

Case Study: Imaxeon Contrast Injector



Genesys solves power and electronics challenges for revolutionary contrast injector system.

Imaxeon supplies a niche range of high quality contrast injection systems, molecular imaging, nuclear medicine and radiology IT solutions to customers in Public and Private healthcare sectors in Australia.

Imaxeon is ahead of the competition when it comes to developing battery powered contrast injection systems, having done so since 2008. They are currently working on a new injection system, the Centargo Contrast Injector, which includes innovative features to reduce operator set up time between patients and increase overall workflow efficiency.

The Challenge

The Centargo Contrast Injector uses a revolutionary new design that automates previously manual tasks to reduce manual work requirements and improve operator usability. The latest feature set includes:

1. Three motors (instead of two) that enable the use of two contrast media simultaneously;
2. A larger LCD touch screen; and
3. A heater to keep the contrast at the correct temperature.

The additional power requirements and complexity of the new feature set required a complete redevelopment of the injector system's electronic architecture. A new battery solution was also required to effectively handle the increased system power requirements.

Imaxeon's previous system used Sealed Lead Acid (SLA) batteries; due to the increased power requirements, the Centargo Injector would require over 200kg of SLA batteries to operate for a single day. This obviously was not a practical solution.

To help solve these challenges, Imaxeon engaged Genesys Electronics Design, a long-time supplier

to the business, to design and develop new circuit boards and a suitable battery solution for the Centargo Contrast Injector.

John Lopes, Electronics Design Engineers at Genesys, took the lead on this project.

"The Contrast Injector was still in development when the battery pack and power supply were designed. With the system operation still to be finalised, designing a battery solution was a significant challenge. We had to ensure the battery would provide adequate power delivery at all stages of operation, without over engineering the system."

"A complete redevelopment of the stopcock electronics board was also required, to enable multiple injector operation without changing the solution between each patient."

“ I am impressed with the expertise and service provided by Genesys, especially their rigor around electromagnetic compatibility. ”

Designing a New Battery Solution

The first step was to review the System Level Requirements provided by Imaxeon. This included a review of its daily operational requirements such as the number of injections to perform each day and length of time between each charge.

The power requirements of the individual boards and modules were tested using a lab power supply, to determine the overall system energy usage. The Genesys team then worked with Imaxeon to design the power architecture of the system and system energy requirements, before recommending the best battery technology to use.

After reviewing a number of battery options, Genesys suggested Lithium Iron Phosphate Battery Packs (LiFeP04) to meet the power and charging requirements of the system. These battery packs are significantly more energy dense than SLA batteries, can handle many charge cycles, and are safer than Lithium Batteries.

LiFeP04 battery packs require a Battery Management System to ensure safety of the batteries. This is a circuit board that monitors the state of the battery, cells and battery temperature, and has the ability to shut off the battery pack if a fault is detected.

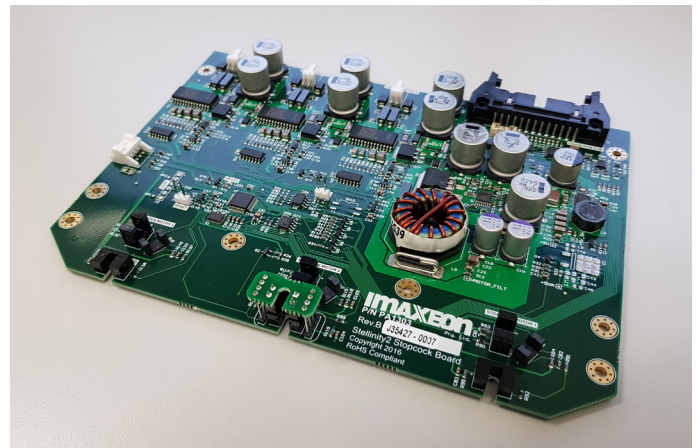
Genesys was able to leverage off previous work to design a management system and charging circuit for the LiFeP04 battery packs that would meet Imaxeon's power and safety requirements.

Genesys sourced a suitable Manufacturer who could produce the batteries at a reasonable cost, organize the required certification and design the battery pack enclosure to meet UL requirements. The manufacturer was also helpful in providing design input to streamline the manufacturing process.

Controlling the Injector Valves

To enable safe and accurate operation of the multi-injector system, a new electronics board was designed to provide precise timing and control of the mechanical operation.

Due to the automation of the system, precision is imperative to ensure an accurate amount of liquid is provided each time and ensure no backflow or air contamination.



Results

Development of the battery packs and baseboards is now complete. The battery packs are going through a rigorous certification, verification and testing process, with the PCB boards to follow soon. To facilitate this process, Genesys provides production support and functional test procedures to the manufacturer.

The prototype battery packs fit the required size constraints of the system and testing to date has shown the battery capacity exceeds the system requirements, including number of operational hours, injections per day and required charge speed for flat battery packs.

Mick Brooks, R&D Manager at Imaxeon is impressed with the work Genesys has provided to date.

“We have used Genesys for electronics design and development support for close to 10 years. I am impressed with the expertise and service they provide, especially their rigor around electromagnetic compatibility.”

“I would be happy to recommend Genesys Electronics Design to anyone looking for a partner to help with design and development of medical device electronics.”



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