

Monitoring of Separator/Electrode Drying Furnace Temperature Distribution

In-vehicle Lithium-ion Battery Applications

Distributed Temperature Sensor

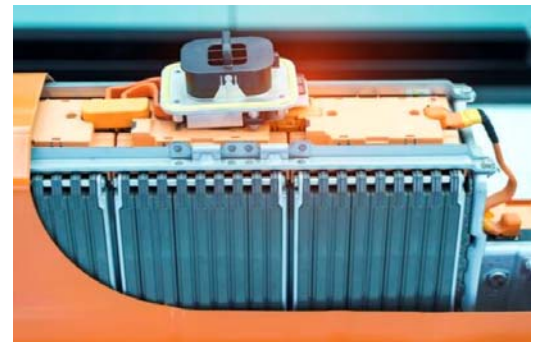
The DTSX is a unique and innovative temperature monitoring system that uses fiber optic cable as a temperature sensor.

Current Situation and Issues

Drop in Productivity Caused by Temperature Unevenness in Drying Furnace

The temperature inside the drying furnace of the coating drying process for the separators/electrodes that make up a lithium-ion battery is linked to product quality. However, at present, the in-furnace temperature cannot be grasped as a temperature distribution simply by installing thermocouples, for example, at several meter intervals.

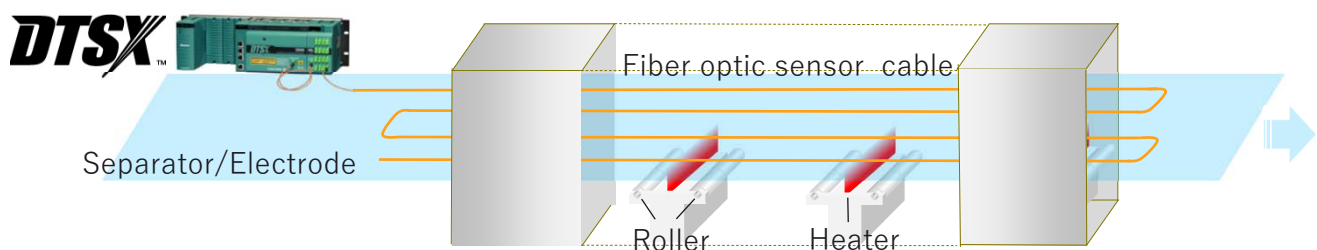
In the drying process, changes in the furnace structure, size, heating method, coating material, etc. and various factors even during a single day cause the in-furnace temperature to become uneven. For this reason, drying performance might vary. This might increase the incidence of quality defects and lead to a drop in productivity.



Overview of inside of
In-Vehicle Lithium-ion Battery

Solutions and Benefits

Fiber Optic Cable Visualizes In-furnace Temperature Distribution



The DTSX fiber optic distributed temperature sensor can monitor temperature distribution every meter along the path of the fiber optic cable.

Thermocouples, etc. are used for heater control as up till now, and by adding DTSX to them, it will be possible to visualize the temperature distribution inside the entire drying furnace.

Resolving heater and other problems by utilizing the result, and passing products through the furnace after setting the in-furnace temperature to the ideal temperature profile result in improved productivity.

When attempts are made to measure multiple points by thermocouples, etc., wiring is complicated, construction costs escalate and periodic maintenance of each individual sensor is required. This is unrealistic when applying it to multiple drying furnaces.

As the DTSX system requires only laying fiber optic cable inside the furnace, both initial and running costs can be reduced. Moreover, a single DTSX can cover multiple drying furnaces, which improves cost effectiveness.

The DTSX has also been put to use in monitoring the temperature distribution in tunnel furnaces.

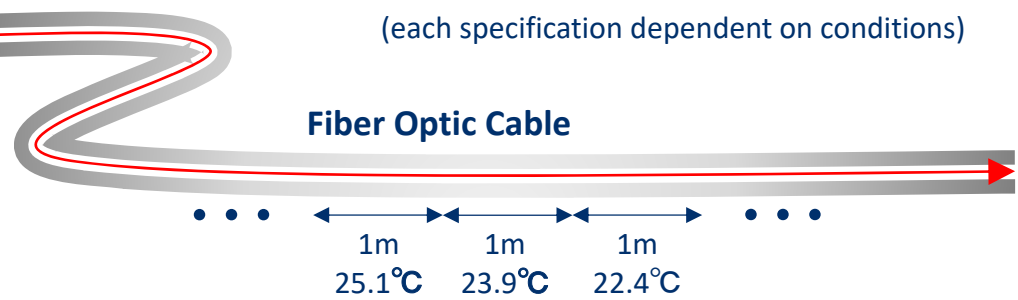
Features of Optical Fiber Sensing in DTSX System

The Fiber Optic Cable Is the Temperature Sensor



DTSX200 / DTSX3000
Distributed Temperature
Sensor

- Monitoring Distance: to 50 km
- Monitoring Temperature: - 200 to 300 °C
- Shortest Monitoring Cycle: Approx. 5 seconds
- Temperature Resolution : 0.03 °C
(each specification dependent on conditions)



* Temperature distribution monitored every 1 m

Main Features

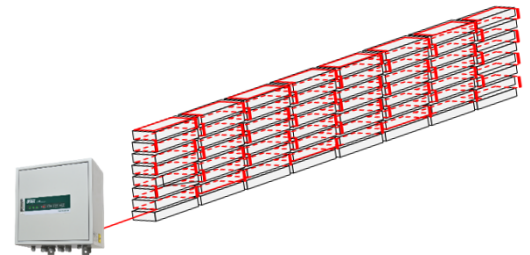
- ✓ 24 hours, 365 days monitoring even in wide areas and ordinarily non-manned areas
- ✓ Power supply not required, explosion-proof, not affected by electromagnetic noise
- ✓ Flexible installation
- ✓ High compatibility with DCS and other host systems (Modbus/TCP)

Other In-vehicle Lithium-ion Battery Applications

✓ Smart Monitoring of Aging Process Shelves

Thermal runaway of lithium-ion batteries mounted on individual shelves is discovered at an early stage. This enables a quick initial response when an abnormality occurs to limit damage to a minimum.

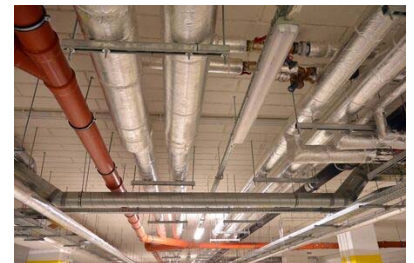
(For details, refer to Bulletin 39J00Q21-01EN)



✓ Prevention of Fires in Exhaust Air Ducts in Battery Assembly Process

Fires or dust explosions in exhaust air ducts for preventing the contamination of aluminum dust in the assembly process of lithium battery batteries are monitored. Abnormalities are not overlooked as ducts extending over long distances in blind areas such as roof space are comprehensively monitored.

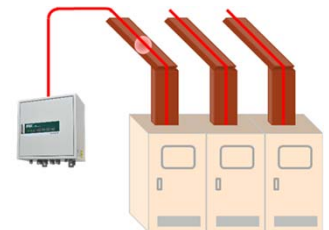
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✓ Monitoring of Soundness of Power Supply Bus Bar

The joints of the power supply bus bar are monitored. Abnormalities are not overlooked as fiber optic cable is built into the bus duct and bus bars extending over long distances in blind areas such as roof space are comprehensively monitored.

(For details, refer to Bulletin 39J00Q23-01EN)



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