

TISPORT, LLC

Advancing high-performance titanium wheelchair design with SolidWorks software



SolidWorks software enables TiSport to automate the design and manufacture of its custom-made, high-end, titanium wheelchairs, shortening delivery times while controlling costs.

For individuals who depend on a wheelchair to navigate the terrain of our modern urban society, a smooth, comfortable ride is critically important. The wear and tear to the body associated with the jostling, bumpy ride of traditional wheelchairs can become another impediment for those who already face mobility challenges. Body stress, posture-related problems, and upper-extremity joint deterioration are common conditions associated with the long-term use of conventional wheelchairs. A custom-made, high-end wheelchair that is easier to propel and less stressful on the body can help many physically challenged people remain independent longer, and continue to lead healthy, productive lives.

The founders of TiSport, LLC, understand how vital a comfortably fitting, high-performance chair can be. With a history of working with titanium tubular products in the specialty metals industry, the company set out to create a superior class of titanium wheelchairs by combining customization with advanced materials fabrication. To achieve this goal, TiSport needed to implement and sustain a high degree of design and manufacturing automation, according to Alan Ludovici, vice president of engineering.

"About 50 percent of the chairs we make are customized to fit the individual customer," Ludovici explains. "To build this volume of custom wheelchairs, we needed an integrated 3D product development and manufacturing environment to automate processes, control costs, and shorten delivery times."

After studying the Pro/ENGINEER® and SolidWorks® software systems, TiSport chose SolidWorks 3D CAD software and integrated SolidWorks Simulation to design its chairs because the software is faster and easier to use. The company added the integrated and Certified Gold CAMWorks™ CAM Product from Geometric Technologies, Inc., to automate its machining operations.

Challenge:

Automate the design and manufacture of custom-ordered, high-end titanium wheelchairs to hold down costs and speed delivery.

Solution:

Utilize the SolidWorks 3D product development platform to automatically configure and machine wheelchair parts.

Results:

- Cut design time in half
- Decreased annual development costs by \$400,000
- Realized manufacturing savings of \$11 per chair
- Reduced returns to about one-half percent

"Based on our testing, we found that we were twice as fast designing in SolidWorks software than we were using Pro/ENGINEER," Ludovici notes. "It's also easier to get new people up to speed on SolidWorks software."

Creating a more comfortable wheelchair

Using SolidWorks software, TiSport not only has succeeded in developing a superior class of high-performance wheelchairs, but also has grown to become one of the leading manufacturers of lightweight wheelchairs in the United States. "Our TiLite® titanium wheelchairs are considered to be among the best wheelchairs in the world because of their light weight, ease of mobility, and smooth ride," Ludovici points out.

"We are able to build such a high-performance, high-quality chair partly because of the shock-absorbing nature of titanium and partly because of the design automation that we have achieved with SolidWorks software," he adds. "Titanium chairs absorb shocks better and float over obstacles easier than aluminum chairs. Even on rough surfaces, titanium chairs require less energy to propel and will roll farther. The key to profitably building custom titanium chairs is SolidWorks software. Without it, we simply would not be in business."

Custom manufacturing demands automation

To create a customized wheelchair for each individual customer, TiSport needed to capture all of the design variables associated with comfort and use SolidWorks design configurations to automate the creation of each unique design.

"There are 50 to 70 parameters – such as the seat width, seat depth, type of back rest, and type of caster – that serve as the driving dimensions in our SolidWorks design table," Ludovici notes. "We input these variables from our order form, and SolidWorks automatically configures all of the parts, quickly outputs complete drawings, and finally generates the bill of materials for the chair. Because CAMWorks is fully integrated with SolidWorks, the design goes straight to machining and CAMWorks instantly generates the G code.

"This approach saves us time and money," Ludovici stresses. "If we were modeling each chair from scratch, it would take twice as long. We estimate that configurations save us \$400,000 annually in development costs."

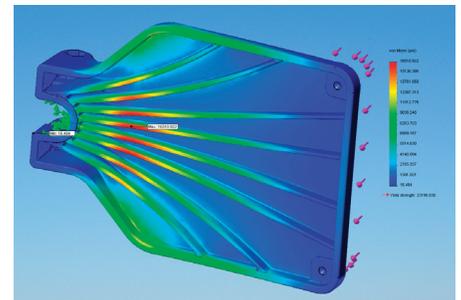
A better, more affordable footplate

While SolidWorks software configures designs and CAMWorks drives machining, TiSport uses SolidWorks Simulation to improve quality, reduce weight, and lower manufacturing costs. For example, the company used to make footplates out of aluminum, which could develop burrs and sharp edges with use.

"We used SolidWorks Simulation to determine if we could make the footplates out of a material that would hold up better and save us money. The analysis showed that we could use a composite, injection-molded footplate with ribbing to both improve performance and cut our manufacturing costs by \$11 per chair. Using SolidWorks tools, our quality is impeccable, with a return rate of about one-half percent."

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Alan Ludovici
Vice President of Engineering



Using SolidWorks Simulation tools, TiSport validated the use of a less expensive, better-performing material for its footplates, cutting manufacturing costs by \$11 per chair.



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