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NOC Autosub Long Range AUV Powered by Steatite Lithium Thionyl Chloride Battery Solution...

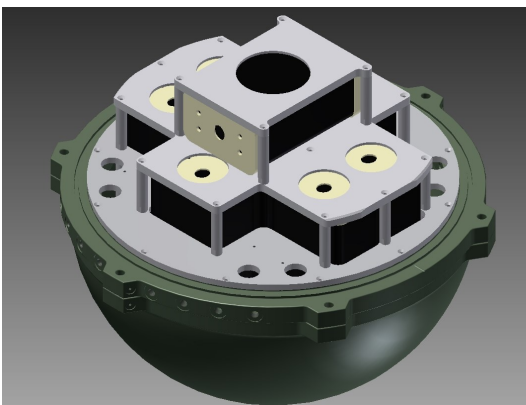
JULY 2017

INTRODUCTION

The National Oceanography Centre (NOC) undertakes integrated ocean research and technology development from the coast to the deep ocean. It provides long-term marine science capability including: major facilities; sustained ocean observing, mapping and survey; data management, and scientific advice. Marine science national capability is provided to the Natural Environment Research Council (NERC) by NOC working in conjunction with their Delivery Partners.

National Oceanography Centre (NOC) is wholly owned by NERC and brings together the NERC-managed activity at Southampton's waterfront site and Liverpool's former Proudman Oceanographic Laboratory, creating the UK's leading institution for sea level science, coastal and deep ocean research and technology development.

Since 2001, Autosubs have brought back unique information from under floating ice, first from under sea ice in the Antarctic and Arctic, and later from under floating glacial ice in the Antarctic. In doing so, they have arrived at the beginning of a new era for glaciologists and polar oceanographers. The first science application for Autosub Long Range (ALR) is the FASTNet (Fluxes Across Sloping Topography of the North East Atlantic) programme, a four year physical science research programme, which started on October 1st 2011.



HEMISPHERE WITH BATTERY PACK FRAME

FASTNet's main aim is to construct a new paradigm of Ocean/Shelf exchange using novel observations and model techniques to resolve the key seasonal, inter annual and regional variation absent from existing knowledge.

ALR will be capable of moving horizontally at up to 1.0m/sec, like a conventional AUV and dive to 6000m. Five two month missions are planned each covering in excess of 2500km.

In the longer term, the ALR's capability will enhance the NOC's increasing use of AUVs for oceanographic research.

THE CHALLENGE

Historically NOC have used Alkaline and Lithium Polymer battery packs in AUV's but with the ever increasing deployment demands on endurance NOC required a fresh approach to power. Steatite worked with NOC to develop a mission critical Lithium Primary solution that increased the AUV's endurance whilst reducing the whole life cost. AUV deployment can be costly with limited deployment and recovery times so deploying for as long as possible can be essential.

	Primary Lithium	Alkaline
Operating Temperature Range	-55°C to +200°C	-20°C to +54°C
Energy Density	14.7 Wh/in3 / 650 Wh/Kg	5.2 Wh/in3 / 125 Wh/Kg
Nominal Voltage	3.9 V / 3.6 V	1.5 V
Watt Hours (for D size cell)	59.0	22.5
Advantages	<ul style="list-style-type: none"> • Ideal in high shock and vibration environments • Very high open circuit & nominal load voltages • Lighter weight than alkaline (lower pack weight, easier field service, easier handling) • Internally fused • Possibly lower "total" cost 	<ul style="list-style-type: none"> • Low unit cost • Easier to transport • Easier to dispose
Disadvantages	<ul style="list-style-type: none"> • Requires knowledge of appropriate safety and handling 	<ul style="list-style-type: none"> • Limited temperature range • Short life cycle • Low power density per cell • Not hermetically sealed – potential leakage hazard • No internal safety fuse

THE SOLUTION

Steatite's Lithium Primary solution offered a number of benefits over the existing Alkaline solution such as greater endurance due to the increased energy density, weight saving, higher stable head voltage and a greater operating temperature range. These benefits are outlined in the table below.

Lithium Batteries are already utilised with success in oceanographic applications including Autonomous Underwater Vehicles (AUV), Pipeline Inspection, Seismic Surveying, Acoustic Profilers, Sonar Devices, Oceanographic Buoys, Sensing Devices, GPS Systems and Memory Storage.

Steatite Batteries designed and manufactured battery packs, each containing 56 x Lithium Thionyl Chloride D cells. These battery packs were then tested to meet UN Testing Criteria Part III 38.3 Rev 5, Clauses T1 – T5. The finished solution comprises of 10 x battery packs, in order to achieve NOC required battery set specification of 25.2 Volts DC @ 152Ah. Each battery set will be constructed into a frame inside a pressure vessel by NOC with connections made to the Autosub.

