RANDOM RESEARCH, INC.

Revving up the development of electric automobiles with SolidWorks software

Random Research used SolidWorks to develop a lightweight, all-wheel-drive racecar, which included innovations that are now being applied to electric vehicles.

Random Research, Inc., is a design consulting firm that is on the leading edge of next-generation electric automobile development. When company President Dennis Palatov founded Random Research in 1995, he needed a 3D CAD program that could support the random and varied nature of the product development, industrial design, and engineering consulting work that has become his firm's trademark.

"I understood the value associated with having effective, efficient software solutions, and realized the importance of acquiring a versatile, flexible CAD program as the foundation of our design platform," Palatov stresses. "I wanted a CAD system that was both intuitive and capable, easy to use, yet applicable to modeling a wide range of design solutions to engineering challenges."

Palatov evaluated the Pro/ENGINEER® and SolidWorks® CAD systems before selecting SolidWorks software. Random Research chose SolidWorks software because it is intuitive, easy to use, and provides a breadth of design capabilities, including large assembly, sheet-metal design, and mold development tools.

"SolidWorks was the first piece of software that I bought for the company," Palatov recalls. "I have found it to be the easiest and most effective CAD solution. In fact, I have never read the manual. Whenever I need to do something, I can easily figure it out or quickly find an applicable tutorial online."

Results:

- Created a lightweight, all-wheel-drive racecar for less than $150,000
- Developed automotive chassis and drive-train innovations
- Minimized prototyping and production costs
- Established a foundation for developing next-generation electric vehicles

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Designing a concept car single-handedly

While Palatov has used SolidWorks software to complete a multitude of projects, one of Random Research's most ambitious efforts involved an idea that Palatov initiated and funded himself: the development of an all-wheel-drive, lightweight racecar.

"I have always had a passion for racecar, and became intrigued with the idea of designing a lightweight concept car with all-wheel drive," Palatov explains. "In racing, all-wheel-drive cars are not attractive because they carry a big weight penalty. Most weigh between 2,500 and 3,500 pounds. I began thinking about how I would go about building an all-wheel-drive racecar that weighs 850 pounds."

By using SolidWorks software, Palatov was single-handedly able to design, build, and test the prototype for the DP1 concept car for less than $150,000. "Typically, this type of program at a traditional car company would cost between $5 million and $8 million and require an entire design group," Palatov points out. "Because of SolidWorks software, I was able to do the work of a 10- to 15-person design department at a fraction of the cost. It would not have been possible to do the design on the DP1 by myself without a tool like SolidWorks software."

Developing automotive innovations

The need to reduce the weight of the DP1 concept car prompted Palatov to take new approaches to automotive design. Instead of a drive shaft, he used a chain drive with a centralized differential and integral torque splitter to drive the front and rear wheels. because it was lighter and more efficient. He developed a chassis innovation that uses identical front and rear suspensions in concert with a backbone structure. In the process of designing the 700-part assembly for the DP1 concept car, Palatov relied on SolidWorks Collision Detection tools, SolidWorks SimulationXpress analysis capabilities, and multibody part functionality.

"Collision Detection proved to be invaluable, particularly in the engine area where the clearances ranged from one-eighth to one-quarter inch in every conceivable direction," Palatov notes. "SolidWorks SimulationXpress allowed me to conduct quick stress analyses to make sure the parts could carry anticipated loads. The prototype exceeded expectations, and these SolidWorks Simulation tools helped me to keep down prototyping and production costs."

Setting the stage for next-generation electric vehicles

The innovations that Palatov developed for the lightweight, gas-powered DP1 concept car also provide solutions to weight and drive-train challenges associated with the development of electric automobiles. In fact, Random Research is involved in a joint initiative to transfer the design innovations Palatov developed for the DP1 concept car to the development of electric, battery-powered vehicles.

"The parametric nature of SolidWorks software makes it easy to reuse design concepts for other purposes," Palatov says. "By simply changing a few parameters, we can adapt a design for a new application. That's exactly what we did on our joint venture. Our patent-pending electric car chassis design grew out of the DP1 chassis design. SolidWorks software not only made the DP1 possible, but also helped to facilitate the development of next-generation electric vehicles."

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Dennis Palatov
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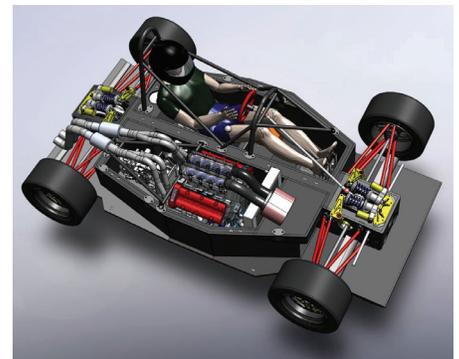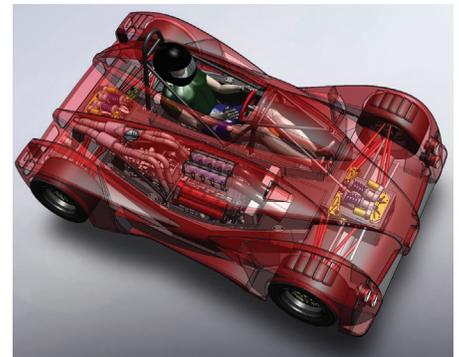
Using SolidWorks software, Random Research designed, built, and tested the prototype for the DP1 concept car for less than $150,000.

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