Case study: Customised power for automated pipeline inspection

Background

[Inductosense](#) is an ultrasonic sensor technology company specialising in monitoring technology for internal corrosion and erosion in pipework and vessels. Their innovative WAND system is a non-intrusive, semi-automated or automated corrosion monitoring solution designed to save the expertise, time and cost required to gather thickness data from hard-to-reach pipes and fixtures.

The [WAND-RDC](#) (Remote Data Collector) uses Inductosense's patented ultrasonic thickness sensors, specialised data management software and, at its heart, a battery-powered device which collects data from the sensors and transmits it wirelessly up to 200m via long range Bluetooth 5.0. The data acquired informs engineers of structural thickness in up to 8 areas of a pipe without the need to remove insulation or manually inspect these areas. WAND-RDC can be prompted to retrieve live thickness readings, and also programmed to schedule automatic data collection at predefined intervals.

The challenge

The WAND system is designed for use in very harsh environments such as offshore rigs and hazardous industrial settings. Inductosense needed a battery for the RDC which could meet these criteria:

- Low current drain with high pulse
- Wide temperature range, able to operate at -40°C to 75°C
- Estimated capacity 13Ah @ ~8.4V
- Requirement of minimum 5 year life
- High reliability due to the inaccessibility of the RDC once fitted
- Cells need to be intrinsically safe without the risk of arcing or sparking due to their often close proximity to highly flammable gases

From this, we knew that the design and development of the battery pack was going to be complex and likely to take some time. Of course, we couldn't have known that the emergence of COVID-19 was going to add further complications!

The solution

Our battery team were engaged at the onset of the project which allowed us to understand the unique requirements of the device in order to advise on the mechanical design and assist in gaining the necessary ATEX certification and industry approvals as well as the battery design itself.

We considered several cell partners but knew that Tadiran cells were going to be the best option due to their high reliability and long life. We worked alongside electronic designers, ByteSnap Design, to achieve the optimum configuration.

A Hybrid Layer Capacitor (HLC) is common in data logging applications and in this case, a Tadiran HLC was selected to provide the high current pulse required to take a reading from the WAND sensor. The data collection from the RDC via Bluetooth 5 – a much lower-power operation – and recharging the HLC after taking readings was taken care of by three Tadiran D cells.

Discharge testing started in 2020 and Steatite managed the relationship with the test house. Following the results of this testing, sample packs were built in October 2020 and we started technical conversations with the certification body to achieve ATEX certification.

While the battery was being developed, design of the plastic housing progressed and we were pleased to be involved in advising a suitable design. We were also able to devise a funnel for the battery assembly team to pour in potting, making the manufacture simpler and robust.

ATEX certification and UN38.3 approval were received in mid-2022 and volume production started.

Results

The collaborative partnership between Steatite, Tadiran, ByteSnap and Inductosense resulted in the creation of a truly innovative, scalable and cost-efficient solution for ongoing automated pipeline management.

The RDC measures just 19cm x 13cm x 9cm, weighs 1.15kg and is capable of storing up to 1500 readings. 1000 units are due for delivery into the industrial inspection sector during 2024 and we're proud to be a part of this pioneering technology. Furthermore, the WAND-RDC was recognised with an "Internet of Things Product of the Year" Award at the Elektra Awards in November 2022.

"Having worked with Steatite from the initial requirements to prototype design, testing, ATEX certification and finally the production, I strongly recommend Steatite not only because they are knowledgeable, but also for their willingness to work with their customer to turn obstacles into solutions."

Shani Lu
IoT Manager