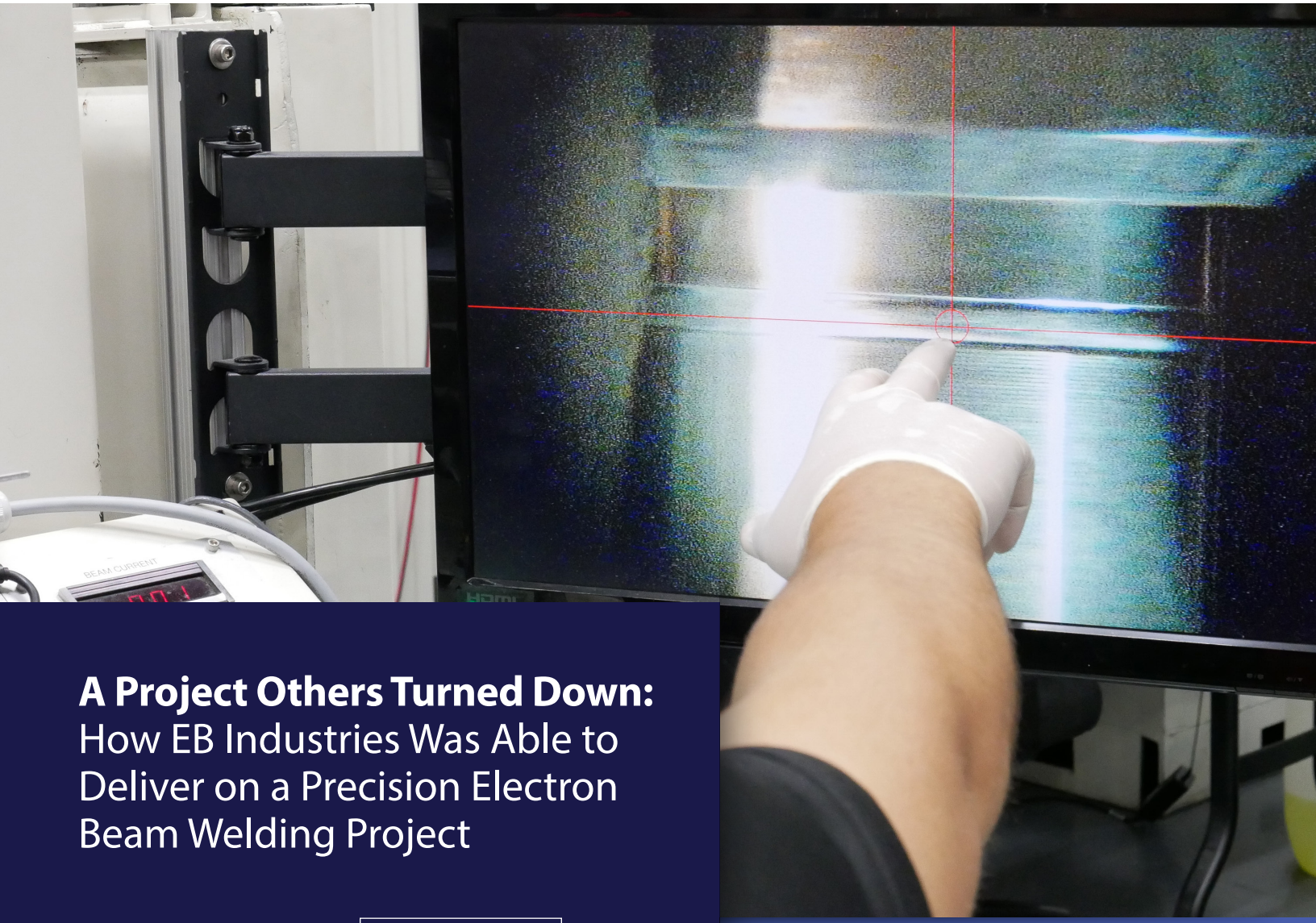
EB INDUSTRIES



A Project Others Turned Down: How EB Industries Was Able to Deliver on a Precision Electron Beam Welding Project

CASE HISTORY

MAC Machine Inc, based in Baltimore, Maryland, manufactures tight-tolerance parts for military/aerospace and medical applications. The company is a turnkey one-stop shop for its customers, offering the full range of services from initial design through to finished manufactured components. It performs CNC machining, wire EDM cutting, plating, painting, heat treating, MIG and TIG welding and assembly operations.

