



# Building prototypes with modular fixturing

## Will system become a fixture in the welding industry?

By Eddy McNeil,  
Associate Editor

**D**eployed behind the seven plants that make up Vermeer Manufacturing, Inc., stands an army of welding fixtures, their steel frameworks scarred by exposure to frigid winters, summer heat, and the rains that fall on the Pella, Iowa, facility.

Once among the front-line soldiers in the daily battle to meet demand for the company's trenching equipment, underground cable pullers, hay bailers, tree-stump chippers, and cutter wheels, among other products, the fixtures now stand idle most of the time (see Figure 1). Like reservists pressed into active duty only when they are needed, the 5,000 or so fixtures—some more than two decades old—await a call from a

customer in search of a replacement part for one of Vermeer's machines.

When that happens at the company's Underground Division, it falls to area supervisor Rich Barnett to fulfill the request. For 20 years, Barnett has been involved in welding at Vermeer, and he has often experienced the frustration of spending hours to locate an out-of-date welding fixture in the outside storage yard so that a replacement part could be



Figure 1

Welding fixtures for parts that are no longer in production are exposed to the weather outside Vermeer's facility.

fabricated. If the fixture cannot be found, the part must be made by hand.

So Barnett was intrigued when he learned of a modular fixturing system for welding and assembly available through the Bluco Corp., located in suburban Chicago. The system allows workers to build temporary frameworks using stops, clamps, and angles rather than constructing a series of permanent fixtures or building the parts by hand.

"As soon as I saw it was offered and I saw the video, I nearly got on my knees and begged for it," Barnett said. "I've built so many things in this company by hand over the years or on an old metal welding table that was out of square. As soon as I saw this offered, I knew what potential it had."

## The Modular System

The modular fixturing system was developed by a German company, Demmeler, which experienced similar frustrations in dealing with short-run welding and fabricating, said Robert W. Ellig, president of Bluco. Patented in the U.S. in August 1994, the system consists of a high-tensile-strength steel table with a grid pattern of bored holes for mounting a variety of angles, stops, clamps, and extensions. In addition, the table sur-

face is marked with guidelines to aid in positioning for open setups.

The table, which has five working surfaces, is flat to within 0.0025-inch tolerance from end to end, 0.002 inch from side to side, and to within 0.0004 inch per foot across its surface. The bore locations, which are spaced 100 millimeters (3.9 inches) apart across the face of the table, are accurate to within 0.0015 inch of each other.

At the heart of the system are the clamping and positioning bolts and the clamps, which are available in several styles with screw or toggle mechanisms. They are affixed to pipes designed to fit into the bored holes. The pipes are fitted with steel collars that have O-rings to establish and maintain the proper height. In addition, each clamp has a built-in compensating mechanism to ensure that the part is not displaced as the clamp is tightened and the pipe flexes.

The positioning and clamping bolts provide 3 tons of clamping force and withstand up to 25 tons of shearing force. For big jobs, extensions are available to allow two or more tables to be joined while still maintaining the precise grid pattern for the bored holes.

## Becoming Creative

Vermeer bought its first modular fixturing system, a 10-foot table, about a year ago and ordered a second 10-foot table shortly after that. Barnett said that without the tables, the company probably would not have set up a special department that handles nothing but obsolete parts and prototype models.

"It's an aid that we never had before. We couldn't get this elaborate," Barnett explained. "When you're trying to build an item for a 20-year-old machine, you have to be precise. The machine might be worn, but the customer still wants that new part. If you don't build it accurately, it's not going to fit.

"We'd still build the new stuff by hand, hope it came out right, and correct as we went along. Now that we have the table, we're able to eliminate so many headaches," he said.

Pat McQueen, a Vermeer welder who has been building prototype and obsolete parts on one of the tables for the past six months, said it took him about two months to become comfortable with the system. He showed some recent visitors to the plant how he used the modular fixturing system to set up an obsolete part for one of the company's underground cable pullers (see Lead-in photo).

The part included five subassemblies and other components that were positioned with angles and other locators and then held together with an array of clamps, some made specifically to be used with the table, and a second group that included a hodgepodge of other clamps and fasteners.

"It's a lot easier to build off this than it is to build off of a jig," McQueen said. "This is exactly opposite of what the print shows. You've got to turn this thing upside down, according to the print. When you get a jig in here, you don't know that. You're just thinking, looking at the print, and looking at the jig. It may be upside down, just like you had to build this one, but you don't always know that."

Barnett said he has tried to impress upon McQueen that "the only restriction

that he has is his mind. He's getting more and more creative, but that's what it takes.

"Once I get the point across to the individual that he's working on a grid, we've made progress," Barnett said. "The best way I can describe it to him is to imagine a Rubic's Cube. Remember that the blocks continue to go up. Once they visualize that, they don't feel so bad when an engineer comes from the center of one hole to the center of another, and it's 40 inches out and 20 inches up."

"Another nice thing about these is you can build a whole part without welding anything," McQueen added. "You don't have to tack anything with this if you don't want to. You can go through the whole part and make sure it's right and then go back and tack it. If you build by hand, you don't have that option."

### **"Technological Sense" Versus Economics**

Ellig, whose company also sells modular fixturing for machining and coordinate measuring machines (CMM), said his company began selling the modular fixturing tables in the U.S. two years ago. He said he has found many allies in fabricating shops but is not always as successful in convincing company management of the

value of modular fixturing.

"The guys in the shop who see it can understand what it does. They fall in love with it," he said. "But depending upon where they are in the power structure, they may or may not be able to get it for their companies. A lot of guys who see it want it, but the guys in the front office say, 'No, we don't think so.'"

"The Germans have about 2,000 of these already installed in their market. Here, we have significantly fewer than that, but that's because there's a major difference in the mentality of our manufacturing base," Ellig said. "Europeans look at this and say, 'Yes, that makes technological sense, and we should have that.' They put it in, it works, and the economics follow. Here, the first question I always get is, 'What's it cost?' As a result, we don't sell anywhere near as many of these systems here as they do in Europe."

### **No More Hunting**

Barnett said Vermeer currently has 13 different product lines, any one of which may be revised as the company's engineers see fit. If changes are dictated for noncritical parts, particularly those that will require no subsequent machining, the job of building the prototype likely will go to a regular welding station. Prototypes for critical machine

parts, those with bearing points, or parts that must mate with a tractor are likely to be built on the modular fixturing table, he said.

"That first machine I showed you when we came in the door? From the time it was cut as a prototype unit until the time it hit production—and we're currently doing 10 a week—it was less than six months. That's the fastest we've done anything, and this table helped," Barnett said. "Otherwise, we'd have been doing it on the floor and on a welding table and fighting the bows and fighting the heat and the ends lining up. We didn't have those problems. It really, really saved us a lot of headaches."

Barnett said that when he receives orders for parts that are no longer in production for machines that are 15 or 20 years old, he no longer hunts through the outside storage yard for the fixture to build the part. In the time it would take him to locate the fixture, he said, he can often build the part on the modular fixturing table.

"We want to get rid of half of the fixtures out there, if not all of them," Barnett said. "I told the boss that I feel confident enough with this tooling that I have, to go ahead and cut them up. Save the space." ●

