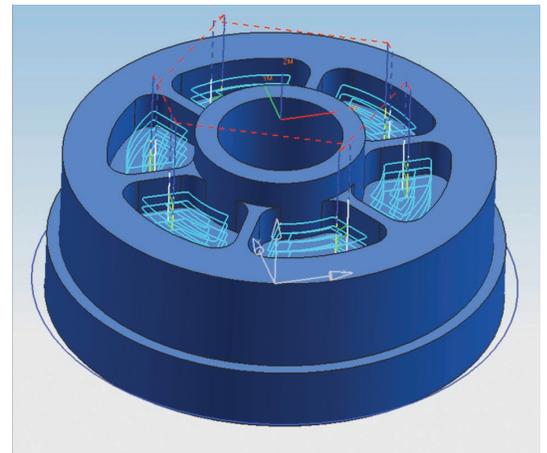
Redesign for Whirlpool Corporation has the potential to save the appliance manufacturer up to \$1.85 million annually

Practical experience for college seniors

Michigan Technological University enrolls approximately 7,000 undergraduate and graduate students from across the nation and around the world. The university has 130 degree programs in arts, humanities and social sciences; business and economics; computing; engineering; forestry and environmental science; natural and physical sciences; and technology.

Michigan Tech's Department of Mechanical Engineering – Engineering Mechanics offers a graduate program that is ranked 48th among doctoral-granting mechanical engineering departments in the U.S. (2010 U.S. News & World Report: America's Best Graduate Schools). Its undergraduate program is ranked even higher, at 22nd nationally (2008 U.S. News & World Report: America's Best Colleges).

To qualify for an undergraduate mechanical engineering degree at Michigan Tech, students must apply what they've learned in class to a real-world design challenge. For most, this means participation in the Senior Capstone Design Program. "The Senior Capstone Design Program provides students with their first job, rather than



“By the time students start the Senior Capstone Design Program they are very comfortable with NX.”

Jamie Dufner
Graduate Student
Teaching Assistant
Department of Mechanical Engineering – Engineering Mechanics
Michigan Tech

their last class,” says William Endres, PhD, associate professor and director of the ME Senior Capstone Design Program at Michigan Tech.

Teams consisting of four to six students help sponsoring companies address actual design challenges while providing a fresh perspective. With guidance from an advisory team, student teams apply their coursework to establish requirements, develop a viable design, and then build and validate the performance of a working prototype. The teams have access to a number of CAD solutions, including NX™

software from Siemens PLM Software. “NX is taught in one of the first engineering disciplines on campus,” explains Jamie Dufner, currently a graduate student teaching assistant for Michigan Tech’s ME Senior Capstone Design Program. “It’s easily learned. By the time students start the program they are very comfortable with NX.”

Whirlpool Corporation’s request

As a senior, Dufner was co-leader of a Senior Capstone Design team that worked with appliance manufacturer Whirlpool Corp. on a problem it was having with the support rollers in some of its clothes dryers. These are the components that support the dryer’s rotating drum. Each dryer model uses two or four rollers, and Whirlpool requires 15 million rollers per year. At the time, Whirlpool was using two different roller models, but cost and reliability were concerns. “Our team’s objective was to replace the prior two rollers with one design that would reduce the cost of the rollers, while maintaining or improving quality and performance,” says Dufner. Performance considerations included the noise level during operation and the need for the rollers to last the lifespan of the overall appliance.

Senior Capstone Design teams typically choose their CAD system to match the software used by the sponsoring company.



Solutions/Services

NX
www.siemens.com/nx

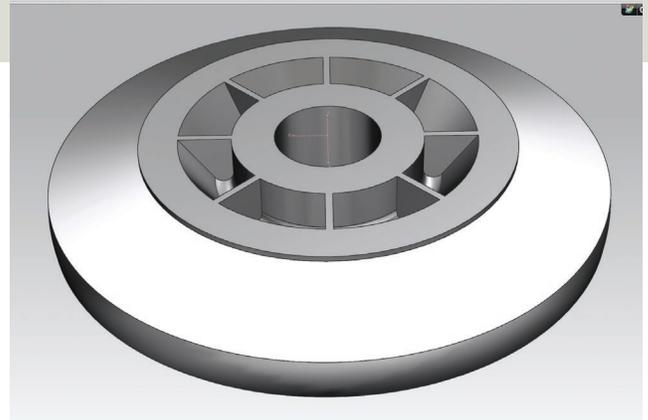
Customer's primary business

Michigan Tech enrolls 7,000 students in more than 130 degree programs.
www.mtu.edu

Customer location

Houghton, Michigan
United States

But even though Whirlpool uses Pro/ENGINEER® software, Dufner's team stayed with NX. "The student doing the CAD work preferred to work in NX, so when it came time to design our final concepts, he used the software with which he was most comfortable," Dufner explains.



Eleven-cent reduction adds up

The team used NX to model a number of possible roller redesigns. "Our ideas were much easier to understand as NX models compared to making sketches," says Dufner. "Doing the brainstorming work in NX was definitely a time saver too." The clarity provided by 3D computer models was probably the most important benefit, according to Dufner. "With NX, we could clearly explain our ideas to our advisors. It was a wonderful way to communicate. People of every language and every nationality in the room understood what we were talking about."

After narrowing the redesign options to two, the team used the NX CAM functionality to easily convert CAD models to CNC code for machining prototypes. The CAM software gave the team an interactive preview of the cutting operations. "This was crucial in identifying any tool gouging, unwanted cutting or inefficient move-

ments to help reduce the cutting time and the number of errors," states the team's final report.

The two prototypes were tested on an accelerated life-test machine provided by Whirlpool. One design option was rejected because it didn't meet the noise requirements of Whirlpool's appliances. The chosen concept exceeded Whirlpool's expectations for the required lifespan while also delivering an impressive cost savings of 11 cents/unit. The team's work adds up to a potential savings to Whirlpool of \$1.85 million annually.

"I love the hands-on nature of the Senior Capstone Design Program," says Dufner. "It allows for opportunities to take skills you developed during coursework with programs such as NX, and apply them to a real-world problem."

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