



Temperature, pressure and multi flow sensors from Grundfos help maintain efficient and optimal battery operation

In a flow battery, it is important to be able to measure differential pressure, flow, and temperature to ensure an efficient and optimal operation. Grundfos supplied Relative Pressure (RPS) and Multi Flow (MFS) sensors to ensure that different factors in flow batteries produced by the Danish company VisBlue are measured continuously, to make sure that the battery runs as efficiently as possible.

The situation

VisBlue produces sustainable redox flow batteries primarily aimed at the housing sector and industry applications. VisBlue has experienced problems with the sensors the company has used previously.

The company needed, therefore, to include in the system sensors that can measure pressure, flow, and temperature. Measuring the incoming and outgoing pressure and temperatures of the battery systems, as well as the flow through the stack, meant that a minimum of two times five sensors had to be integrated in VisBlue's battery systems, and the decision was made to approach Grundfos.

"One of the most difficult parameters was without question finding sensors that could withstand the chemistry in our battery systems, while still being affordable," says Terje Drechsler, R&D Engineer, from VisBlue.



The Multi Flow sensor, where the flow and pressure are measured. The sensor is integrated into the hydraulic system.

About VisBlue:

VisBlue is a Danish/Portuguese company, established in 2014 and based in Aarhus, Denmark. VisBlue commercialises a new battery technology for green energy storage using a safe, sustainable, and scalable unique vanadium redox flow battery system, where electricity is stored in two tanks with liquid electrolyte.

Grundfos supplied:

4 Relative Pressure (RPS) sensors, of which 2 were customised
2 Multi Flow (MFS) sensors with customised software

The battery systems shown in these pictures are used for testing and demonstration purposes only and are not indicative of the delivered product.

The solution

Pressure and temperature issues were resolved using four Relative Pressure (RPS) sensors from Grundfos, which measure both pressure and temperature. VisBlue's battery systems are now equipped with two of these sensors, one to measure incoming pressure and temperatures and another to measure outgoing pressure and temperatures.

"The sensors from Grundfos came through with flying colours in the chemistry test. The test showed that the sensors could handle our electrolyte liquid without opting out like we have previously experienced," reveals Terje Drechsler with a smile on his face.

A customised Multi Flow (MFS) sensor from Grundfos came to VisBlue's rescue in the company's flow measurement issues. This custom-made version helps to measure both flow and pressure, which has given the company the possibility to monitor the hydraulic resistance of the system. In comparison to measuring pressure, measuring flow is not a necessity to operate a battery system. It is, however, a necessity to monitor a battery system properly and efficiently when in operation. "The great thing about the sensors from Grundfos is that we only have six mounting spots, but actually manage to get 12 measurements out of these," explains Terje Drechsler. All sensors in VisBlue's battery systems are hooked up analogue to a PLC.

The outcome

Thanks to Grundfos, the integration of the four RPS sensors and the two MFS sensors has achieved goals of measuring the differential pressure, temperature, and flow of the company's battery systems. Besides this best-case scenario, VisBlue has gained two indirect leak measurements and two tank level measurements.

VisBlue estimates that the integration of the Grundfos sensors has led to a cost reduction of 70%.

The safety of the new sensors has also enabled VisBlue to react proactively and shut down the battery systems in time if something is amiss. Together with the MFS sensors, the RPS sensors' differential temperature measurement now enables VisBlue to monitor the deposited thermic output of the systems. In all their batteries, VisBlue now measures the temperature four times, the pressure six times, and the flow two times.

"Grundfos has been a valuable business partner for multiple reasons. They have given us the possibility to measure negative pressure and they have helped us with a custom-made product in which they have altered the software of their own product to meet our needs. The people at Grundfos have made a personalised measuring area, which gives us a larger analogue dispersion, which again gives us a larger accuracy measurement. It has also been very valuable for us to be in direct contact with the development department the entire time," concludes Terje Drechsler.



The Relative Pressure sensors, where the stack inlet and outlet in terms of pressure and temperature are measured.

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