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AMM advances additive manufacturing

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BRINGING ADDITIVE METAL MANUFACTURING TO THE MAINSTREAM

AMM leverages advanced technologies and innovative minds to enhance Canadian companies' global competitiveness.

BY MATT POWELL, ASSOCIATE EDITOR

A large blue marlin adorns the back wall of the Concord, Ont. office shared by Norman Holesh, David Slimowitz and Nigel Southway. Slimowitz who is the fisherman of the bunch, has added a number of photographs from his numerous fishing expeditions. The marlin represents a bit of a metaphor for the three manufacturing veterans who have more than 100 years of industry experience between them. They're trying to reel in a much bigger fish.

Holesh, Slimowitz and Southway are confident they've uncovered a solution that will make manufacturers more competitive globally. And it lies in the abilities of a machine gently humming away in a small, lab-like room at the Additive Metal Manufacturing (AMM) office in an industrial park barely north of Toronto.

AMM's story began more than two and a half years ago when Holesh attended an information night on 3D printing. While the focus at the time was on plastics, it was the metals that really excited him.

"Canada needs something that assists manufacturing, and there's very little that assists them in terms of getting the parts they need," says AMM's CEO who has 40 years of manufacturing experience under his belt. "Everyone's looking at low costs, and over the years Canada has lost lots of manufacturing jobs. [Additive manufacturing] seemed like an opportunity to stem the tide and help manufacturers get their products going."

The company offers engineering and design consulting, additive metal rapid prototyping and additive production services. It's also in the midst of developing a Centre of Excellence for additive metal manufacturing, part of an effort to make advanced technologies such as 3D printing more accessible and support a perceived repatriation of manufacturing to Canada. 3D printing will reduce costs, increase opportunities and encourage innovation, say the partners.

"Being a service bureau, we can tell clients that in particular situations, they might not need a lot of additive work, but instead machining or casting. We look at the job from an end product point of view, not just a supply chain view," says Holesh. "Toolmakers are only beginning to see the opportunities additive manufacturing brings them. We're not trying to displace traditional machining, we're trying to augment it."

The company's capabilities are impressive, and they have a little black box of goodies to show off to potential customers. One part cuts weight from traditional machining by more than 50% (118 grams to 54) thanks to an intricate honeycombing construction throughout the middle of the printed tool steel part. Another shows how the company consolidates five parts into one intricate assembly.

"There's no welding fixtures required. No individual parts. Consolidating parts into one results in a massive cost and time savings," says Slimowitz, AMM's vice-president of sales and marketing. He's the founder of Sabito Machinery Inc., a used industrial machinery dealership that shares workspace with AMM. He also brings more than 40 years of industrial experience to the company.

"You can do things you couldn't do before, especially for the tooling market and thermal management concerns those kinds of companies have to deal with. The question is how far are you willing to push the envelope?"

Just as CAD technology was a game changer in the way components are designed, he declares metal additive manufacturing will have the same effect.

The technology is so new, there are no rules. AMM is defining them as they go.

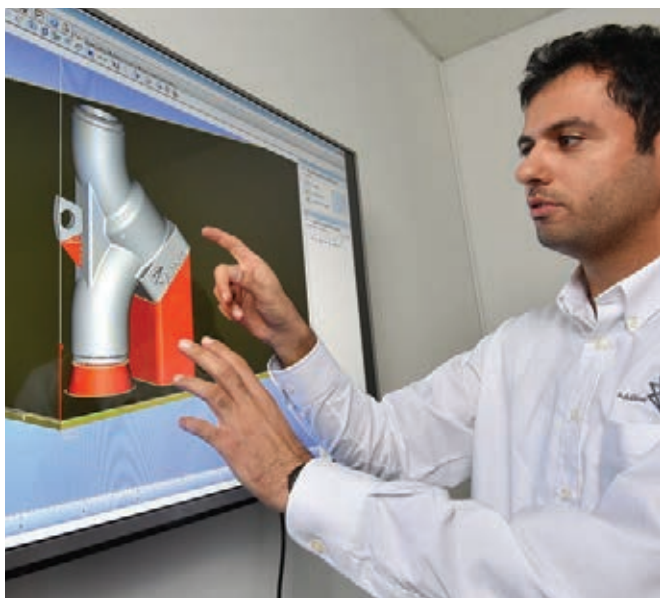
"We need to show manufacturers what's available because a lot of what is available isn't known," adds Holesh. "[Additive] isn't something one thinks of in the normal course of manufacturing. We can rewrite the design for manufacturing rules."