According to Adam Pennypacker, Mac Machine general manager, "we pride ourselves in tight tolerance manufacturing."

One area it does not perform in-house and relies instead on outside partners is electron beam welding, due to the specialized expertise and equipment required.

THE PRECISION CHALLENGE: A Complex, Mission-Critical Electron Beam Welding Procedure

While electron beam welding isn't uncommon, it is a special technique reserved for particularly demanding or precision welding applications. But recently, Mac Machine came upon an EB welding project that was uncommon even for an EB project.

One of its military customers needed to weld a plate to a casting – a difficult task for any team. The work required programming complex machine paths on the plate that is welded to the part. Also, the interior of the part has a number of machined channels, and the weld would have to penetrate these channels. Furthermore, to meet quantity delivery requirements and delivery schedules, the welding process had to be automated.

THE SOLUTION: EB Industries' Expertise Overcomes the Challenge

Other companies that performed electron beam welding did not have the capability to fabricate the needed weld and declined the work. But EB Industries thought it could be accomplished if it applied a bit of additional weld engineering creativity to the project.

EB Industries engineers worked closely with the Mac Machine engineering team to define the process that would reliably weld a plate to a casting and pass rigorous testing standards.

What impressed Mac Machine was the focus and dedication that the EB Industries engineering team applied to the project to ensure its success. Pennypacker indicated that "not many suppliers help with the initial R&D and prototyping, but EB Industries wanted it to be successful, which I thought was amazing. A lot of other suppliers would have thrown in the towel. But the fact that they were able to find a way to automate this and have it run on a machine was pretty phenomenal."

AN ELECTRON BEAM WELD WAS THE ONLY WAY TO MEET THE SPEC

Electron beam welding utilizes a focused beam of high-velocity electrons to join materials. The process occurs in a vacuum, which prevents the electron beam from scattering and ensures concentrated energy transfer to the workpiece. This concentrated energy melts the material, creating a strong, high-quality weld with minimal distortion. Electron beam welds serve applications in the military/aerospace industry particularly well, where precise tolerances and strength are critical.

Electron beam welds provide:

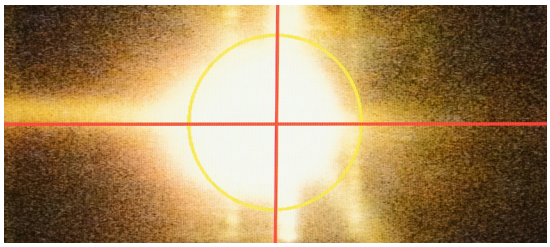
- **Precision** – The technology allows precise control over the heat input, weld depth and weld bead placement.
- **Low Heat Input** – The focused energy beam reduces the risk of distortion, warping and metallurgical changes in the base material by applying minimal heat to a narrow heat-applied-zone (HAZ).
- **High Speed** – Electron beam welding delivers concentrated energy to the workpiece, resulting in rapid fusion and shorter cycle times.
- **Versatility** – The technology enables welding a variety of materials, including metals, plastics, ceramics and composites and can join dissimilar materials with different thermal properties.
- **Quality** – Electron beam technology creates consistent, high strength, deeply penetrated welds with minimal defects.

CONSISTENT ON-TIME DELIVERIES HELPED MAC MACHINE MEET ITS CUSTOMER DEMANDS

Pennypacker said that when the part moved into full-scale production, he really appreciated the way EB Industries went about its business. "As we moved into production, the priorities shifted from initial engineering to quality and delivery. And there again, EBI hit the ball out of the park on that."

Pennypacker said that EB Industries was upfront and honest about production schedules in a way he not only appreciated but found was uncommon among other suppliers. "There was never a situation where we expect the parts on a certain day only to be told it will be another three weeks or so for delivery. Whenever they gave us a date, they were going to hit that, and that really helped us out with our customer," he said.

A PARTNERSHIP TO MEET THE MISSION



For Mac Machine, this was a special project not only because of the technical difficulty of the project, but because everyone involved knew where the part was going.

"This particular program is one that is saving lives for our military and other militaries around the world. So this is one we can't be late on, and all of us, including EB Industries, knew how imperative it was for us all to be successful together."

EB Industries' expertise in electron beam welding combined with its close collaboration, open communication and reliable on-time delivery convinced Mac Machine to rely on EB Industries as its supplier for electron beam welding work. Pennypacker concludes with, "In the end, the professionalism and their staff expertise is exactly what we had to have."