

Modular Welding Fixturing Ups Output of Armored Vehicle Components by 40%



Laurentide manufactured windows for the MRAP.

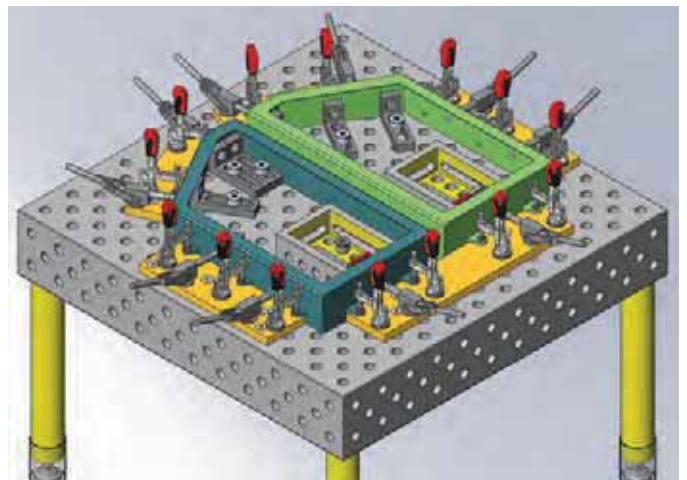
Laurentide, Inc., of Hanahan, SC, north of Charleston, is a multi-disciplined manufacturer comprising three divisions including precision machining, fabrication and coating. Founded in 1994, the family-owned company is a supplier to the defense industry as well as heavy industries such as paper manufacturing. Assemblies and weldments produced by Laurentide range up to 10 tons and may be fabricated in a wide variety of alloys from aluminum and mild steel to structural steel, pressure-vessel steel and stainless, to 46100 Mil-spec, high-hardness armor plate.

Producing components for armored vehicles—tanks, armored fighting vehicles and similar applications—is an important and growing part of Laurentide's business. The company boasts major military customers including market leaders BAE Systems, Force Protection, Inc. and General Dynamics.

Laurentide's military parts programs generally call for volume production. That is the case with a program of window frames that Laurentide is producing for use in MRAP (Mine Resistant Ambush Protected) vehicles, truck-like transports designed to survive IED (Improvised Explosive Device) attacks and ambushes.

Tough Stuff

Laurentide's MRAP program consists of manufacturing window frames into which bulletproof glass is installed by another company. There are seven frames per vehicle-set (two windshield units, one driver's side, one passenger's side, one rear glass plus two side units). The customer contracted with Laurentide to



Solid model of the modular fixture for two windows.

As Seen In



MANUFACTURING NEWS



Modular fixture built from the CAD model.

fabricate the frames which are subsequently shipped to a bullet resistant glass company where glass, up to 4-inches thick, is installed. After glass installation, the finished windows are returned to the end customer for final assembly to an MRAP.

According to Tom Reeve, Laurentide Tool Designer, who is responsible for management of production processing, "The customer originally tapped us for the MRAP program because of their prior experience with our on-time delivery. Timeliness is very important to them inasmuch as this is a relatively high-volume program requiring tight scheduling of logistics across continents." Each month, Laurentide fabricates as many as 200 frame-sets comprising seven part numbers each. Including spares, this amounts to about 1,500 individual frames per month.

Non-critical frame elements are fabricated primarily of laser-cut, bend-formed 3/16th A36 structural steel; areas that could be exposed to enemy fire are of 8.5 mm welded armor. Describing the workflow, Reeve said, "Originally, we designed and built dedicated fixturing, with a custom fixture for each part number, for seven fixtures in all. The fixtures consisted of 3/4-inch mild steel base plates utilizing brackets, dowel pins and clamps to secure components for fitment and tack welding. After tacking, the frames were removed and passed to a work surface for final welding-out in a free state, since a lot of welds were in areas where you couldn't get around clamps or which were less than 3/4-inches off the bottom of the table. Next, the frames were trued-up as necessary. Finally finished welded frames were sand blasted and coated." For about 18 months, that's how Laurentide produced the MRAP family of parts. Then, everything changed.

Rapid Response

A year-and-a-half into production, the customer modified the MRAP window frame designs to change mounting hole locations as well as "ear flange" details on all seven parts, affecting every fixture in the process. At the same time, Laurentide was also required to retain the ability to make frames to the original spec for spares. Ramping up new part production as soon as possible was essential; The customer expressed willingness to take delivery as soon as product could be shipped (a financial advantage for Laurentide). Modifying existing fixtures was not a solution because these would be needed for spares production. That meant new fixtures were required ASAP. The problem was Laurentide didn't have in-house design-build capacity to allocate to the project.

