

UNH PRECISION RACING

IMPROVING SAE FORMULA ONE RACING TEAM PERFORMANCE WITH SOLIDWORKS EDUCATION EDITION



The University of New Hampshire (UNH) Society of Automotive Engineers (SAE) Formula One Racing Team—better known as UNH Precision Racing—switched to SOLIDWORKS Education Edition software to improve the team’s competitive performance, resulting in the best season in the team’s history.



University of New Hampshire
College of Engineering and Physical Sciences

Challenge:

Improve real-world experiences for mechanical engineering students, including participation in UNH Precision Racing (the University of New Hampshire SAE Formula One Racing Team), by shortening the CAD learning curve and by providing access to integrated design simulation tools.

Solution:

Implement SOLIDWORKS Education Edition software to support the mechanical engineering curriculum and the efforts of UNH Precision Racing.

Benefits:

- Improved team performance to all-time high
- Validated racecar design with simulation tools
- Facilitated communication among team members
- Enhanced design visualization

The University of New Hampshire ranks among the top-tier research institutions in the United States. Comprising dozens of academic departments, interdisciplinary institutes, and research centers located amid the rolling hills and riverbeds of one of the most beautiful campuses in the nation, UNH attracts students and faculty from around the world. The university's College of Engineering and Physical Sciences houses the Department of mechanical engineering, which includes state-of-the-art facilities and a strong curriculum that emphasizes real-world engineering experiences.

Those real-world experiences include senior design projects as well as participation in the university's Society of Automotive Engineers (SAE) Formula One Racing Team—better known as UNH Precision Racing. According to Professor Brad Kinsey, chairman of the Department of Mechanical Engineering, UNH Precision Racing provides students with the opportunity to apply engineering skills and knowledge on an actual competitive design project.

Until 2009, UNH students and members of UNH Precision Racing used a competitor 3D CAD system as part of the design curriculum and for developing the racing team's car. That's when UNH decided to replace their 3D CAD package with SOLIDWORKS® Education Edition software. "Our students found the previous software to be very difficult to use, so we decided to switch to SOLIDWORKS because it's easier to use while still providing students with access to integrated engineering and analysis tools," Kinsey says. "With our old system, we found we were teaching CAD instead of having the students pick up a design tool quickly then use it on various projects, including the racecar."

UNH chose SOLIDWORKS Education Edition software, acquiring 500 licenses, because it's easy to use, includes a complete set of finite element analysis (FEA) simulation tools, and provides effective design communication and photorealistic rendering capabilities.

"Using SOLIDWORKS, students can focus more on the design and engineering and less on the tool," Kinsey explains. "UNH Precision Racing comprises several subteams—frame, suspension, electronics, controls, and aerodynamics—and SOLIDWORKS

software better facilitates interdisciplinary collaboration and communication. The team wouldn't be able to build the quality of cars they've produced without SOLIDWORKS."

OPTIMIZING DESIGN

With SOLIDWORKS Education Edition software, UNH Precision Racing can tap FEA tools not only to validate various facets of the car design, but also to optimize critical components to reduce weight while ensuring safety. "We conducted a range of design analyses in SOLIDWORKS prior to making anything," notes Drummond Biles, one of the captains of the 2013-2014 team and a graduate assistant at UNH. "We conducted flow analyses to improve the aerodynamics, frequency analyses to find resonance and improve intake performance, and structural analyses to optimize the lower control arms.

"SOLIDWORKS design software is easy to pick up," Biles continues. "Then, we integrate the advanced modules into project work, like the racecar, so we can optimize the design as much as possible before heading for the machine shop, where we use MasterCAM®, an add-in to SOLIDWORKS, to easily generate code and run CNC machining."



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— Brad Kinsey , Professor and Chairman
Department of Mechanical Engineering

VISUALIZATION IMPROVES COMMUNICATION, FOSTERS COLLABORATION

SOLIDWORKS design visualization and photorealistic rendering tools facilitate communication and collaboration, both across the team and with SAE. For example, UNH Precision Racing must supply SAE with a report at midyear to demonstrate progress. "With the rendering capabilities of SOLIDWORKS, we can provide a photorealistic rendering of what the car will look like, complete with all of the documentation for manufacturing," Biles says.

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"Within the team, we rely on SOLIDWORKS design visualization, collision detection, animation, and hole misalignment tools to identify and resolve potential performance issues in the model, saving us time and producing a better car once we get to production, fabrication, and assembly," Biles adds. "We import the various assemblies into our master model in SOLIDWORKS and fully interrogate the design before we cut metal. Using SOLIDWORKS, we've also begun taking advantage of different materials, such as carbon fiber for the car body."

UNH PRECISION RACING'S MOST SUCCESSFUL SEASON

After switching to SOLIDWORKS software, UNH Precision Racing improved its competitive performance. The 2013-2014 SAE Formula One season was UNH Precision Racing's best season in history. They placed 26th overall in a field that included many better-funded competitors. "Our goal is to improve year over year by applying the experience of prior teams and taking advantage of the engineering tools in SOLIDWORKS," Biles stresses.

"Since we switched to SOLIDWORKS, we've experienced an increase in the number of new students who want to be involved with the team," Kinsey adds. "Our students pick up SOLIDWORKS quickly, and then want to use it. The move to SOLIDWORKS is certainly helping us achieve our goal of providing students with real-world engineering experiences."

With SOLIDWORKS Education Edition software, students who work on the design, engineering, and construction of the car can take advantage of advanced design, visualization, and analysis tools to optimize the car's performance.

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