AMM's EOS M280 laser sintering machine is made by German OEM EOS, who Southway describes as the father of laser sintering technology. Founded in 1989, the global company provides high-end solutions applying direct metal laser sintering and polymer printing.

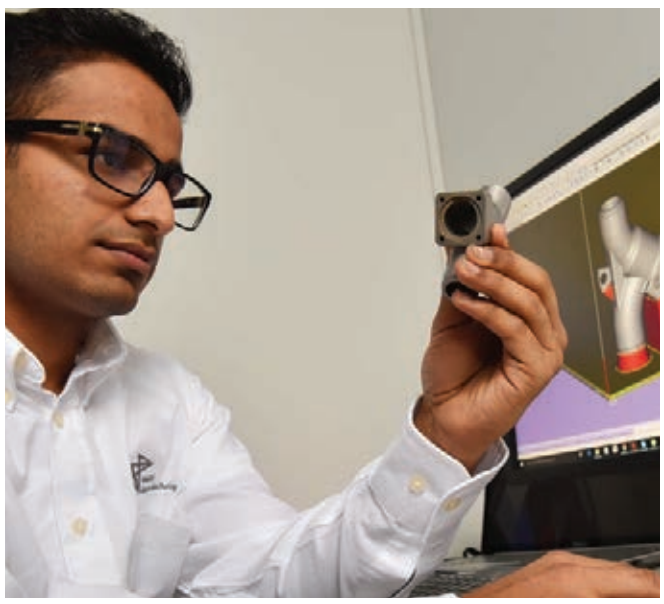
The machine melts and sinters powdered metals, including stainless and tool steel and aluminum, onto a plate at 40 microns – thinner than human hair – building each part swipe by swipe to produce cost-efficient high-quality metal tool inserts, prototypes and end products.

"You literally watch your part growing like a seed," says Smilowitz.

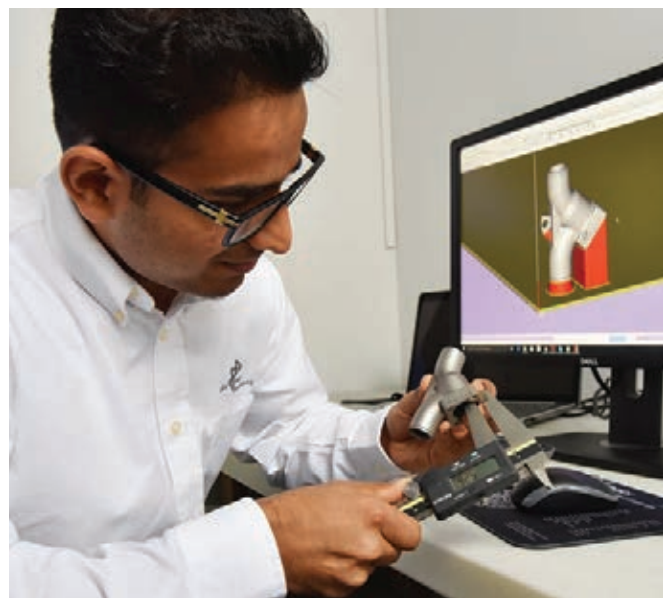
The part comes out of the machine at a hardness of between 32 to 35 rocks (on the Rockwell scale). On instruction by the customer, AMM can get each part hardened to 65 rocks thanks to four post



Senior process engineer Keyvan Hosseinkhani demonstrates how AMM digitally consolidates multiple parts into a single assembly.



