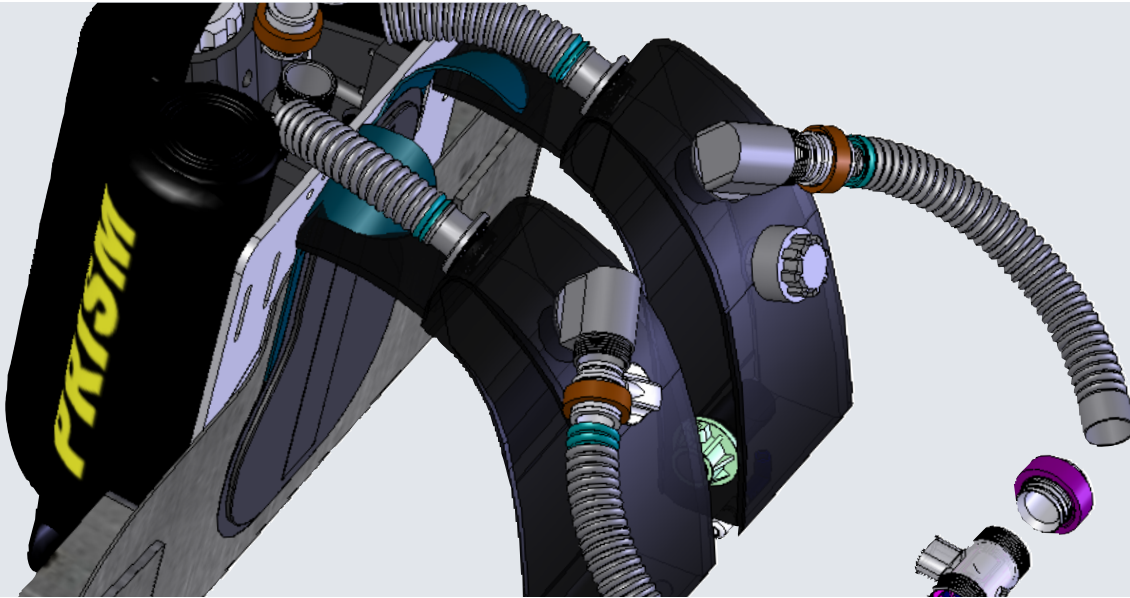


Steam Machines, Inc.

INNOVATING CCR DIVING SYSTEMS WITH SOLIDWORKS



With SolidWorks Premium software, Steam Machines has been able to contain development costs by streamlining the product development and manufacturing process.

- Compressed design cycles
- Reduced manufacturing costs
- Eliminated prototype production
- Optimized system performance

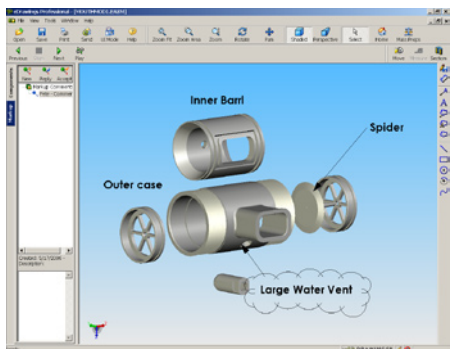
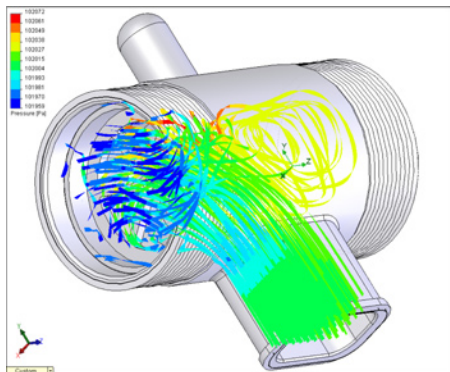
Steam Machines, Inc. (SMI) pioneered the development of closed-circuit rebreather (CCR) diving systems in the recreational arena. Its innovative PRISM™ CCR system scrubs out carbon dioxide and enables divers to “re-breathe” their own air. According to SMI founder and owner Peter Readey, the company began manufacturing the product after making cost-saving breakthroughs in the use of advanced composite materials. These advances brought down the price for each CCR from roughly \$18,000 to \$7,800, thereby making the product available to a wider market.

