Applying Tech: Portable Medical, Part III

How are you influencing portable medical devices?

Gregory L. Horton
President, Stellar Microelectronics

Achievements in microelectronic manufacturing have enabled the medical industry to generate incredible advances in portable medical devices. Stellar Micro has participated in efforts to reduce size through the use of intelligently modified design rules, directly coupled with optimized assembly processes. Our work has required pioneering new methodologies to assemble and stack components, as well as enhanced materials selection for attaching and protecting at the die level. Recent projects include developing robust ENIG plating/aluminum wirebond systems for high reliability applications, high density die stacks, and encapsulation systems for wirebond assemblies.
Stellar Micro specializes in optimizing space, energy use, and durability for implantable, portable, and miniaturized devices.

- Size—Reducing the size of portable devices means increasing the opportunities for their use, as well as increasing the functionality that can be included in their design.
- Efficiency—Increasing efficiencies means devices can perform longer and/or operate in a greater capacity.
- Durability—Portable devices must be able to endure shipping and extreme operating temperatures without damage or compromising performance.

We are in continuous discussions with our customer base regarding design and process enhancements. Efficiencies found in one category are applied to others. Years of contract manufacturing experience enable us to help our clients, from design to delivery. We share a common goal of creating the most efficient medical devices in the industry, and our success is intimately linked to our customer’s well being and prosperity.

James Wilson
Principal, Continuum

Primarily, we are de-coupling controllers from medicine to get to a smaller part of life. An example of this is when we partnered with Insulet to develop the OmniPod Insulin Management System—a tiny, wearable insulin pump that attaches directly to the user's skin with a self-adhesive backing and wirelessly communicates with a handheld device. This makes the clutter of tubing associated with other insulin pumps unnecessary. OmniPod automatically injects a metered dose of insulin at regular intervals, depending on the user's individual needs, and features an automatic cannula insertion process that is virtually painless. OmniPod is the smallest and easiest-to-use pump on the market today, and has given thousands of users a new found sense of freedom from diabetes.
Beyond changing the paradigm of insulin delivery, portable medical devices such as this integrate more fully into how people truly live their lives.

Riley Phipps
Technical and Design Services Manager, Value Plastics

With today's busy, active lifestyles and the ever-escalating costs of healthcare driving more home treatment solutions, the need for safe, portable, and user friendly medical devices is greater than ever. The use of plastic patient care connectors, like those offered by Value Plastics, allows for the manufacture of lighter and less costly devices, and facilitates safety and ease of use through consumables that can be readily replaced by the patient. Single- or limited-use consumables make it easier for patients to address their portable device needs more effectively, while reducing risks associated with infections. Shut-off valve options are often available in these connectors as well, helping to avoid leaks in the changing process. With patient care connectors acting as one of the primary user interfaces of any portable device, it is imperative that we incorporate ergonomic,

intuitive designs that not only mitigate the risk of misconnections, but further safeguard patients by being easily understood across demographics.

Justin McPhee
VP Engineering, Mold Craft Inc.

As technology continues to advance, so do the number of portable medical devices. Along with portability comes a reduction in the size of all the components that comprise the device. As size and bulk reduce, the strength must be increased while the weight of the component reduces.
As a pioneer and leader in the industry, Mold Craft has invested in technology to machine our molds using 0.002 wire EDM with linear motors. This offers extremely tight tolerances of ±0.0001, which are consistently repeatable. We have also been working with a press manufacturer to develop molding processes for engineering resins, such as PEEK. Although this material offers high strength-to-weight ratios and implantability, while also being safe for standard sterilization procedures, it is difficult to mold—especially for thin-walled parts. Another area of development is in MIM (metal injection molding). The ability to mold 98% dense, very small, intricate, stainless steel components has opened the door for component miniaturization. The small detail in these molds has required developing machining parameters for copper electrodes, small hard-milling cutters, and extremely hard materials exceeding 60 Rc.

Mold Craft’s mission as a moldmaker is to not only keep up with technology but to lead the way in supporting medical device manufacturers through investment, innovation, and collaboration.

Joe Pustka
Medical Device Technical Specialist, Uson

Going cordless takes some doing—especially if your device in a sterile environment relies on batteries with vented cells. That can and is a big advantage to surgical instruments such as cordless drills.Vented cells in the batteries make the issues of overcharging, discharging or even a negative charge into non-issues.
People may take leak testing those type batteries for granted now—but at first it was not so straightforward on how to approach the problem.Our mindset at Uson is “If it CAN be done, we will do it.”Our only enemy seems to be the laws of physics, most times impossible to “outsmart”.

In this case, because the vent valves opened in the same direction of the leak test we had to engineer a reverse direction for leak testing.This was accomplished, and still is the method of choice today, by placing a part in a chamber, then creating a vacuum to slightly evacuate the inside of the battery. We then vent the chamber and reseal it, monitoring chamber pressure.Any pressure drop means the battery leaks and that defective part for that surgical drill never finds its way to the operating room.

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