THE BENEFITS

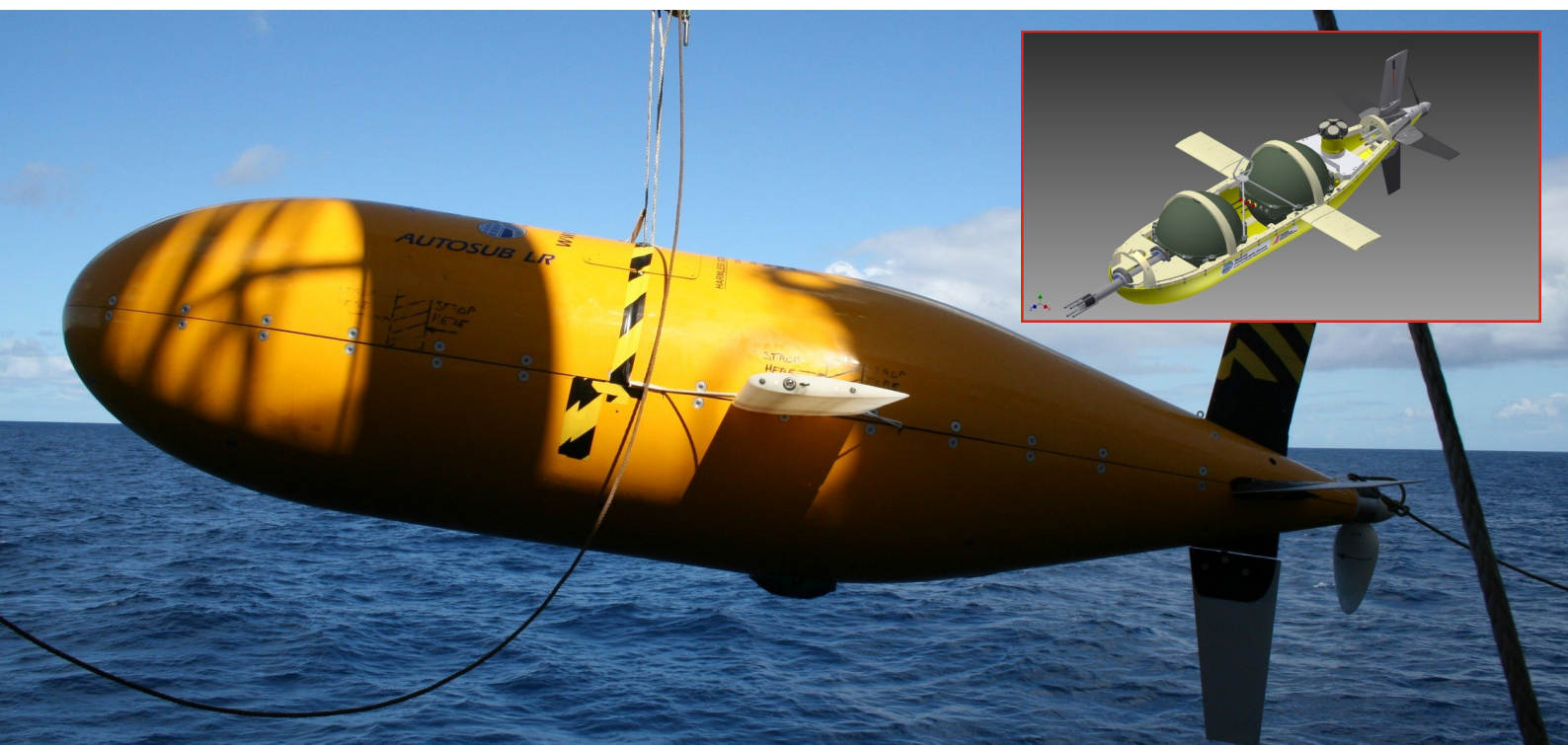
GREATER ENDURANCE: By working with NOC closely to understand the power requirements and application, Steatite suggested a primary Lithium Thionyl Chloride battery cell. This type of cell would offer the most reliable endurance possible and allow NOC to maximise the data collection.

COST EFFECTIVE: Steatite's strong existing relationships with key quality cell manufacturers tailored with in-house design and engineering support means they can deliver complex projects whilst keeping costs to a minimum.

TOTAL SOLUTION: Steatite offers the full solution from concept to disposal. In this project NOC wanted all design, build and UN testing to be carried out by one contractor and Steatite was able to offer this.

TRIED AND TESTED: Steatite has been building battery packs for over 25 years for many applications. Their track record of building battery packs for critical and subsea applications made them the obvious choice for this project.

Steatite and NOC have a long successful trading history so it was only natural to be involved in the selection process for a battery supplier.



ABOUT STEATITE

Steatite provides Industrial and Rugged Mobile computing platforms and integrated Battery solutions for customers who demand high performance and reliability in mission critical and harsh operating environments. A market leader since 1938, Steatite's success comes from our passion and commitment to deliver high quality and reliable electronic products and services customised to your precise requirements. We place a particular emphasis on providing solutions that are built to last, and that can perform in some of the world's most demanding operating environments.

Products range from custom battery packs, electronic components, a full range of rugged mobile computers, fixed industrial computer hardware and custom embedded software solutions. With the ability to design and manufacture bespoke units to exact customer requirements, Steatite solutions are built for reliability in extreme conditions.

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