While Readey used Pro/ENGINEER® CAD software on early CCR designs, he soon found the need for easy-to-use advanced design analysis tools and a design platform that would contain costs by streamlining the product development and manufacturing process. “I needed to do some computational flow dynamics (CFD) work on the unit’s head-down display and couldn’t find a good solution for Pro/E,” Readey recalls. “I started using a CFD solution from NIKA Fluid Solutions that used SolidWorks® 3D CAD software as its solid modeling engine to simulate pressure and temperature changes. As I did more and more CFD work, I became more impressed with SolidWorks software.”

Readey discovered that the SolidWorks CAD solution could support every step of the company’s product development process, from conceptual design, simulation, validation, and testing to computer-aided machining, mold production, assembly, documentation, and training. SMI selected SolidWorks Premium software as its design platform because of its ease of use, compatibility with other software applications, and advanced mold development and analysis tools. Readey also saw the value of integrated SolidWorks Simulation analysis, SolidWorks eDrawings® communications, photorealistic rendering, and animation tools. The company added a seat of SolidWorks Flow Simulation to support advanced pressure and heat-loss translation studies.

“The combination of SolidWorks modeling with SolidWorks Simulation and SolidWorks Flow Simulation analysis capabilities enables us to produce reliable, fully validated systems in a short amount of time.”

Peter Readey, Founder and Owner



SolidWorks Premium software, SolidWorks Flow Simulation software, and CAMWorks software enable Steam Machines to use a single, common data format for every step of the development process.

Saving time, cutting costs

By implementing SolidWorks software, SMI has reduced its design cycles and cut development costs, while continuing to introduce innovations in CCR system design. “Our goal is to obsolete our existing products by continuing to create a safe state-of-the-art rebreather diving system,” Readey points out. “By using SolidWorks software, we are able to save time and control current manufacturing costs, while we continuously strive to innovate the rebreather diving system of the future.”

SMI was the first company to use advanced composites in a proprietary combination of low-pressure-molded plastics and cast materials for diving components, which decreases both weight and cost. Using SolidWorks Simulation structural software and SolidWorks Flow Simulation CFD analysis software, SMI was able to change stainless-steel fittings, which are rated at 5,000 psi (pounds per square inch) to naval brass fittings at a lower pressure.

Testing production parts, not prototypes

Because the SolidWorks design platform includes access to powerful, integrated design analysis tools, SMI can develop sophisticated manufacturing techniques to produce limited runs of its advanced diving technology components without producing repetitive prototypes. “SMI is a relatively small manufacturing company,” Readey explains. “While we produce hundreds of components annually, there are two critical requirements for our success. First, our systems should not fail – which is why we include digital electronic controls with analog and manual backups – and they must be tested fully. Second, we face time pressures in delivering units to our customers.

“The combination of SolidWorks modeling with SolidWorks Simulation and SolidWorks Flow Simulation analysis capabilities enables us to produce reliable, fully validated systems in a short amount of time,” he adds. “These tools allow us to validate part and assembly performance on the computer – as well as develop revolutionary molding processes – so we can go straight to production without prototypes. We still have to test our production systems completely in order to confirm our analysis studies; but because the analysis and testing results consistently concur, we avoid tooling modifications and rework, and can proceed immediately with manufacturing.”

Supporting every step of product development

SMI also realizes efficiencies by using one suite of tools and one common data format for every step of the development process. The company uses SolidWorks solid modeling software to create part and assembly geometry; SolidWorks Simulation and SolidWorks Flow Simulation software to analyze and simulate design performance and production processes; and CAMWorks™ software for automatically creating tooling paths from SolidWorks models. SMI uses SolidWorks mold development and analysis tools to support mold design and eDrawings images for illustrating both online and published training and maintenance manuals.

“The only way to manufacture our CCRs cost-effectively, while maintaining our high-quality standards, is to use the SolidWorks design platform,” Readey contends. “SolidWorks is a lot more open and intuitive, and provides us with a seamless product development and production capability.”



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