High Performance Lithium-ion Battery Power Management System for Long Endurance Deep-Water Operation


Technology Overview

The 2 kWh Deep-Water Lithium-ion Battery Power Pack (DLBPP) is a pressure-tolerant lithium-ion battery system that provides a reliable, long-endurance and longer lifetime power solution for underwater systems. Many unmanned or autonomous vehicles requires stable and long battery life for their operations. On-station time needs to be long so that the vehicle can spend more time to carry out its task. We developed a smart battery management system (SBMS) with high efficiency active cell balancing technology, intelligent self-learning battery state of charge (SOC) and state of health (SOH) prediction for the lithium-ion battery. The active cell balancing technology leads to 15% longer endurance and lengthens the lifetime of the battery for underwater applications. In addition to this, the 2 kWh battery stack module with SBMS system is scalable and swappable to provide higher power capacity and increase flexibility in usage. A built-in pressure-resistant enclosure will eliminate extra battery pressure chamber and associated risks, thereby increasing power system reliability amidst high pressures 3000 metres below sea level.

Features & Specifications

This high performance smart battery management system that our team has developed comprises of the following key features:
- High efficiency active cell balancing
- Intelligent self-learning battery state of charge (SOC), i.e. depth of charge measurement
- State of health (SOH) estimation
- Over and under voltage battery protection
- 15% longer endurance
- Increased battery lifetime
- It is scalable and swappable
- Highly scalable and customisable for different applications
- Integrated fault diagnosis detection of the battery power system
- For deep water operations, a built-in pressure-resistant enclosure to eliminate extra battery pressure chamber and associated risks is included, thereby increasing power system reliability during deep-water operations.
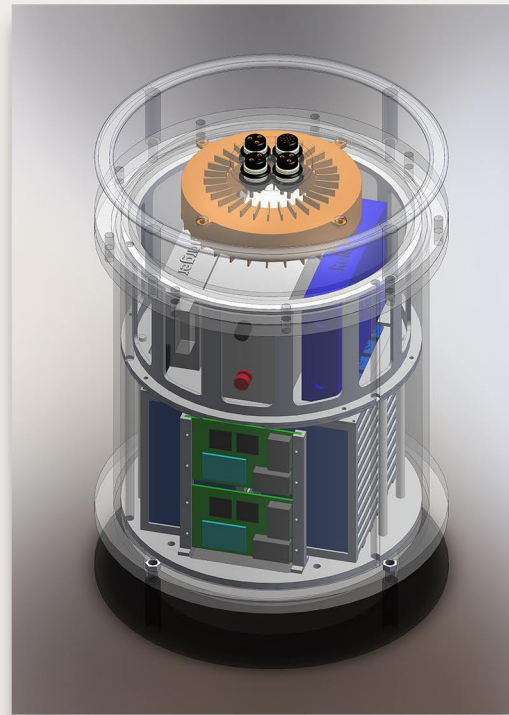
Research Partner

Newcastle University International Singapore

Customer Benefits

- Longer endurance and lifetime
- Higher power capacity by modularity
- Swappable
- High pressure resistance

Potential Applications

- Primary power for autonomous underwater vehicle (AUV) which can perform pre-designated subsea tasks far more cost effectively than ROV.
- Primary power for equipment in time-consuming undersea search and rescue missions.
- Primary power for other underwater sensing applications.