Thinking Ahead

TECHNOLOGY TO WATCH

Growing Up

Additive manufacturing beams down to the jewelry scene

BY TINA WOJTKIELO SNYDER

Design by Lionel Dean for Cookson

Did you ever imagine you'd see the day when a finely woven mesh bracelet with thousands of tiny links could be grown in one piece, on a machine, using 18k gold powder? Well, that day has come.

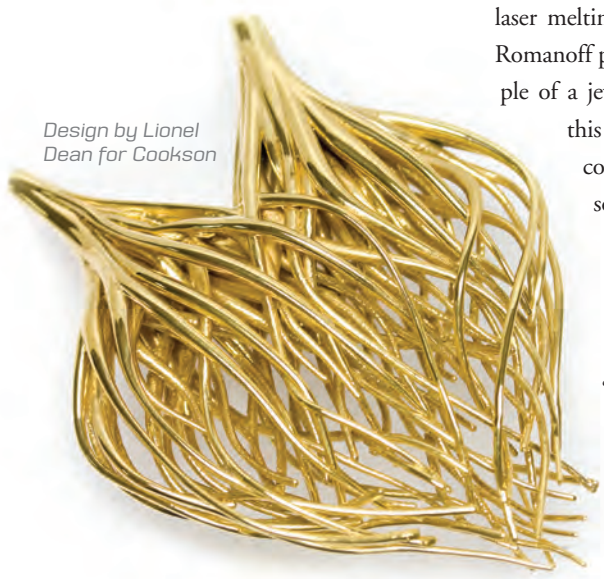
It's jaw-dropping, really.

Today, thanks to additive manufacturing, an intricate piece of jewelry—something that used to take countless days of hand labor to make—can now be produced overnight on a laser melting machine. The machine builds up a net shape, layer by layer, much the same way as a rapid prototyping system does—only instead of resin materials, the layers are made of metal powder.

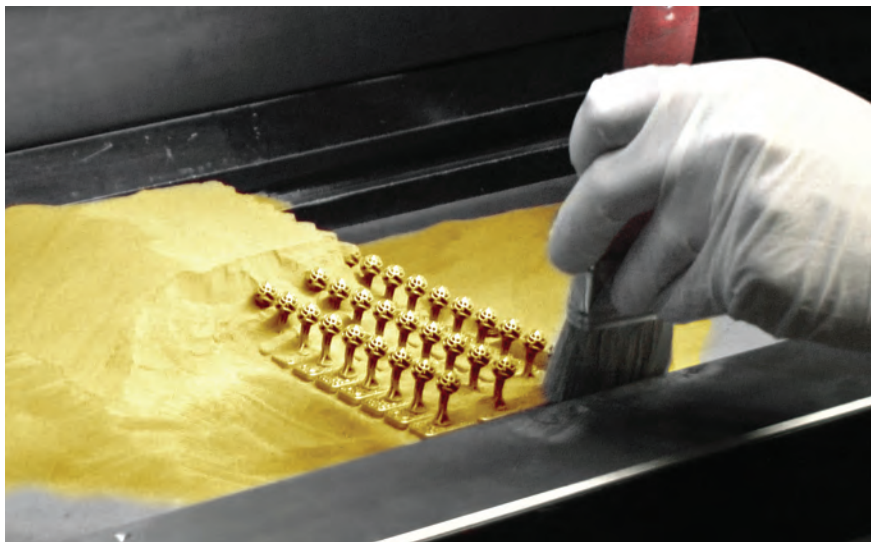
The manufacturing technology itself isn't all that new—it's been in use for more than a decade in other industries, such as medical, dental, aerospace, and automotive. What's new is how it's been adapted for jewelry making, which has its own unique demands. Those other industries don't work in precious metals, nor do they require pristine surface finishes: You can take a belt sander to a large steel auto part to smooth it out, and any metal loss is

financially insignificant. You can't say the same for an 18k gold pendant. For years, the technology couldn't make that leap and produce high quality "builds" with good surface finishes: the powders weren't good enough, nor were the laser melting machines small enough to accommodate jewelry making. Now, thanks to smaller machines and, most important, recent developments in precious metal powders, it can.

"The trick to powder metal technology is in making and selling the powder, not the machines," says Steven Adler of A3DM Technologies in Portland, Oregon, a member of MJSA's Thinking Ahead Advisory Council. "There are a number of machines on the market that would be able to grow jewelry pieces from precious metal powder, but there are only a handful of powder suppliers at present." And those suppliers have been working hard to atomize various alloys of precious metal powder to achieve the particle sizes necessary to obtain the fine surface finish required in jewelry production. At presstime, precious metal powder was available in gold and silver only, not palladium or platinum, from four suppliers: Cookson Precious Metals, Hilderbrand, Legor, and Progold. (For a complete list of products and descriptions, see page 22.)



Design by Lionel Dean for Cookson



In additive manufacturing, a laser melting machine builds up a net shape, layer by layer, much the same way as a rapid prototyping system does—only instead of resin materials, the layers are made of metal powder. An EOS system is shown above.

A New Option

It's important to point out that companies heavily invested in additive manufacturing technology don't view it as a replacement for the lost-wax casting process, but rather as an additional option in the jewelry manufacturer's repertoire.

