



CEO Michael Bowman with one of two new Mazak HCN-5000s. They were added, along with an HCN-6000 and an HCN-6800, to fill out the complement of Magnum Machining's 16 various HCN machines, making it a "House of Horizontals." (All images provided by Mazak)

MAGNUM MACHINING INC.

Shop Prospers By Becoming a House of Horizontals

At one point in time, Magnum Machining Inc., Deerwood, Minn., processed the majority of its parts with a bevy of vertical machining centers (VMCs). Unfortunately, that type of machining platform didn't quite mesh with the shop's part production needs, according to CEO Michael Bowman. "Horizontal machining centers (HMCs) proved to be the perfect production match for us, boosting speed, consistency, process flexibility and overall productivity," he said.

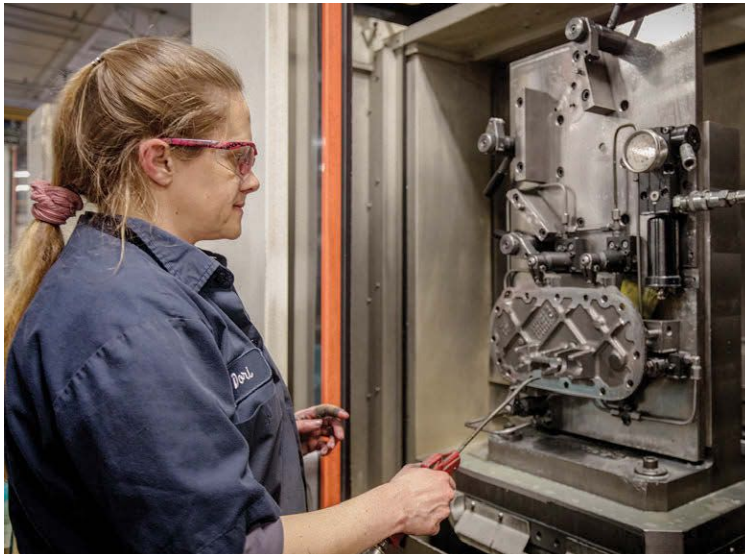
Bowman explained that the verticals required that operators stop the machine, open the door, clamp a part in a fixture, close the door and restart the machine every time they loaded a new part. All this happened while the machine's spindle sat idle, non-productive and waiting. In addition, the shop's parts—mostly medium to large castings—often involved deep holes and features that required long tool overhangs. The VMCs were unable to provide the necessary reach and stability for such operations.

By the nature of their design, HMCs deliver the necessary support and stability for the long-reach milling, drilling and boring operations the shop needed to produce higher quality and more precise parts. On top of that, HMCs, according to Bowman, provide Magnum with virtually 100 percent machine spindle utilization, as their integrated two-pallet changers allow parts to be loaded and unloaded while machine spindles continue to work uninterrupted. HMCs also typically have larger work envelopes, which give the shop the added processing flexibility it needs to run either one or two big parts, or several smaller parts on the same machine platform.

When it comes to parts and production, Magnum is not a job shop per se, according to Bowman, but instead a Tier One supplier that does mostly contract manufacturing of recurring jobs. That means the shop often knows exactly what to expect at what time and can plan production flow accordingly. Such reoccurring job lot sizes run anywhere from five to 2,500 pieces. For some jobs, the shop will produce 20,000 parts per year; for others, only five parts are needed annually.

Magnum specializes in machining castings and does some bar-type work for a customer base ranging from heavy equipment to commercial HVAC manufacturers. Most cast parts are made from gray and ductile iron, steel, stainless steel, aluminum or brass, and each can weigh as little as ½ lb to 700 pounds (0.23-317.5 kg). Machining cycle times can vary from 1½ minutes to upwards of six hours.

Part machining operations include turning, milling, drilling, boring and tapping. Magnum strives to reduce cycle times, not only to reduce cost per part, but also to increase capacity to take on more work. As noted by Shawn LaFava, general manager at Magnum Machining, “The key is how quickly we can make the



Dorene Nelson, CNC machinist, tends a machine at Magnum. The company's HMCs allow virtually 100 percent machine spindle utilization, as integrated two-pallet changers are loaded and unloaded while machine spindles continue to work.

capacity available to get more hours per spindle. We regularly determine our capacity based on available employee and machine tool spindle hours and try not to go above 75 percent machine capacity. At this level, our customers know we can respond quickly and they come to us for any emergency jobs.”