Jaskaran Sadheora, technical designer, inspects a newly printed metal part.



Sadheora uses a computer to design parts, but they are validated using old-school measurement tools.

AMM's leadership team (L-R): Norman Holesh, CEO; David Slimowitz, vice-president of sales and marketing; and Nigel Southway, vice-president of engineering. PHOTOS: RODNEY DAW

processing capabilities including grinding, lathe-work and sand blasting. Each part polishes to a mirror finish.

Super speed

"Everybody talks about speed to market. When you have a product to launch, and the toolmaker tells you it's going to take 12 weeks to produce a soft tool or a prototype, that's going to slow anyone's production cycles down," says Holesh. "We can produce a prototype in four days. That allows customers to test and validate much faster and gets the final tool to their facility much sooner. We're trying to show the toolmakers they can get on with building the final tool a lot sooner, and therefore get the final product to market much more efficiently."

The technology is not push button, explains Southway, AMM's vice-president of engineering. He's an executive member and past chair of the Society of Manufacturing Engineers (SME), a leading advocate for the Take Back Manufacturing Forum and the North American Reshoring initiative in Canada, and he lectures on sustainable supply chain management and lean practices at Sheridan College in Brampton, Ont.

Southway sees plastics 3D printing being ahead of metal additive manufacturing by about four years. But development on the plastics side has pushed demand for metals printing despite a number of tighter barriers to entry, including costs.

"There's more gymnastics to go through, but metal has more legs, especially as it relates to manufacturing," says Southway, adding that the sintering machine AMM has purchased cost more than $1 million, compared to high-quality 3D plastics printers, which are as inexpensive as a few thousand dollars.

"Metal has a lot more change in focus as far as manufacturing is concerned," he says. "The software is not play and ride. There's quite a learning curve, and most 3D parts are still going to be tooled in injection moulds. Tool makers are only dipping their toes in. We have to teach them how to design the technology and that's a significant challenge."

But he's confident AMM has found people with the right skills to make that happen.

"If you're not computer literate, you don't belong in this industry, and that's the advantage our young guys have," says Southway.

New blood

Filling out AMM's six-man team, through work with local post-secondary institutions including McMaster University and Sheridan College, is a team of young and tech-savvy manufacturing minds who Holesh says balance out the "grey hairs around the table."

In a lab-white control room next to AMM's laser sintering machine, Keyvan Hosseinkhani, Jaskaran Sadheora and Manan Gandhi man laptops equipped with high-tech CAD software. This is where the magic happens.

Senior process engineer Hosseinkhani who came to Canada from Iran, is also a PhD candidate at McMaster University, where his research focuses analysis of mechanical and thermal stresses and tool wear in metal machining processes. He is responsible for analyzing the mechanical and metallurgical properties of 3D printed metal components and he conducts customer benefit analysis for AMM.

> "The software is not play and ride. There's quite a learning curve, and most 3D parts are still going to be tooled in injection moulds. .."

Sadheora, an Indian-national who came to Canada to pursue studies in manufacturing technology at Sheridan (where he met Southway), is AMM's technical designer and focuses on bringing custom designs to life from the computer screen to the laser sintering machine in the room next-door.

"This is an emerging technology that's going to take over more manufacturing production," he says. "And if we stick with it, this is the future – it has so many applications in the realm of manufacturing design."

Holesh sees a major benefit in having the youngsters around because of their tech-savinness and familiarity with computers. But he also believes having an opportunity to work with an up-and-coming high-tech manufacturing firm is critical to developing the next-wave of manufacturing leaders.

"We're trying to give these kids a bit of hope…that when they come out of school, there will be jobs for them," he says. "They bring an incredible level of education and a background in 3D printing, at a research level. Coupling their skills with the experience of us older guys, we think we've created a dynamite team."

