



# ZIM Success Story



## High Temperature Lithium-Ion Batteries

*New Li-ion batteries meet the highest safety standards at temperatures up to 150 °C. Even under extreme application conditions, such as in deep geological drilling, they reliably supply energy for sensors and can be charged on site. The batteries are available for a variety of other applications.*

Conventional lithium-ion battery cells only guarantee safe usage and an acceptable life expectancy within a limited temperature range (typically 0 °C to 40 °C, maximum 60 °C). Other energy storage systems such as lithium metal batteries allow higher application temperatures, such as those found in deep drilling, but at the same time have a high risk potential and are not rechargeable. When operating so-called MWD (Measurement While Drilling) devices, in which the measuring equipment is integrated into the drill string behind the drill rig, the sensors used must be supplied with energy. This is done by a generator in the drill head, which is driven by the drilling fluid, but does not provide the same power

throughout. Therefore, batteries that can withstand the extreme conditions are required as an energy buffer.

### The product and its innovation

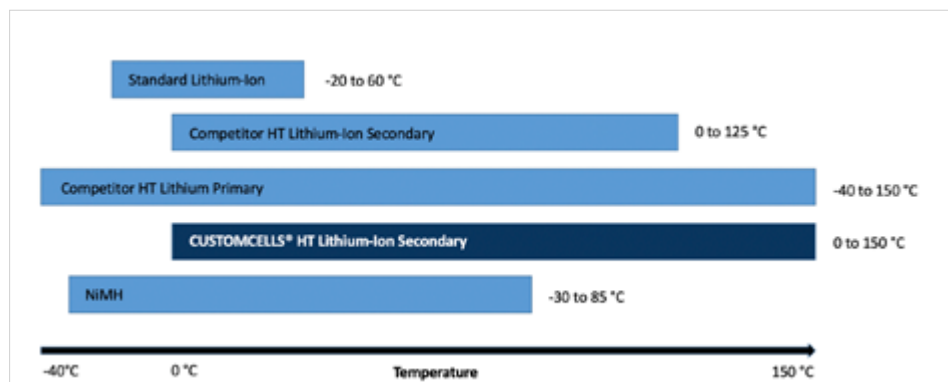
Motivated by the need for MWD equipment to measure boreholes, Custom Cells Itzehoe GmbH, the Fraunhofer Institute for Silicon Technology (ISIT) and the Canadian company Evolution Engineering Inc. had set themselves the goal of developing lithium-ion batteries that are particularly safe and can be discharged and charged at high temperatures. Changing the batteries would then no longer be necessary.

In the ZIM cooperation project, ISIT developed a concept for mag-

netic field-reduced cells in Li-Ion technology, while Custom Cells Itzehoe concentrated on the development of high-temperature stable battery cells based on a novel Li-Ion cell chemistry with new material combinations. The Canadian partner Evolution Engineering Inc. was responsible for assembling the cells into battery packs, adapting the battery management system and conducting field tests.

### Market and customers

As a result of the development and production of the first sample series, CUSTOMCELLS® offers customer-specific Li-ion battery cells that can be reliably charged and discharged in temperatures ranging from 0 °C to 150 °C, offer a high degree of safety against



CUSTOMCELLS® High temperature technology in competitor comparison

### Project information

**Project duration:** 01/2017 to 12/2019

**Project form:** Cooperation Projects

**Technology field:** Energy technologies

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thermal runaway and promise a long service life even under harsh environmental conditions.

High temperature lithium-ion batteries have a high market potential. In addition to the already existing use in borehole measurements, there are many other possible applications. They are suitable as energy suppliers, for example, for the wireless energy supply of medical technology devices that are sterilised under heat, for monitoring safety-relevant or particularly hazardous areas where high ambient temperatures can occur, or as energy back-up systems for actuators in safety-critical areas where high temperatures occur in the event of a disaster.

### The partners

Custom Cells Itzehoe GmbH, founded in 2012 as a spin-off from the Institute for Silicon Technology of the Fraunhofer Gesellschaft (ISIT), is one of the world's leading companies in the development of application-specific lithium-ion battery cells.

The Fraunhofer ISIT in Itzehoe is one of the most modern research institutes for microelectronics and microsystems technology in Europe. In close cooperation with industry partners, miniaturised components for power electronics and microsystems for sensor and actuator technology are developed here. For more than 20 years, research has also been conducted at ISIT on new Li accumulators.

The Canadian company Evolution Engineering Inc., which is based in Calgary (Province of Alberta), is a specialist for MWD devices. Founded in 2011, the company focuses its research and development on sensor-based solutions to various technical problems.



This project was carried out as a result of the fourth German-Canadian (Region Alberta) call for proposals for research and development projects.

### Information about the program

The Central Innovation Programme for SMEs (ZIM) of the Federal Ministry for Economic Affairs and Energy provides funding to all technologies and sectors:

- Individual projects
- Cooperation projects
- Innovation networks and feasibility studies prior to R&D projects.

### Information and advice on cooperation projects

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