Lake Area Technical & Midwest CAM Solutions
Joining Forces to Produce Face Masks in COVID-19 Fight

When the shortage of Personal Protection Equipment (PPE) for the front lines of the COVID-19 crisis became apparent, two doctors and a designer in Billings, Montana – Dr. Dusty Richardson, Dr. Spencer Zaugg, and Colton Zaugg – designed and modeled a washable, reusable face mask to help medical staffers extend the use of available fabric masks and accommodate additional filtration materials. They made CAD models, developed a process for community involvement, and provided information, instructions, and CAD files on their website, makethemasks.com.

The mask assembly includes a shell, an insert that holds a woven filter, flexible sealing material for the edge of the mask (if using a hard material for the mask), and straps. Injection molding would require machining mold components, and using a flexible injection material could eliminate the need for an edge sealer.

In March, faculty members of Lake Area Technical Institute (LATI), a two-year vocational school in Watertown, South Dakota, became interested in producing the masks. Among the two-year degrees offered is an associate of applied science degree in precision machining. Instructor Darrel Grohs said that LATI is the only school offering that degree in the state, with graduates working as far north as the North Dakota border, and as far south as Yankton and Sioux City. "We're teaching in one of those industries where everybody needs us, but nobody knows we exist," he said.

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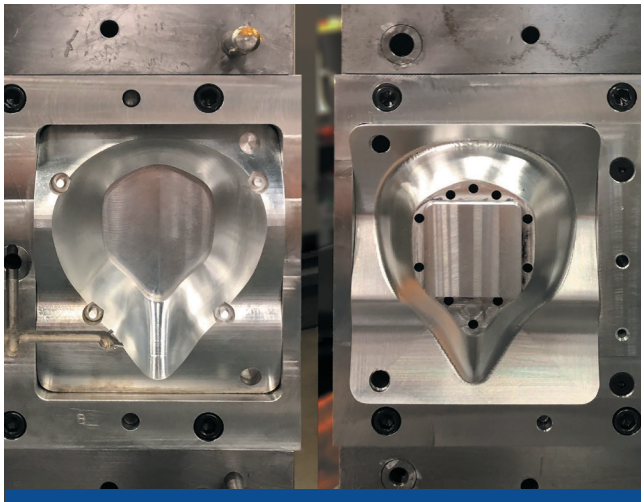
> ***Darrel Grohs, Instructor, Lake Area Technical Institute (LATI)***

Grohs teaches second-year students in the precision machining program, while Gary Mudder and Mark Ramsey teach first-year students. However, it was Brooks Jacobsen, the supervisor of the robotics program who got things rolling after he had made a shell, the mask's largest component, during three hours of 3D printing. With a goal of supplying Watertown medical staff and facilities, injection molding would be required for the shell, although the filter-holding insert would be a good candidate for 3D printing, especially as its small dimensions enables ganging several for each cycle.

Grohs took inventory of available mold components to determine what needed to be machined, checked for available molding material, and obtained approval for the project. But when he received CAD files from the robotics group, he encountered an immediate hurdle. He had not worked with SolidWorks STL files as a starting point for machining, and he needed to program a toolpath to machine the flowing surfaces of cavities and cores.

He consulted Rick Meide, Applications Engineer and President of Midwest CAM Solutions, the Twin Cities based regional distributor of GibbsCAM. (LATI qualified for 3D Systems' educational grant program, and received 21 seats of the GibbsCAM



The mold was a team project for LATI instructors, with assistance from GibbsCAM representatives, Midwest CAM Solutions, and Watertown automated equipment manufacturer, Dakota Automation.

Cavities and cores were machined on a Mazak Nexus 410 machining center, using CNC programs generated with GibbsCAM.

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Rick Meide, Applications Engineer and President, Midwest CAM Solutions

Classroom Edition and annual maintenance.) What happened next, according to Meide, was the easiest part of the whole project. "They isolated what they wanted to machine and sent me the files," he explained. "GibbsCAM was the first CAM system to read SolidWorks files directly, so they came right in. Also, GibbsCAM makes it really easy to make molds, which helps machinists save a lot of time and effort. It's so fast and easy that I had the toolpath ready in about five minutes."

When Grohs received the files, he saw that they were too large for the controls on his machines. Furthermore, because the educational and industrial versions of GibbsCAM are encoded differently, he couldn't open the program files to divide them. So he contacted Dakota Automation, a local automated equipment manufacturer and one of many GibbsCAM users in the area. The company allowed Jordan Collins, one of several LATI graduates who work there, to assist Grohs. Working together, they found logical points to divide the programs into segments that fit into the memory of the school's Mazak Nexus 410.

While Grohs machined cores and cavities, the other machining instructors, Mudder and Ramsey, worked on mold components. Grohs explained that neither had built a mold, and that it had been several years since he had built one. While he used the Mazak, Mudder and Ramsey worked on the lab's two Haas VF-1 machines.

The mold base had the parallels and backing plate, but not the main body, so Ramsey machined the main body plates into which the cavity and core blocks would be inset. Mudder squared up components, figured locations and bored holes for the ejector pins, and machined pin plates and pin cover plates. Progressive Components, an Illinois-based manufacturer and international supplier of mold components and mold monitoring devices, donated the ejector pins and other components.

After pressing a few prototypes, making adjustments, and changing the material to a softer thermoplastic rubber, the injection press began molding a pair of mask shells every 80 seconds. The initial run was 300 pieces, but the team had material for another 1,300 in beige and 1,300 in black. Meanwhile, the robotics group made filter-holding inserts on a 3D printer.

"Everything came together, and everything worked without running into many glitches," Grohs summarized. "Mark and Gary had a lot of fun, figured out the Haas machines and controls, and learned a lot, while I added another mold to my career. Also, I have to thank Brooks for bringing us the project, Dakota Automation and Jordan Collins for their help, Progressive Components for their donations, and Rick Meide and Midwest CAM for being there for us."

"I feel special in helping Lake Area Technical Institute with a project geared to help others," Meide said. "So, as we do for all our customers, we wanted to help the best way we could. That school is really instrumental in training students for employment in the surrounding area, and my GibbsCAM customers are just unbelievable, working together, like we are all a team helping everyone." PM

FOR MORE INFORMATION about Midwest CAM Solutions, contact Rick Meide at 877-444-0982 or rick@midwestcamsolutions.com.

MORE ABOUT LAKE AREA TECHNICAL INSTITUTE:

LATI participates in Build Dakota, a state program that provides scholarships for students who study to become employees of specialized industries. Qualifying students receive grants to attend LATI on the condition they work in South Dakota for three years. The school enhances the state's scholarship with its own "Stretch the Million" program, which enables a South Dakota company to partner with a student. The company pays for half the grant, thereby gaining an immediate employee (with 3-year commitment) when the student graduates. Simultaneously, the reduction of the state's portion "stretches" the fund to assist another student.

Illinois-based manufacturer, Progressive Components, donated mold components for LATI projects, including the ejector pins for the mold, shown here in a test fitting for the cores.

After testing the mold by making these prototypes, the team adjusted the mold, obtained a more flexible thermoplastic rubber, and began production, molding a pair of mask shells every 80 seconds.