NEOTech

Background

Enabling commercialization of new wireless sensor and IOT technology in the medical market through collaboration in the product development process with NEO Tech.

Medical Device OEM Partners with NEO Tech to Innovative IoT Product

Innovative medical device OEMs are striving to identify new ways to add value to their offering utilizing Internet of Things or IoT technology. As the health care system increasingly values efficiency and outcomes, IoT applications are changing medtech product roadmaps and business models. The suite of technologies that comprise what is known as IoT is opening new ways to create value from information. Deploying the optimal IoT technology in medical devices requires design expertise that is frequently best found outside the four walls of the medical OEM's engineering staff that are focused on medical science and patient treatment. Achieving competitive time-to-market with IoT enabled devices favors the engagement of an ecosystem of technology partnerships that rapidly deliver compelling solutions.

A medical device leader in products and services that advance orthopedic care faced the challenge of introducing IoT into one of their bracing product lines. The OEM identified a market need/ opportunity to monitor patient activity levels; which required the integration of both electronic sensors and wireless connectivity to its generally mechanical orthopedic brace products. They chose to engage NEO Tech as an outside electrical engineering and electronics manufacturing solution partner the project to augment their internal engineering resources.

The joint engineering team faced some challenges including:

1. Technology selection for the optimal embedded gyroscope, accelerometer and wireless communications interfaces

2. Fit the package in a size not much larger than a quarter

3. Energy management design to balance power consumption versus battery size to last 12 hours between charging

4. Making the product rugged to function in dusty and underwater environments – IP67 compliant – as well as enabling adequate data storage and management so that patient information can be stored during periods when the Bluetooth communications are not available and transmitted later.

Achieve High Funcionality in a Compact Design

The application needed to achieve high function in a compact design. To accommodate this, NEO Tech engineers listened to the customer's needs and requirements, participated in daily calls and passed design files back and forth numerous times throughout the process in order to find the solution that worked best. DFX was not just a benchmark but a daily interaction to create an optimal design. NEO Tech believes that staying in close contact with a customer and being transparent at all times is one of the keys to a successful design services project.

The NEO Tech engineers discerned that using a SolidWorks solid modeling tool and tying it with the electrical layout tool Altium would be the best fit. This enabled the electrical and mechanical designs–as well as design for manufacturability–to be performed simultaneously with a closely knit single point team. This reduced the number of iterations and also assisted in achieving the level of miniaturization needed to fit the available space.
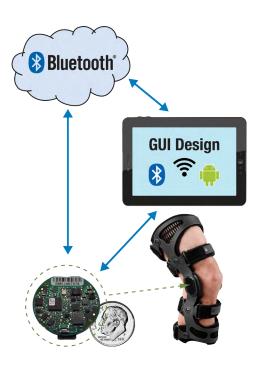
Another crucial factor was component selection. While standard 0402 parts were mainly used, the NEO Tech engineers were able to place smaller components in areas where needed. The company has the ability to place components including 0201 to 01005. To meet the compact challenge that the application required, the engineers worked to find parts with combined functionality, ultimately resulting in the use of fewer parts, which is ideal for compact designs. For example, the sensor included both an accelerometer and a gyroscope – with multiple sensors in packages. NEO Tech switched to 16 bit micro parts so that all the peripherals would be built-in. Parts were chosen to optimize the design and to get it in as small a form factor as possible. NEO Tech also moved the programming and debug header functionality to the USB port to achieve the space constraints during development, while optimizing the battery size to both fit the compact envelope and achieve the desired life. Over the air (OTA) software update functionality was designed in. NEO Tech wireless engineers also characterized and designed the Bluetooth antenna to work through waterproof epoxy materials.

Power Management

It was important to the project's success that power storage be addressed in the design process. NEO Tech performed power modeling to discern which parts used more power than others, and if they could be shut down at certain times for various lengths of time for energy conservation. The engineers worked with the customer to find out how the product would be used, which then would determine which parts needed to stay active and which could be placed in sleep mode to avoid using power when it was not needed. Ultimately, NEO Tech chose to use a specialized circuit design that shuts off

Product Realization for IoT Medical Smart Products

power completely during shipment and also when being tested in the factory, significantly reducing power draw and current drain. When the circuit is not in use, it goes into an automatic sleep mode, saving additional power. These types of circuits are ideal for IoT-enabled designs.

Ruggedization

Next, NEO Tech engineered the product to be waterproof / IP67 compliant. IP67 is an ingress protection rating system for protection against solids and liquids, with the 6 denoting dust resistance and 7 requiring water immersion protection up to 1 meter deep. Originally, the company wanted them to be shower-proof but ultimately decided that they needed to be viable under water (e.g., in a therapy pool). To solve that challenge, NEO Tech engineers included sealing in their mechanical design that included, a rubber seal around the connector, and ultrasonic welding of the lid when placing the plastic package together. The USB connection also required a waterproof seal design that was included. NEO Tech found the waterproof components and assembly processes that could reliably meet these requirements.

Collaboration Is Key to a Project's Success

NEO Tech and the medical market OEM engineering teams worked as collaborative partners throughout the engineering and product bring-up process including the initial build and all the accompanying modifications and enhancements. The NEO Tech team members built a good working relationship, interacting with the customer's organization at all levels as a partner to find out what was needed and the best way to solve each challenge faced. NEO Tech utilized their in-house prototype line that meant that once the materials were in hand, the prototype was turned around in days as opposed to weeks if a typical outside proto shop were used. The rapid real-time collaboration and NEO Tech's responsiveness enabled the project to be completed on time and within budget.

The collaborative effort effectively used the OEM's end-market knowledge, and NEO Tech's IoT experience in power electronics and wireless device design to engineer and successfully build working prototypes in a short timeframe. NEO tech's experience in EMC and FCC compliance certification assisted the OEM in rapidly moving the product through certification house verification. The result is the first available medical brace capable of monitoring patient therapy progress that also is functional underwater.

Medical technology is important to all of us; we rely on the fact that it will be safe, reliable, and effective if and when we need it. IoT technology will certainly improve that performance, and with the right partner network, companies can increase their market position while providing for the safety, security, and efficacy of their medical products.

To learn more about NEO Tech and its products and technologies, visit the company's Web site at www.neotech.com.