



View of Roberts Tool Company's new Kitamura HX400i 4-axis horizontal machining center. 21 palletized work settings (400mm pallets) can be brought into the machine automatically and stored for future call up. Programmable probing for tool, part, and fixture measurement assures precision every time work flows into the cell for machining. Tool storage capacity of 150 tools allows back up and redundant tools. Roberts can put as many as 60 jobs on the system at a time.

Going Lean and Flexible

A Highly Successful Job Shop Beats the Odds with Lean and Flexible Manufacturing.

Story and photos by C. H. Bush, editor

Professional track athletes know the value of staying strong, lean and flexible. Being lean and strong gives them a high strength-to-weight ratio, which delivers the sprint power they need to beat their competitors across the finish line. At the same time, being flexible keeps their muscles from freezing up along the way and allows them to finish the race.

"It's really not too different in our business," says Brad Hart, president of Chatsworth, CA's Roberts Tool Company, Inc., a large job shop that specializes in producing high-precision, highly complex machined parts. "At Roberts Tool we combine continuing-improvement, lean manufacturing techniques with the latest in flexible manufacturing systems to give our customers the broadest service possible. As a result, our customer list has grown to resemble a who's who among aerospace and commercial giants, and we have continued to grow even during the economic downturn."

When Hart took over management reins from his father in 1999, Roberts Tool Company had 45 employees and annual sales of \$4.5 million. Today, less than 5 years later, the company employs 67 people and expects to post sales for 2005 in the neighborhood of \$13.5 million. Growth of that magnitude during hard times might to many in the job shop business resemble a minor miracle, but Hart says his company has grown because he put it on a strict regimen to turn it into a lean manufacturing machine that can "kick the butt" of just about any other shop, including offshore.

"Basically, we've doubled our output per employee," Hart says, "plus we've cut our lead times from 16-20 weeks down to 3 or 4 weeks, which has really been the key to our growth."

How They Did It

How did the Roberts team accomplish such a feat of growth in productivity and profitability?



Chuong To, Kitamura set up/ operator, (left) and Brad Hart, Roberts Tool Company president, discuss just-in-time delivery scheduling for the Kitamura.

“It was really one of our customers who got us started in the right direction,” Hart recalls. “They came to us and said, ‘We want to introduce you to lean manufacturing, and that rang a bell with me because I’m not a machinist. The way they described it, lean manufacturing was a way of documenting the internal processes in a way that would give me an overview and a sense of control. Lean manufacturing would make us less dependent on key people, because once you set up a cell, you can have good reliable people who are not the most experienced make the parts. With a lean cell, people follow a set process to make the parts and they always come out the same way.”

Lean Guru

Hart’s customer wanted to come into his shop and help him adopt lean methods, but Hart felt that that would give them too much insight into the company’s internal operations.

“I thought lean manufacturing was a great idea, so we brought them in and did a couple of kaizan events to get the flavor of it,” he says. “Soon after that we hired one of our customer’s lean gurus, a man named Eric Satterthwait, to come on board full time to help us. He stayed with us for four years, flying in from Utah on Monday’s and flying home again on Fridays. It was one of the best investments we ever made.”

At about the same time, Roberts Tool acquired a company called Cliffdale Manufacturing, Inc.

“We bought Cliffdale because we were making high-end, highly precise hydraulic components, and they made missile parts, which gave us another market,” Hart says. “Cliffdale had sales of about \$1.5 million and had eighteen employees at the time. They were located just about ten minutes away, so we decided to send our lean guru there to

kick off our program.”

Hart’s lean guru had a clear-cut set of goals at Cliffdale.

“His task was to find families of parts that would all be able to use the same cutting tools, the same workholding setups, the same machines, and procedures,” he explains. “Then he was to develop cells specifically around those part families. The idea was to create cells that would meet the customer’s needs. To determine the productivity needed from a cell, we divide the quantity of parts the customer needs by the time available to produce them. On the Sidewinder missile parts we make, the customer needs a part every ten minutes, so our cell has to produce a part every 10 minutes. We analyze all our part families that way, and we put together

whatever number of machines we need to make that happen. Most of our cells have four or five machines in them.”

Hart says the results of their first efforts were amazing.

Hart: “At one time the maximum number of the Sidewinder parts that could be produced in a month was 600. Recently that cell produced 2100 in a month. Now, instead of requiring eighteen people to build \$1.5 million worth of parts, we’re doing it with five people and \$70,000 worth of equipment. The system works perfectly.”

