

Performs Well Under Pressure:

Product Development and Prototype Solutions



Computer-aided engineering, 3-D printing accelerate prototyping of new steam pressure regulator.

When the manufacturer of a medical sterilizer partnered with Marsh Medical, we not only achieved reductions in size and weight coupled with performance improvements the application required, but also demonstrated how numerical simulation tools and additive manufacturing can accelerate the prototyping process.

It began when the manufacturer approached Marsh Medical about creating a compact, high-flow, high-temperature steam pressure regulator for its autoclave. Pressure control is vital, as the device uses steam under pressure to kill harmful bacteria, viruses, fungi, and spores, typically to sterilize medical instruments.

The steam regulator had to be located in a tight, difficult-to-reach space within the device. The current regulator was too large and too heavy to be practical. The customer needed a unit that was lightweight and more compact, but that could deliver flow performance equal to or better than the larger regulator.



MD95 Steam Regulator

Product development

The product that Marsh Medical engineers devised was mainly an exercise in optimization. The fundamentals of the existing unit remained the same, however, the weight, size, and flow performance were all optimized and taken to the limit of their capabilities. The resulting product is the MD95 steam pressure regulator.

The solution was created after careful consideration by the Marsh Medical engineering team, which provided regular design updates to the customer. The team incorporated customer feedback and received approval at every major design milestone.



A job finished, a job just begun

After solving the challenge of optimal performance in a more compact regulator, Marsh Medical continued to shine during the prototyping process. The team employed numerical simulation tools and additive manufacturing to develop rapid prototypes. This accelerated testing, allowing it to happen months faster than would have been possible without using such tools.

To reduce the weight of the unit, finite element analysis (FEA) and computer aided engineering (CAE) simulations were performed on the product's pressure-retaining components to reduce weight while maintaining the mechanical strength needed in a pressure vessel. We were able to trim off wasteful material that was not ultimately needed. This led to an approximate 50% reduction in weight to the cast components, while maintaining the necessary pressure rating requirements for the customer.

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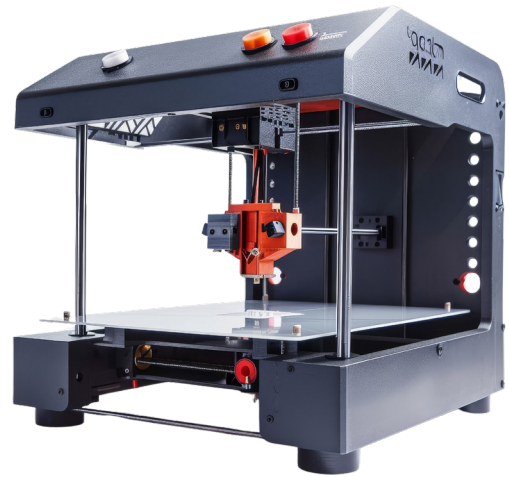
A similar CAE process was conducted to improve the internal flow paths using computational fluid dynamics (CFD) tools. This led to an approximate 10% increase of flow performance at the low- to mid-range pressures. These techniques helped to optimize the design and happened relatively quickly since they were purely computer simulations.

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3-D printing

Once the simulations helped reach an optimized design, additive manufacturing processes were used to develop fully functional prototypes within a matter of weeks. 3-D printed metal components enabled creation of a fully functional unit that could be tested at requested conditions to replicate the end use and verify results achieved through the computer simulations.

This series of events highlights a process of design and optimization that can be applied to other projects that need to be completed under time constraints.



Also of value, these FEA and CFD simulations generate stunning images that conveyed progress to the customer, in the manner of a picture being worth a thousand words. **M**



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8019 Ohio River Blvd. Newell, WV 26050 | (304) 387-1200 | info@marshbellofram.com

About Marsh Medical

Marsh Medical brings nearly a half-century of experience in the design and manufacturing of medical device components into a single access point. Marsh Medical's dedicated team shatters the limitations of the past with new designs, improved performance, unmatched adaptability, and innovative materials. In-house engineers and chemists develop custom solutions to the challenges facing manufacturers of today's medical equipment. Gain greater convenience, faster service, and streamlined procurement from a trusted name. For more information, visit www.marsh-medical.com



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