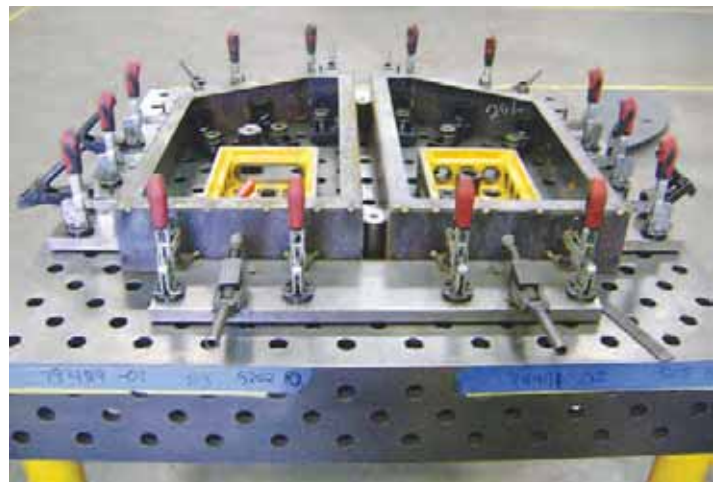
Bluco Modular Welding Fixturing = Rapid Response

That's when Paul Crawford, Vice President of Manufacturing, Laurentide, decided to take a closer look at the Demmeler modular welding fixturing system from Bluco Corp., Aurora, IL. A few months previously, Crawford had checked out the Bluco system at a trade show and was favorably impressed. He pulled the Bluco show literature he had filed and called for a production team review to determine whether the system was a feasible way to fast-turn the MRAP fixturing. Laurentide contacted Bluco with an RFP. Bluco in turn, asked that Laurentide create and send them SolidWorks models for the entire family of MRAP window frames. Next, at a Go-ToMeeting web conference, Bluco engineers presented their proposal which, at no cost, included actual fixturing designs for all seven window frames. According to Reeve, "Bluco's presentation was quick and very informative. Bluco demonstrated how easily their modular welding fixturing system could be configured for our specific parts via 3D modeling. The presentation also showed how we could develop our own modular fixtures utilizing modeling tools and a library of Demmeler System component models that Bluco would provide. Bluco also offered details on a six-month, Rent-to-Own financial package. Since six months was exactly our expected duration for the project, that suited our situation perfectly.

"We acquired three tables. Two 1,000 mm x 1,000 mm (40- x 40-inch) and one 1,200 mm x 1,200 mm table, all in the D28 configuration. The tables serve as platforms on which to mount the angles, blocks, clamps and other fixturing accessories included in the standard 125-piece kit. The MRAP window frames measure approximately 18- x 20-inches. We fixture one- or two-at-a-time per table and can make all seven part numbers on three tables by swapping out some of the components."

The Bluco Concept

The tables are made of 25 mm (1-inch) thick high-tensile-strength steel, ribbed to ensure stability. Tables feature 28mm (1.1-inch) diameter mounting bores on a 100 mm (4-inch) grid across the face and four sides of the table, with an accuracy of ± 0.025 mm (0.001-inch) hole-to-hole and ± 0.05 mm (0.002-inch) overall. Fixture elements match the bores and grid pattern on the table. Structural pieces have 28 mm (1.1-



Left and right window on one table.

inch) slots to position fixtures between holes. Positioning and clamping bolts attach fixture elements and workpiece locators. Clamping bolts insert through the fixturing elements and the work table. An O-ring in the body of the bolt helps prevent rotation during tightening. Turning the knurled bolt head extends a series of five locking balls into a chamfered recess at the bottom of the mounting holes to center the bolt shank and clamp the components together. With each element positioned, a hex wrench tightens the bolts.

Clamping Bolt Schematic

The stability, hardness (nitrided to Rockwell 55C) and flatness (0.1 mm [0.004-inch]) of the Demmeler table make it efficient to use in conjunction with metrology instruments, for example a height gage. In addition, the table has a convenient scribed millimeter scale.

Laurentide's Bluco table installation includes three, in-line cells with pallets of raw components located on either side. There is sufficient clearance between the pallets and tables to provide good mobility for two welders.

Faster Set-Up, Higher-Accuracy Boost Productivity Numbers

The new set-up immediately delivered dramatic throughput improvements. Originally, about 25 frames-per-day were produced on dedicated fixturing. With the Bluco system, production increased to an average of approximately 35 frames/ day, or 40% more.

Quality improvements were also dramatic. Laurentide performs overall inspection of finished window frame weldments utilizing a fit-form-and-function gage article designed and built in-house. A separate laser-cut template is used to gage the most critical features of the window frames, i.e., "ear lugs" that include holes which must line-up with studs hard-fixed on the vehicle. The template is laid onto the ears then pins are dropped-in to make sure everything lines up. Frames that were welded on dedicated fixturing experienced 3% rework - a rate that required 100% inspection for all output. Use of the Bluco system slashed rework to near 0%. This,



Scrap and rework have been dramatically reduced.

in turn, allowed Laurentide to move to a sampling routine wherein only 10% of frames were inspected, a sub-sampling of which is measured to very high tolerances using a Zeiss Contura G2 CMM.

