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Battery Reduces the Size and Weight of Remote Measuring Device By More Than 90 Percent in Marine Applications

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When researchers travel to remote Arctic waters, weight and size is everything. As is the case with NOAA/PMEL scientists who have been conducting ongoing experiments using GPS/ice buoys to measure the effects of global climate change on ice floating on the Arctic Ocean. For their needs, the ideal GPS/ice buoy delivers more power into less space, with less weight and extends product life.

Oceantronics, a Hawaii-based manufacturer and leading supplier of commercial radar, GPS systems and peripheral equipment for the US Navy and other federal agencies, has been delivering remote tracking devices to NOAA/PMEL since 1994.

Oceantronics' original battery pack weighed 54 kg, and required 380 alkaline D cells to operate for a period of one year. Last year, Oceantronics delivered its new generation of buoys to the North Pole Environmental Observatory, resulting in a size and weight reduction of more than 90 percent. The new GPS/ice buoy battery pack weighed just 3.2 kg., utilizing 32 D cell lithium thionyl chloride batteries and four hybrid layer capacitors.

To create a smaller, more cost efficient buoy, Oceantronics chose the Pulses Plus hybrid lithium thionyl chloride batteries from Tadiran, the only battery currently available which combines a bobbin-type Li/SOCl2 lithium thionyl chloride battery with a hybrid layer capacitor. Switching to this new hybrid lithium battery resulted in a significant ease of transport. By utilizing a number of smaller lithium packs in place of the larger alkaline packs, they were also able to extend the operational life of the system many fold.

In developing its new generation GPS/ice buoy, Oceantronics demanded a battery that could withstand tests of -40°C prior to deployment. They also demanded that the batteries pass all UN standards for shipping non-hazardous goods.

Oceantronics chose between spirally wound and bobbin type lithium cells, Spirally wound lithium cells, while adequate in supplying high current pulses over a wide temperature range, lack the energy density of bobbin lithium cells. Standard bobbin-type lithium thionyl chloride (Li/SOCl2) cells deliver extremely high energy density, high cell voltage, good low temperature characteristics, low self-discharge rate and good safety characteristics. However, standard bobbin-type cells have two drawbacks: passivation after storage at elevated temperature, and low current due to its low rate design. As a result, these cells could not deliver the high current pulses required for NOAA/PMEL's remote tracking device.

Oceantronics selected Tadiran PulsesPlus hybrid lithium technology which combines bobbin-type lithium thionyl chloride chemistry with a hybrid layer capacitor (HLC) specially modified for use with lithium batteries. The resulting cell delivers higher energy density and high current pulses without any passivation or voltage delay problems.

PulsesPlus batteries are used in other remote applications as well, such as automated meter reading, remote terminal units, GPS asset and vehicle tracking, medical devices, buoys (drifting, moored, ARGO, etc.), mayday and other emergency systems, such as current meters, transponders, harbor lights, acoustic releases, seismometers and other oceanographic devices.

For a variety of high energy density/high current pulse application, bobbin-type Li/SOCl2 chemistry combined with a Hybrid Layer Capacitor offers unique benefits due to its inherent long life, reliability, high energy density, as well as its ability to withstand extreme temperatures and harsh marine environments. Long life and reliability are essential, as battery failure usually results in total system failure for stand alone systems with no back-up power source.

As remote tracking devices grow increasingly complex and feature-rich, this new hybrid lithium battery technology will be increasingly called upon by design engineers seeking to pack more power and performance into less and less space.

Oceantronics' GPS/ice buoy being retrieved by helicopter to the Arctic for use in experiments measuring wind, temperature, sunlight and ice thickness near the North Pole. (Courtesy Sigrid Salo NOAA/PMEL.)

Same operating life with smaller size for use in GPS/ice buoys. Oceantronics' original battery pack (left) used 380 alkaline D cells (54 k). The new battery pack (right) uses 32 lithium thionyl chloride D cells and four hybrid layered capacitors (3.2 kg).

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