Electronic Device Design, Part III

More medical devices are being designed with electronic components that enhance the overall functionality and/or efficiency of the product. It is interesting to theorize where these electronics may take healthcare. For this month's Perspectives, we received a large number of responses so be sure to check out the other Parts of this feature.

Looking ahead, what technology will educe the biggest breakthroughs in electronic medical devices?

Frank Shen
Product Marketing Director, American Portwell Technology Inc.

Whatever the scope of the medical application, design engineers face the same challenges—longevity, legacy compatibility, cost savings, noise and heat minimization, and computing power performance. The technology inherent in today's embedded computer solutions not only helps design engineers meet these challenges, but also surpass them to reduce the total cost of ownership throughout the product lifecycle and beyond.

Maintaining a distinct competitive edge is essential in today's economy and especially in a thriving industry like medical device manufacturing, so OEMs need to seek out the most sophisticated solutions available that enable them to provide a better service, more economically, with a faster time to market. Embedded computer technology has emerged as the de facto standard in the arena that demands precision and perfection, with no room for error. Medical device OEMs are using embedded computers to design applications and equipment that provides diagnosis, therapy, detection, examination, and even monitoring of bio-signal. Similarly, healthcare automation solution providers apply the same technology to facilitate the healthcare process or reduce the cost of healthcare.

Mike Calise
Executive VP and U.S. General Manager, Mitrionics

High performance computing (HPC) technologies are accelerating the personal healthcare revolution. By integrating HPC, biochemistry, optical processing, and storage, scientists are advancing drug discovery and genomic research, and creating exciting personal therapeutic strategies unimaginable until now.

Genomics technology is capable of determining pre-dispositions to cancer, heart disease, and diabetes. Personal healthcare information previously unattainable or unaffordable can be purchased for the price of a fine dinner. You can learn if Finasteride will reduce or prevent the possibility of prostate cancer, confident side effects are unlikely. This is only the beginning.

Next-generation gene sequencers can slash discovery costs for an entire personal genome. Genomic information costs are being radically affected by the newest HPC technologies applied to the workflow using "multi-hybrid" computers incorporating complementary acceleration types, in a single or clustered chassis, including essential software support. They enable differing workflows, having dedicated or reconfigurable acceleration types optimized by application.

With HPC comes exponential growth of useful yet unruly datasets. Beyond capture-and-create, secondary analysis of this data volume pushes even the newest computing technologies to practical limits. Fortunately, as sequencing instruments break new ground, so do HPC acceleration technologies tackling these bioinformatics challenges.

Brian Coates
Technical Design Specialist, Lumex

A critical technology which will change the way medical devices operate in the next three to five years is light emitting diodes (LEDs). The ever expanding range of wavelengths and intensity will continue to accelerate adoption by pioneering companies, particularly in the ultra violet (UV) range, which are the low

wavelengths from 10 to 410 nm. Currently, UV LED technology can achieve as low as 365 nm and have been used for cosmetic applications and long term sterilization. However, as the wavelengths approach 280 nm, they are considered germicidal which is critical to purification of air and water, as well as other types of sterilization. At these wavelengths, they can also be used in arrays for blood and other fluid analysis, curing for dental applications, and spectroscopy.

Tim Stewart
Business Development Manager, Donnelly Custom Manufacturing Co.

Though RFID technology has been around for some time, its usage in the medical device industry has been limited. One drawback is electromagnetic interference (EMI). *The Journal of the American Medical Association* recently published a study conducted by a team of Dutch scientists in which it was discovered that EMI from RFID devices has the potential to interfere with medical equipment.

In past years, Donnelly worked with one of its customers to produce an RFID tag encased in injection molded plastic. It was questionable whether the tags would survive the heat and pressure associated with the molding process but survive they did. The trick was refining the design to achieve a configuration that would ensure a complete sealing of the device within the plastic. After several iterations success was achieved.

Encasing the tags in plastic not only protects them but it opens up additional applications as the devices can be molded into a myriad of different part designs and products.

In light of the recent *Journal* study, Donnelly is investigating options to address the EMI issue. If successful, the potential exists to remove one more hurdle preventing a more widely accepted use of RFID in medical devices.

Larry Carlberg
Service Bureau Manager, GKS Inspection Services

Medical devices are increasingly incorporating highly sophisticated electronics that require an equally sophisticated inspection technology. Computed tomography (CT) scanning is such a technology. Since medical devices are usually encased and difficult to inspect by conventional methods, CT scanning makes sense—it is able to gather complete data sets of complex internal geometries and it is non-destructive to the part.

We all know that medical devices are life altering. If a connection fails or if a device malfunctions, people may die. This implies a higher production cost than most products. Because safety and reliability are paramount, medical device companies are willing to do whatever it takes to certify that their products are trustworthy.

As a fairly new, highly accurate inspection technology, CT scanning is not yet very well known or understood. CT scanners are quite expensive, so the medical industry has been using CT scanning services to gain immediate access to this advanced technology. As CT scanning gains acceptance and spreads into a wider market, it will become more cost effective.

In the future, I believe CT scanning technologies used for inspecting medical devices will make an even greater impact on the medical manufacturers.

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