Indeed, there's a growing appetite for AMM's capabilities. A 2013 report by Colorado-based research firm Wohlers Associated Inc. forecasts global sales of additive manufacturing (metal and plastic) to reach $6.5 billion by 2019.

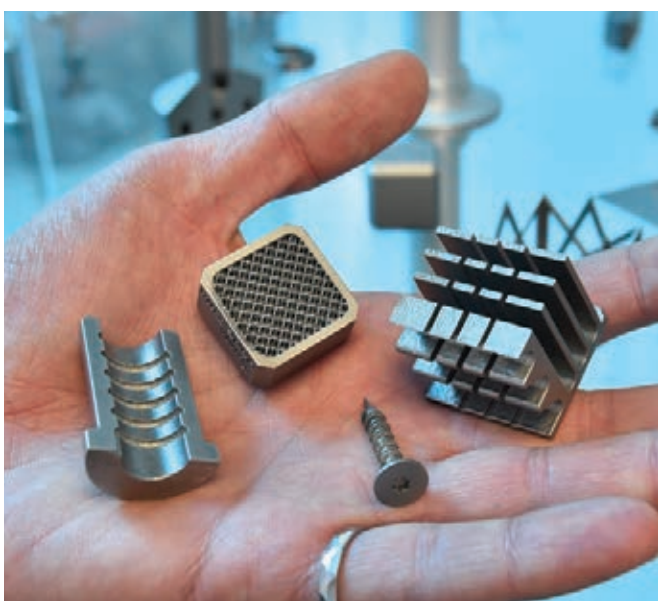
AMM plans to take full advantage of this market trajectory with an aggressive growth plan that within three years will see AMM expand the facility's capabilities to provide 150,000 hours of additive metal processing capacity annually.

Eventually, Southway predicts, the office will house 20 laser sintering machines.

Holesh believes part of AMM's task will be overcoming a general resistance to change among manufacturers; resistance he says is a result of feeling threatened. And as Canada's manufacturing supply chain shifts into more advanced technologies and global markets, additive metal manufacturing has the potential to improve companies' competitiveness and the speed at which products are brought to market.

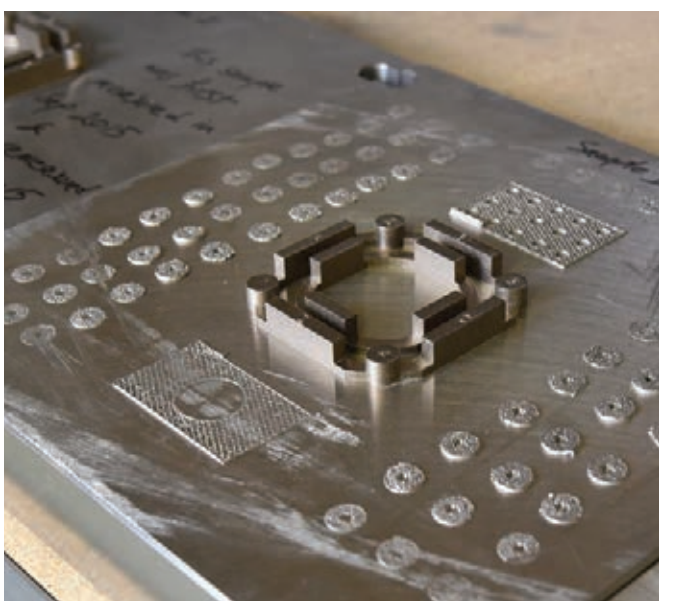
"This technology is going to happen whether people like it or not," says Holesh. "It's an exciting game changer and I'm surprised that more people haven't adopted it, but they will."

Comments? E-mail mpowell@plant.ca.



Some of AMM's 3D-printed parts and tool assemblies.

A view inside one of the company's more intricate printed pieces.



The parts are printed on, then removed from plates made of steel and aluminum.