Metal Enhances Healthcare Technologies

The following article originally appeared in Medical Design Technology. It is part of Medical Design Technology's Roundtable series where they invite experts to comment on topics of interest to their industry.

WITH THE USE of plastics exploding in the component fabrication world for medical devices, it would seem the use of metal would dwindle away. But that's not happening anytime soon as metal components still offer an array of advantages over their molded or 3D printed counterparts that keep them as the ideal option for a number of applications. And this isn't just in the orthopedic space as the material of choice for implants. Rather, metal components are being indicated for use in a number of different types of devices, from surgical tools to implantable technologies to portable solutions.

Advantages

Speaking about machining in this month's roundtable, Judy Carmein, CNC machining product manager at Proto Labs, shared some comments on why machining was still quite the viable option for medical device OEMs. "End-of-arm tooling (e.g., robotic surgical tools) require high strength and intricate geometry that usually cannot be obtained with injection-molded plastics. The same is true for surgical tools. In addition, many materials that can be machined are also easy to sterilize, which is important in most medical applications. And the low upfront tooling costs allow for customization of individual parts."

Adding his own thoughts on why metal and machining are still being used in the medtech space over plastic components, Ken Altman, director of advanced manufacturing, machining division, at Orchid Orthopedic Solutions said, "Machined metal or titanium medical devices can be finished to very tight tolerances and sometimes, competitively priced to plastic components for smaller runs."

Challenges

So with metal (and machining more specifically) still providing great value as a component fabrication option to medical device designers, it's important to be mindful of what other designers are doing that create problems for them later in the production process. Both Roundtable participants shared a number of challenges they observe in the medical device development space.

"Designers need to think about the machining process while designing their parts. Certain part features can add significant cost and should be included only if necessary to the design," says Carmein. "Tight inside radiuses, and tiny features all add to the cost of machining the part. These features require very small end mills for cutting. In general, the smaller the end mill tool that is required, the longer it takes to machine the part — this drives up costs. Smaller tools also tend to deflect, so small, deep features can be especially problematic."

"Generally most OEMs have great designs but occasionally small details are overlooked, often geometric dimensioning and tolerancing requirements make manufacturing difficult and end parts expensive. "This is where DFM [design for manufacturability] reviews with your contractor create a big benefit," adds Altman. He goes on to say that, "Sharp corner radiuses are often specified for no apparent reason; adding a small fillet radius adds design strength and may reduce your final product cost. The sharp corners create a challenge for machining due to tool corner breakdown during machining."

3D Printing

As 3D printing continues to "invade" as a disruptive technology across so many industries, it was interesting to hear the Roundtable participants speak to how it was creating an impact in the machining space.

"3D printing is a disruptive technology for the manufacturing industry, and especially for machining. But this disruption is driving innovation within traditional machining applications. A near net shape, non-manufacturable part can be built in direct metal laser sintering (DMLS) and then can be selectively machined for increased precision. It's an instance of multiple processes working together," offers Carmein. She continues, mirroring a point made previously by Altman, "There are, however, some unintended design challenges that 3D printing has created for machined components in the medical device space. For example, if parts are taken from concept through development with only printed samples, when it comes time to manufacture production parts in the desired machining setting, issues can arise. So manufacturability should be considered at every stage if the part will eventually move from prototype to production."

Altman shares Carmein's mostly positive outlook of 3D printing saying, "3D printing has been a great complement to machining. In some cases, it's difficult to determine how internal features will be machined. Orchid owns several 3D printers, making it easy to print parts if needed before

production, making process development easier while eliminating errors and improving final product acceptance."

Outlook

Looking ahead at machining's future in the medical device space will sure to continue to bring challenges to the experts who offer the service, but it will undoubtedly continue to help bring about fantastic innovations in the healthcare technology space.

Carmein predicts, "There will most likely be an even closer customization of product design with patient. Soon it will be common to scan a joint to be replaced, build a CAD file from the scan, and then manufacture the new joint as the procedure is in process. You can also expect an increased focus on very small devices, whether implantable or end-of-arm robots to conduct the actual surgery."

"I'd predict components will continue to get smaller and machining will rely more on micro-sized tools and additive manufacturing to produce these small components. In five to ten years, there could be more cloud-based applications for CAD/CAM systems and improved remote access for machine attendance. Collaborative robots could continue to evolve and may replace much of the human-machine intervention," concludes Altman.

Vapormatt Employee Celebrates 50 Years in Blasting

PHIL DAWES has celebrated an incredible 50 years in the blasting sector and 20 years as an employee at Vapormatt in December. Vapormatt specializes in wet blasting for surface preparation and finishing.

Phil began his journey in the blasting industry in 1965 as an apprentice at Abrasive Developments, which coincidently was also owned by the family that founded and continue to operate Vapormatt today, the Ashworths. He rose through the company to a sales engineering role and after knowledge-boosting stints elsewhere in the blasting industry, he joined Vapormatt in the autumn of 1995—bringing with him 30 years of valuable experience.

During his time at Vapormatt, Phil has spearheaded the development of the company's composites business and played a key role in the growth of its aerospace offering, among other valuable contributions. Despite his anniversary landmarks, he has no plans to retire just yet and will continue to pass on his extensive experience to his Vapormatt colleagues.

"I've greatly enjoyed my half-century in the blasting sector and more recently at Vapormatt, playing my part in growing both industry knowledge and the use of wet blasting over the past 20 years," said Phil Dawes, Sales Engineer at Vapormatt. "I'm now looking forward to what is in store for Vapormatt and the wet blasting process in the future."

Commenting on the Phil's anniversary, Robin Ashworth, Managing Director at Vapormatt, said, "Phil has been a wonderful member of the Vapormatt team throughout the time he has been here. He has an excellent grounding in all things wet blasting and is a fountain of knowledge for the rest of the team, especially for his young colleagues who are able to further develop their own skills thanks to his advice and knowledge. His reliability, dedication, loyalty and willingness to share his knowledge over the past two decades has been and continues to be truly appreciated by all here at Vapormatt."

2015 marked the 60th anniversary in the blasting industry for Phil Dawes. Mr. Dawes is a Sales Engineer at Vapormatt.