

Manufacturer Halves Cycle Times Using Variaxis

Liqua-Tech has a strong reputation as a small, high-quality manufacturer of liquid-propane flow meters. The Ukiah, CA company's meters, which are used to meter liquid propane at rates from 3 to 100 gallons per minute and feature durable cast-iron housings, are sold throughout the world.

As a leader in its industry, the company has to contend with competing products of lesser quality and lower cost. Determined to maintain the high quality of its product, Liqua-Tech is always on the lookout for manufacturing technology that enables it to machine the abrasive ductile cast iron more efficiently.

The complex shapes of the iron castings that make up the housings for Liqua-Tech's flow meters require machining on multiple faces. The castings undergo various types of machining operations, from drilling to helical thread milling. Just about every side receives some type of machining operation.

To present each side at the proper orientation to the necessary tool, the casting workpiece must be rotated and tilted at different times during the machining cycle. An older Fadal machining center performed the actual machining while a manual tilt-rotary table indexed by an operator manipulated the part. The machining cycle incorporated many pauses to allow the operator to open the machine door, index the part, check part placement, close the door, then restart the machine.

According to Brent Christensen, director of engineering, it was time for a change. “The machine had served its purpose well but was basically old technology. We were also seeing greater production demands from our distributors.” To meet the increased production volume, Liqua-Tech ran the Fadal two shifts per day, four weeks per month. Despite this schedule, the company could not get meters out the door as fast as it would have liked. “We knew we had to do something differently,” says Christensen.

While its competitors were eager to provide lower-cost meters made with easier- and faster-to-machine aluminum housings, Liqua-Tech would not take that route. “The design and the service these meters experience do not lend themselves to aluminum,” explains Marta Felt, president. “These meters will see service on the back of a truck going over rough roads. Aluminum just doesn’t hold up as well as ductile iron. Our focus was to maintain the high quality of our product and still compete on price with competitors that sell a less-durable product.”

As pallets of castings were piling up, Christensen finally found what he was looking for at a Santa Clara, CA tool show. While passing the Mazak booth at the show, Christensen saw a Variaxis 200 in action and saw exactly what he wanted. “I saw this machine maneuvering an aluminum part around, just the way I wanted to manipulate our parts. When the Mazak sales rep. told me what the machine would cost, which was less than I expected to pay for a new mill plus a Tsudokoma table, I told him to write up the proposal.”

Single Setup and Faster Cycle Times

Eager to see how well the Variaxis would tackle the cast-iron housing machining, Christensen began playing with its operation the moment it was installed. Within two days the machine was programmed and machining production parts.

Initial testing involved face milling and the drilling and tapping of bolthole patterns. That success quickly led to the more-complex machining required on the actual housing of one of the company's key products.

"The model LPM-102 flow meter receives machining on the top two surfaces, the sides and the bottom," explains Christensen. "The part then needs tilting and rotating for the tools to hit another side at a 45° angle. The Variaxis did all this in a single fixturing."

On the older system, tilting and rotating of the part was done manually. The Fadal would perform all milling, drilling and tapping operations on a single side, after which the operator would index the part to the next orientation and the machine would repeat the process using as many tools as needed.

The flexible part manipulation possible on the Mazak actually shortened the programming necessary to machine the housings. This was due to the reduction of tool changes in the cycle. According to Christensen, "Now we grab a face mill and mill everything that requires face milling, with the tilt-rotary table quickly positioning the part as needed. Then we grab the center drill and center drill all those features requiring center drilling. We continue in this way until the part is done. We are no longer grabbing tools multiple times as we did with the previous machine."

The single fixturing, while an important consideration, was enhanced by the faster cutting speeds and feeds possible with the new machining technology offered by the Variaxis. "On some of our parts it knocked our production times down by half, if not more," claims Christensen. Work that took an hour to machine on the older machine initially took 28 minutes on the Mazak. This initial work, without fine-tuning of the cutting parameters, already delivered an impressive 53% reduction in cycle times.

These features enabled Liqua-Tech to quickly catch up on its orders while running the new machine for only one shift per day. Over the last few months since the installation of the Variaxis, Christensen views production changes at Liqua-Tech as night and day. "Not having

had any direct experience with one, it was a leap of faith to go with this Mazak machine. But we are really happy with it. The spindle speeds, the rapid travel, tool-change time--everything is fast.”

Everyone in the shop is excited with the flexibility and capabilities of the new machine. Their key focus is on setup reductions. Supervisors and operators often approach Christensen with ideas on how the machine could save setup times on other in-house jobs.

The faster cycle times, fewer setups and longer tool life delivered by the Variaxis have allowed Liqua-Tech to maintain its competitiveness in the propane industry. “Not only have we doubled production rates, but we now have a machine (the old VMC) available to do other work where otherwise it would have been tied up. Overall, this investment has made a world of difference for us.”

