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Electron Beam Engineering Presents

Case Study: CoolSculpting® by ZELTIQ®

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When the innovative medical device manufacturer ZELTIQ had trouble producing its revolutionary new fat-freezing product for the CoolSculpting process, they brought it to Electron Beam Engineering, Inc. (EBE), and it didn't take long until the problem was solved.

The device – a liquid-cooled heat exchanger, which uses controlled cooling to freeze and eliminate unwanted fat cells without surgery or downtime – originally was assigned to a different welding vendor, but the work was transferred to EBE who took it on as a complete turnkey manufacturing project in 2011. Production is now running smoothly due to the expertise of EBE, a job shop in Anaheim, Calif., that specializes in precision welding for medical devices such as the CoolSculpting heat exchanger.

The engineers at EBE, who have a wealth of experience in laser and electron beam welding, quickly discovered that the original part had a complicated design which made it difficult to produce in volume and made the manufacturing process quite time-consuming. After welding a small batch of these parts, EBE approached ZELTIQ about the idea of a simplified design and ZELTIQ was open to the change.

After development of the new design and welding trials, EBE began producing the complete assembly using multiple welding tools for machining and electron beam welding. The electron beam machine, a 318 Beamer, which was manufactured by EBE is CNC programmed to follow the complex weld profile and control the weld parameters automatically producing not only a structurally pressure-tight weld but one with a neat, narrow weld that does not require post-weld finishing.

As part of the redesign EBE recommended a change in the shape of the product. The inside of the device has a maze of grooves that coolant runs through in a way that evenly distributes the cold to the entire surface area which is profiled to the contour of the body (the stomach area and "love handles"). Trillwood said his team changed the design, of the inlet and outlet ports to bring down material costs by about 15 percent. Additionally, EBE simplified the exchanger's cover, which resulted in less scrap and less rework.

Even though the redesign was costly, it still saved ZELTIQ about 20 percent of the manufacturing costs because it became a much faster process.

"We cut the time to produce one of these by about 20 percent," Trillwood said. "Our aim was not only to weld their parts together but to engineer them and make recommendations to enable us to manufacture a more producible product that could meet their production demands."

Once the parts are manufactured, EBE pressure-tests them to make sure there aren't any leaks. There is a final machining cut on one surface that ensures that it is a perfectly flat surface – within 1/1,000th of an inch with a 63 RMS finish. Then it's laser-etched with a part number and chem-filmed with a protective finish that prevents corrosion, a step that is also very common in the aerospace industry.

EBE has been keeping up with demand for these FDA-approved CoolSculpting devices since early 2012 as the product has exploded with popularity around the world, surpassing 1 million noninvasive, painless treatments for fat reduction.

Electron beams create a high-integrity weld with minimal distortion. Compared to other welding processes, they are typically run at three to six times faster welding speeds and generate at least ten times less heat input. Electron beam welding is preferred over laser welding for aluminum – as was the case with ZELTIQ's heat exchanger, which is made from 5052 aluminum. The high reflectivity and high thermal conductivity associated with aluminums and copper make these materials more suited to welding with an electron beam.

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