Custom Power


# Case Study: Custom Battery Pack and Smart Charger for the Regulated Medical Market

## Background

Emblation is a medical technology company specialising in microwave-based devices that enable clinicians to treat a wide variety of conditions from skin lesions to various cancers. Emblation's design and manufacturing team approached us to partner on a custom battery pack for their SwiftPro product (the world's first Battery Powered Medical Microwave Device) to advance its Global expansion.

> "Custom Power were a great development partner combining their technical battery expertise with superb project management support for all the many bumps in the road that you face along any new product development journey."
>
> **Anna Daisley**
>
> Programme Manager, Emblation

## The Challenge

The end product required a custom 12.3V battery with BMS and charger. Working to Emblation's enclosure design and interface requirements, we designed the battery functionality to create a highly integrated custom solution.

The end product needed to meet UN38.3 and IEC62133-2 standards as well as being UL recognised, meaning that critical components had to be sourced from a restricted supply chain. Secondary redundancy features needed to be included, plus the requirements of a Tier 1 cell supplier had to be adhered to. These included:

- Over-voltage
- Over-current
- Over-temperature protection
- Addition of a thermal fuse

We also had to address challenges in interpreting and meeting the UL94 flammability requirements necessary for recognised UL approvals with respect to the plastic battery enclosure..

# The Solution

As is often the case, we were working to a tight timeline in addition to the strict parameters of the product. Our agile Project Management team adopted a sprint approach to allow for multiple elements of the project to be progressed simultaneously rather than being restricted by staged milestones.

**Mechanical Partnership**
Our engineers worked closely with Emblation's mechanical design team to assist with tooling modifications that allowed the integration of a thermal fuse to prevent overheating and thermal runaway.

**Charger Design Collaboration**
We engineered and validated the smart charger circuitry, including a custom connector integrated on the board, ensuring reliable communication and performance between the charger and battery pack.

Emblation then combined our smart charging circuitry with the additional functionality they wanted within the charger dock, including indicator behaviours to show the battery's charging status through the charging dock lights.

**Prototyping and Testing**
Prototype packs were put through rigorous in-house and external testing and it was apparent that adjustments were needed.

A slight lift on the thermal fuse side of the case required us to create an aperture to house the fuse. Additionally, our own internal testing highlighted that the BMS wasn't communicating as well as needed. To improve this, extra sleeving was added to one of the interconnecting tags, reducing the risk of thermal hot spots and allowing the BMS to function more efficiently.

By the end of the process, enhanced validation and pack programming ensured that our quality expectations and assembly methods were consistently met. These measures are key components of a strong quality system, aligned with the principles of ISO 13485.

Having a traceable and well-controlled inspection process ensures consistent quality and repeatability throughout manufacturing. We were proud to not just provide this, but to be able to adapt to changing requirements during the project.

# The Results

Through technical innovation, proactive collaboration, and a strong focus on compliance, Custom Power successfully supported Emblation in developing a robust and certified power solution.

- Achieved UL recognition for the battery pack, meeting all safety and compliance requirements.
- End battery product was certified to IEC62133-2 and UN38.3
- A secure communication protocol between the device, charging dock and the battery ensures that only authenticated, approved battery packs are recognised and permitted to operate with the product.
- Delivered a validated, high-reliability power system suitable for a regulated market.
- Excellent collaboration between the teams resulted in faster design iterations and smoother certification processes.
- Established a long-term, trusted partnership between Custom Power and Emblation for future power system developments.
- The product is now being sold in the USA, Canada, UK and Australia.

This project demonstrates Custom Power's ability to partner closely with customers, navigate complex regulatory requirements, and deliver dependable, high-quality power systems tailored to specific application needs.