casestudy

Sitting on top of a modular fixturing table, a rock wheel frame attachment for a skid steer is finish-welded.

Getting the needed fixtures

Variety is the spice of life for Woods Equipment Co. The Oregon, Ill.-based company is a manufacturer of attachments and implements for agricultural tractors, skid steers, wheel loaders, tractor/loader backhoes, and excavators. To be more specific, the company's product line includes brush cutters, mowers, material handling equipment, snow removal equipment, rock saws, pavement shavers, power brooms, and rakes. Brands include Woods®, Alitec™, BMP®, Central Fabricators®, Gannon®, Wain-Roy®, Gill®, WoodsCare™, and TISCO®. Of course, that product list doesn't include a variety of aftermarket parts used in agricultural, landscape, and construction applications.

Complicating the product offering are the numerous variants offered. For example, Woods-manufactured attachments for a skid steer include brooms, cold planers, loader buckets, pallet forks, pavement saws, power rakes, power augers, and stump grinders. And each of those attachments may differ slightly from one job to another because Woods' products must interface with all makes and models of tractors and equipment that come from all over the world.

The company certainly has come a long way from the days when Leonard, Keith, and Mervel Wood built the first tractor-mounted rotary cutter. Woods employs approximately 1,500 people nationwide and sells its products through dealers in the U.S. and Canada. The company just celebrated the shipment of its 1 millionth unit.

To ensure it keeps heading in the right direction, Woods has undertaken initiatives to increase the flexibility of its manufacturing processes so that series production of both new and established designs is supported better. Simultaneously Woods is working to improve productivity for items made in one or two allotments—the "specials," which usually include certain replacement parts and prototypes.

One of the first areas to be targeted was the welding operation. The goal was to expedite the creation of welding fixtures and reduce the amount of hard fixtures that had to be fabricated and stored.

The purchase of Demmeler modular welding fixturing systems from Bluco Corp. (Naperville, Ill.) helped Woods to accomplish those goals.

A Productivity Boost

Over the past six years, Woods has installed four modular fixturing systems. They are deployed in research and development, backhoe production, tooling, and production welding.

"We brought in our first Demmeler table, a 5-foot by 10-foot unit, as a way of reducing the fab time of dedicated fixturing," explained Mark Eden, Woods' tooling supervisor. "Our research and development people had been using a Demmeler system to fixture prototypes, and we realized that the system could benefit our tooling operation."

For 38 years Bob Kissee, senior toolmaker, has been responsible for crafting Woods' dedicated fixturing. For him, the switch from open table methods to a modular fixture approach six years ago was no small matter.

"I was reluctant at first," he said. "It looked like it'd take quite some time to learn, but I caught on pretty quickly.

"Today, with the Demmeler, we fabricate hard fixtures in about one-third of the time," he added. "Now I'd never go back to laying out with measuring tape and chalk, and holding parts by hand." (See Figure 1.)

The modular welding fixturing tables feature 1.1-inch- (28-mm-)

Figure 1
This 5-ft. by 10-ft. Demmeler table in the toolroom is mounted to a scissors lift for easy access.

diameter mounting holes on a 4-in. (100-mm) grid across the face and four sides of the table with an accuracy of ±0.001 in. (±0.025 mm) hole to hole and ±0.002 in. (±0.05 mm) overall.

Fixture elements are constructed to match the holes and grid pattern on the table. Structural pieces have 1.1-in. (28-mm) slots to position fixtures between holes. Positioning and clamping bolts attach fixtures, workpiece positioners, and other elements to the worktables or to each other. The hardened clamping bolts are designed to provide up to 3 tons of clamping force and withstand up to 25 tons of shear.

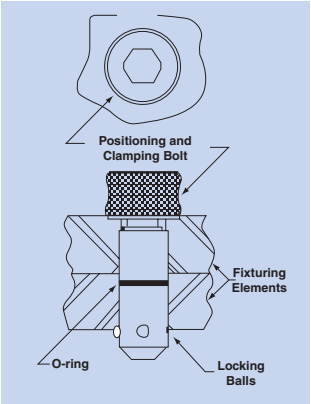

Figure 2
Clamping bolts insert through the fixturing elements and the worktable. An O-ring in the body of the bolt helps prevent rotation during tightening. Turning the knurled bolt head extends a series of five locking balls into a chamfered recess at the bottom of the mounting holes to center the bolt shank and clamp the components together.

Figure 3
The tack-welded rock wheel housing (top) will eventually wind up on the front of a skid steer (bottom) and be used to cut pavement.

Clamping bolts insert through the fixturing elements and the worktable (see Figure 2). 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.

"In the toolroom, in building our fixtures, we have the ability with the Demmeler system to hold closer tolerances on weldments and weld fixtures," Eden added.

Success in the toolroom soon led to a harder look in the production welding area. Could the modular fixturing system help increase production welding throughput without consuming additional production floor space? The answer proved to be yes.

"By combining dedicated and modular fixturing, we gain a number of advantages," Eden said. "We're able to run all the parts we've got to run without taking up more production floor space. If we had to use hard fixtures for all the stuff we run through the Demmeler, we wouldn't have enough room for production."

A Productivity Example

To understand how dedicated and modular fixturing can be combined, a closer look at the production of Woods' rock wheel housing is helpful (see Figure 3).

A conventional 5-ft. by 5-ft. Demmeler 3-D welding table has standard modular fixturing angles mounted to the table's side (see Figure 4). One angle is keyed to the table's bore pattern. A special tooling ring speeds the setup by fixing the location for the second angle. Dedicated riser blocks on the top of the angles establish the height of the housing tubes. When completed, the table and modular components are reconfigured for the next part. The dedicated components are returned to a small storage bin (see Figure 5).

Figure 4
A tooling disk aids in the setup of modular fixturing.

Figure 5
Special adapters are stored away when the welding job is done.

Modular elements used more frequently because of their versatile nature are stored on an accessory cart. The visual presentation of the components makes it easy for the welder to select the right parts and to construct the fixture. Typical fixture build times for a part in the same family may be as short as 10 minutes, according to Eden.

A complete 3-D solid model database was included with the fixturing system package Woods ordered. Dennis Ankney, Woods' tooling designer, uses the CAD system to design and document their fixtures.

"We have the Demmeler system as models on CD, and we use it whenever we can. It makes design easier, and we save on tooling costs," he said.

A Productive Goal

John Kubik, Woods' executive vice president, said the investment in productivity enhancements is the first step on a journey toward a greater goal.

"While Woods has significantly stepped up its investment in research and development for product development, it is also investing in plant and tool modernization; that is, in better and quicker ways of doing things," he said. "This will be a key to maintaining Woods' proud heritage and brand equity and will position the company to retain and advance its position of leadership in the future."

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