Marta Felt concurs. “This machine has given us the capacity to machine a durable product just as fast as our competitors can machine their aluminum products. The investment for us was actually not in a process but a technology. This was technology we believed would allow us to make the quality product we wanted and to sell it at a competitive price. The machine surpassed all our expectations.”

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PHOTO CAPTION 1: A Mazak Variaxis 200 enabled Liqua-Tech to halve machining cycle times and, through its rigidity and spindle speed, increase tool life four thousand percent.



PHOTO CAPTION 2: Using the multi-axis capabilities of the Variaxis 200, Liqua-Tech cut machining times in half on this iron casting for its LPM-102 liquid propane flow meter.



PHOTO CAPTION 3: A flow meter body casting awaits machining on the tilting-rotary table of the Variaxis 200 with Mazatrol 640 PC Fusion CNC Control

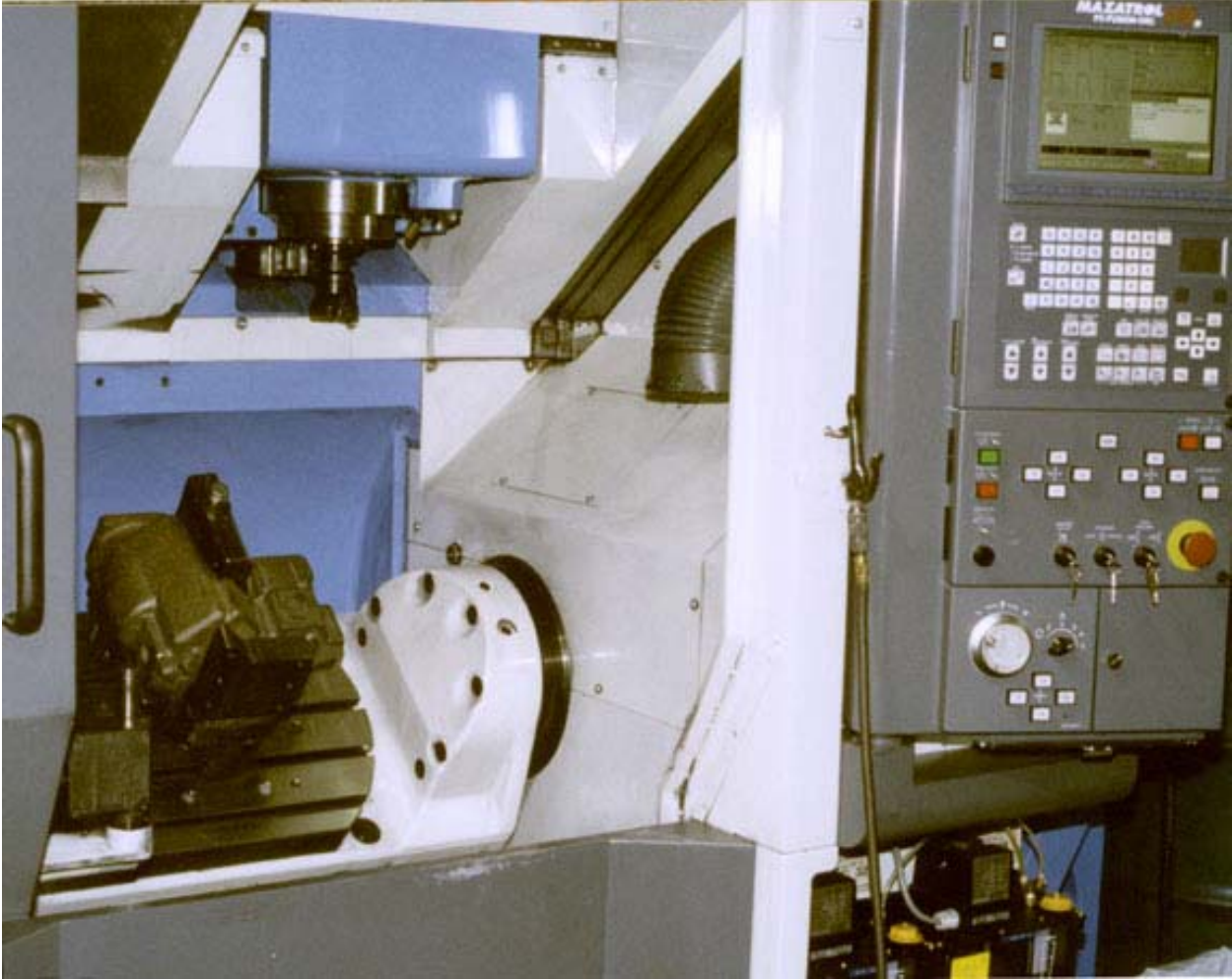


PHOTO CAPTION 4: Hydraulic clamping, the 225° C-axis rotation and the 150° A-axis tilting on the Variaxis 200 table easily positions the pump body for rigid boring of the two ports, which are at a 45° angle to one another, using a 1-7/16-inch diameter spade drill.