"The real potential for this technology is in designs that are difficult or impossible to make using traditional casting techniques," says Brian Romanoff of Romanoff International Supply Corp. in Amityville, New York, the U.S. distributor of the Mlab laser melting machine by Concept Laser. Romanoff points to link chain as an example of a jewelry item especially suited to this process. "Instead of casting components separately and then soldering or laser welding them to arrive at the finished piece, you can eliminate countless labor hours by growing the pieces from powder," he says. "This was never before possible in the jewelry industry."

David Fletcher, European product manager for Cookson Precious Metals in Birmingham, England, likewise sees the biggest opportunities for laser melting in complex designs. "This technology really stands out when it's used to produce parts that can't be made any other way, such as mesh and hollow forms," says Fletcher. "If a standard jewelry item such as a wedding ring or band can be manufactured successfully with lost-wax casting, it's probably more cost-effective to keep making it that way."

Since it partnered with laser melting machine manufacturer EOS 15 months ago, Cookson has been traveling to jewelry shows and conferences worldwide to educate manufacturers about the technology. The company offers a total manufacturing solution, including 18k gold powder (with other powders in development), the laser melting machine, and technical support, as well as a service bureau for designers.

Industry Response

While the potential is obvious, the response to this new technology among jewelry industry veterans has so far been mixed,

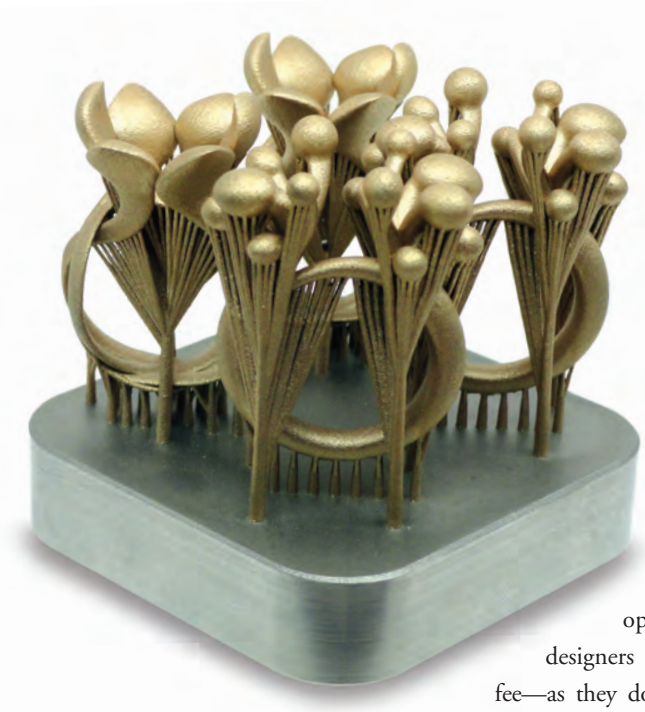
The greatest potential for additive manufacturing technology is in complex designs that are difficult or impossible to produce by casting. The mesh bracelet shown here, which was designed by Digital Forming for Cookson Precious Metals, is one example.

with most citing cost as the biggest roadblock to implementation. The average investment in a laser melting machine suitable for jewelry production ranges anywhere between about $160,000 and $300,000—before you account for the powder needed to operate it.

"If you are considering even one of the smallest laser melting machines available for 18k gold, factor in a little over $100,000 for the 2 kg of gold you need to operate it," says Linus Drogs of Au Enterprises in Berkley, Michigan, a member of MJSA's Thinking Ahead Advisory Council. "The technology is a fabulous advance for our industry, but it's only realistic for a very few companies with deep pockets to use it for precious metal powder."

J. Tyler Teague of JETT Research in Johnson City, Tennessee, who is also a member of the Thinking Ahead Advisory Council, sees limited application in the marketplace at this time. "Jewelry manufacturers who make jewelry for royalty could probably afford to implement this technology," he says. "If you make very high end, complex custom orders a few pieces at a time, this could work for you."

Drogs and Teague agree that if the build envelope for these systems could be minimized, thus requiring less powder to



Additive manufacturing technology would seem to offer wide appeal to designers and custom jewelers who love dreaming up wild creations for which production is limited by the boundaries of the lost-wax casting process. The pieces shown here were grown on the Mlab by Concept Laser, which is being distributed in the U.S. by Romanoff International Supply Corp.

operate, the technology would be a more viable option for gold jewelry manufacturing in the current metals market. "If you could scale down the build chamber and pop out one piece at a time using only 0.25 kg of gold, the technology would be more widely applicable," says Drogs.

For those who want to test out the technology without making a large financial investment, both Cookson and Legor currently offer a service bureau option, in which jewelry designers or manufacturers pay a fee—as they do to a contract caster—to submit CAD files to be grown on a laser melting system. Because the biggest potential for this manufacturing process now is building pieces that are difficult or impossible to cast, it would seem to offer wide appeal to designers and custom jewelers who love dreaming up wild creations for which production is limited by the boundaries of the lost-wax casting process.

The potential for this cutting-edge technology to unleash creative freedom in the jewelry industry is exciting, and designers and manufacturers have only just scratched the surface of what is possible when imagination and technology come together. Stay tuned. ◆

Are you interested in learning more about the newest manufacturing technology to hit the jewelry scene? Don't miss the March 2013 issue of MJSA Journal, which will feature an in-depth look at additive manufacturing developments and applications.