Each Cell a Profit Center

Once their lean approach was proven at Cliffdale, Hart brought the concept into Roberts Tool and restructured his entire set up.

“It was a tough thing to do,” he recalls. “We had to move the machines closer together. We standardized all the fixtures. We hired a bunch of college kids studying manufacturing engineering to help us. We put a video camera on our setup guy and followed him all over the shop for days. When he went to the rest room, we parked the camera outside and waited for him. Then we sat down with a TV and fast forwarded through four day’s worth of video.”

What they achieved with their analysis was eye opening.

“One of our cells, which uses four Haas machines is a good example,” Hart says. “We had one part that typically

Complex hydraulic pump components produced on the Kitamura. Once such parts are produced, no more setup or first article inspection is required for subsequent orders.





Chuong To loads and sets scheduling at the Kitamura HX400i load station.

took 100 hours of set up and about 9 to 10 hours of run time. Now with our Haas cell, we can do the set up in two hours, bringing TAKT time down to less than an hour. What we determined was that 90% of setup time was spent looking for all the stuff the setup man needed to do his job.”

According to Hart, most of the hard work creating his cells is done, and he has converted each of them into profit centers for their families of parts.

“Once a cell is running, we treat it as a small business and our sales teams are responsible for finding work to keep that cell going,” he says. “If we don’t have enough work to fill a cell, the sales people have to find other customers or other parts to fit the same process. The concept has helped us greatly increase productivity and triple sales in less than five years.”

Going Flexible

One side effect of setting up his lean manufacturing cells was that there were a number of complex parts left over that didn’t fit into any family of parts and thus could not be produced efficiently in one of Hart’s cells. To solve this problem and to meet the need to produce highly complex, high-precision parts on short notice and in low volume, Hart purchased a Kitamura HX400i 4-axis horizontal manufacturing cell with 21 400mm pallets and 150-tool storage. The system is equipped with a 25-hp, geared, 13,000 rpm spindle capable of delivering very high accuracy and repeatability.

“I’ll give you one example of why I bought that machine,” Hart says. “I was at Magic Mountain in the

swimming pool at five P.M. with my two little girls. Suddenly I get a call on my cell phone from Europe, where it was one o’clock in the morning. My customer says, ‘I need two parts today for the Paris Air Show.’ They refused to tow their airplane into the show, but they couldn’t fly without my parts. I said, ‘My guys have gone home. It’s five o’clock Saturday.’ He says, ‘I don’t care.’ I said, I just received the casting yesterday’. These were \$2,000 parts, which typically had a sixteen-week lead time. But he wouldn’t take no for an answer. I finally agreed and found our guys. They showed up Sunday morning at six o’clock. They set up the cell, made two parts and deburred them. I took them to LAX and I put them on an airplane Sunday night. They arrived in Europe on Monday night. That kind of stuff happens, and if we’d had the Kitamura, we could have called up a program and punched a button and got our parts fast.”

Kitamura for Flexibility

Another reason Hart bought the Kitamura was because he does a lot of work for the Airbus.

“Their parts are all short lead times and low volume,” he says. “They’re the kind of customer for whom lead times don’t mean much. If they want parts tomorrow, they want you to ship them tomorrow, even though they haven’t given you the proper lead time. Basically they have this idea that we should be able to produce at their demand. So, what we’ve done is put their parts in the Kitamura and and now, literally, they can call us up a week before or even the day before they need the parts and we can deliver. Or, they can call up and say we don’t need those parts, and we can cancel without losing money because with the Kitamura our lead times are much shorter. The Kitamura has 21 pallets, which allows us to put as many as 60 jobs on it at a time. Once we have a part setup and have produced a first article and qualified the process, the next time a customer needs that part, it’s just a matter of pushing a button. Also, with its cell controller it’s easy to reschedule parts to be run.”

Another use for the machine, Hart says, is to produce parts that require true dimensions and tolerance.

“You just can’t take parts like that off one machine and put them on another,” he says. “In situations like that the Kitamura really shines. That machine delivers extremely high accuracy and repeatability and it does so in one setup. It’s really a flexible manufacturing system.”

Shortly after buying the Kitamura, Hart purchased another large flexible machining center.

“Lean manufacturing lets us be competitive on higher volume parts families,” he says. “Flexible manufacturing allows us to be competitive on low-volume, complex parts on a just-in-time basis. With the two systems we definitely have the best of both worlds.” ■