Happy Welders and Future Applications

Laurentide's welders reportedly prefer the Bluco modular welding system to dedicated fixturing. Reeve said, "The guys on the floor were thrilled with the MRAP fixturing as designed by Bluco, telling me that system elements mate accurately and securely and fit together intuitively. As a matter of fact, a 20-year veteran of fabricating fitting said that working the Bluco system was 'fun.' That's high praise and maybe a factor contributing to the dramatic increase in productivity."

Contemplating the conclusion of the MRAP program, Reeve said Laurentide has decided to exercise their option to purchase two of the Bluco tables. "I've currently got Solid-Works fired up and am designing some modular fixturing for a new set of components. It's going smoothly...if you know what the parts are supposed to look like, Bluco's approach makes it easy to lay everything in,"

For more information contact:

Bob Ellig, President
Bluco Corp.
3500 Thayer Court
Aurora, IL 60504
(800) 535-0135
Fax: 630-637-1847
bellig@bluco.com
www.bluco.com

Tom Reeve, Tool Design
Laurentide, Inc.
915 Commerce Circle
Hanahan, SC 29410
843-747-4707
Fax: 843-747-2258
Tom.Reeve@LT-chs.com
www.laurentideinc.com



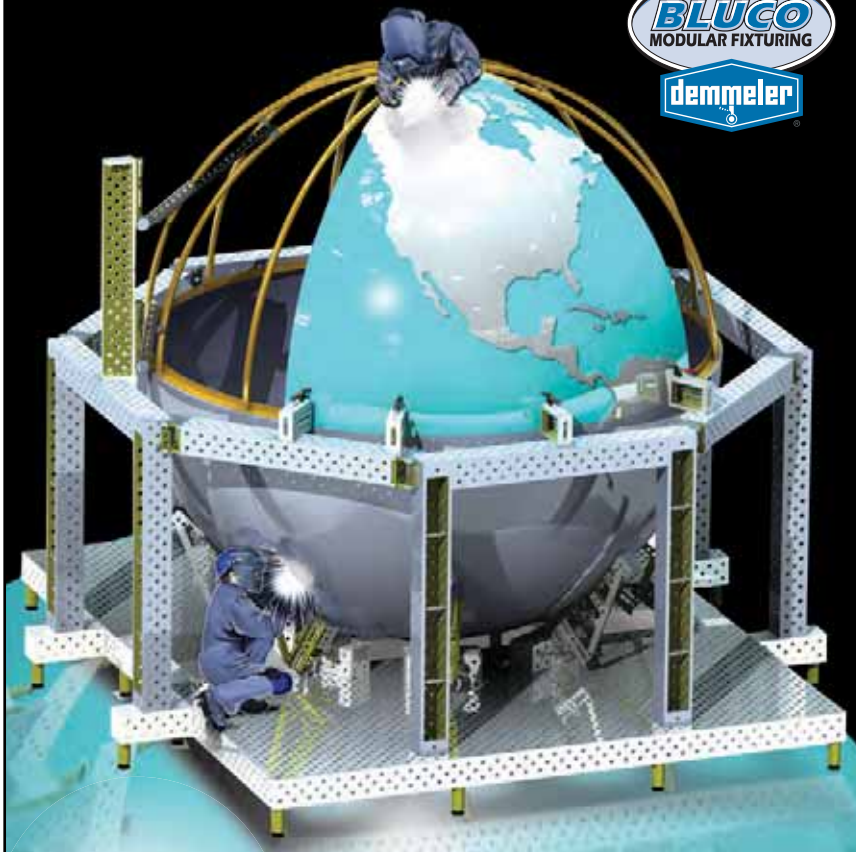
CMM part inspection is now sampling instead of 100%.

Visit Bluco Corporation's Design Center

Bluco invites prospective customers to visit their Design Center and Showroom. See real examples of how modular fixturing is used, and sit down with design engineers to discuss your parts and requirements. If you can't make the trip to meet with the engineers, you can send in your drawings via a secure upload server (www.bluco.com/fileupload) for a free quote.



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Bluco Corporation
3500 Thayer Court
Aurora, IL 60504
Toll Free (800) 535-0135
www.bluco.com

Constant Innovation

Bluco's modular fixturing product line is constantly evolving and being improved based on feedback from customers around the world. New components are designed to simplify setups or provide new functionality, and are always compatible with existing systems already in use.



For More Information

For a complete review of the products and services offered, visit www.bluco.com, send files to www.bluco.com/fileupload, send e-mail inquiries to info@bluco.com or call toll free (800) 535-0135.

*Bluco Corporation, 3500 Thayer Court,
Aurora, IL 60504, 800-535-0135,
www.bluco.com*