Magnum now has 16 various models of HCN Series HMCs from Mazak Corp, Florence, Ky., representing about 68 percent of the shop's total number of manufacturing systems. Most recently, the shop added two HCN-5000s, one 6000 and a 6800, all of which feature Mazak's MAZATROL SmoothG CNC.

Having all Mazaks, according to Bowman, dovetails with the shop's HMC manufacturing strategy and the increased workflow flexibility it enables. “We know that once we prove out a program on our Mazaks, the machines are so consistent that we know

that every time we run that particular job in the future, there will be zero variation,” he said. “The consistency and speed of the machines also allow us to run more jobs ahead of time. Plus, we always strive to reduce setup time and increase productivity by using fewer machinists to produce more parts.”

To accomplish this, Magnum runs multiple parts simultaneously whenever possible to shorten job turnaround times. This is why the shop's HMCs prove more advantageous than VMCs, according to Bowman. “On a VMC, we might have room for maybe two parts, while on a Mazak HCN we can load three or four of those same size parts on each side of a four-sided tombstone fixture,” he said. “Machine time for each individual part might remain the same,

but we have eliminated the costly idle production time involved with the load/unload process for VMCs, so our overall job turnaround time is much shorter as well.”

The MAZATROL SmoothG CNC control makes it easy to generate programs for processing complex parts through off-centerline machining as well as angled drilling, milling and tapping operations. It incorporates a variety of advanced programming functions that give Magnum ease of use and ensure high-speed, high-accuracy machining performance, according to the shop. Some of those functions include High Gain Feed Forward Control to boost machining speed and accuracy, Real Time Tuning to ensure optimal machining balance as workpiece weight changes, and Variable Acceleration Control to calculate optimal acceleration for a combination of axes.

Magnum's lineup of Mazak's HCN HMCs work with virtually any type of casting material, require minimal floor space, yet still provide wide machining areas for the shop's large workpieces or multiple smaller ones. Pallet sizes for the HCNs range from 400 to 800 mm square, while spindles are from 40-taper/12,000-rpm to 50-taper/10,000 rpm. The machines also have a fast two-pallet changer as standard equipment that provides a rotating front pallet for easy set up.

Magnum relies on talented, industrious individuals to work together with their Mazak advanced technology. Unfortunately, the skilled labor pool in Magnum's surrounding area has hollowed out significantly since 2013, though Bowman observed that the situation continues to slowly improve as local tech school admissions grow.

Bowman strives to ensure the shop has the internal training capacity to hire individuals with any mechanical aptitude or desire to learn. He also said that within 30 to 45 days, these trainees,


as a result of Magnum's training, are able to operate machines, navigate the controls and do their own part inspections. What makes this short learning curve possible, according to Bowman, is a combination of the training program itself and the shop's manufacturing equipment, specifically its Mazak machine tools and their user-friendly MAZATROL SmoothG CNCs.

"When you compare machine controllers in the past to those of today, there are significant differences," he said. "For one, the newer Mazak control was designed with today's younger individuals in mind. Its look and functionalities are similar to those of today's tablets and smartphones, so there is an immediate comfort level with the younger machinists when they can work with such a machine control."

Shane Cartie, maintenance manager at Magnum Machine, added that the control's advanced functions—such as those for maintenance, usability and customization—further enhance ease of use and shorten the learning curve.

Magnum's commitment to its customers' success and its efforts to always maintain mutually beneficial relationships is rooted with Bowman's father, Jerry Bowman, who established Magnum Machining in 1994 in Rochester, Minn. The family had a cabin in the Deerwood area, and in 1997 Jerry Bowman expanded operations to the area. The shop's current facility started as a single building that was subsequently expanded to bring the Rochester facility's work up to Deerwood. The Deerwood facility currently employs 72 people. Magnum has also opened a facility in Mexico that essentially mirrors the Deerwood shop in terms of customers, production levels and types of workpieces.

"As my father always did, we will continue to place our relationships with

customers first," Bowman said. 

For more information from Mazak Corp., go to www.mazakusa.com or phone 859-342-1700.