iTHERM QuickSens for the optimization of mixing processes

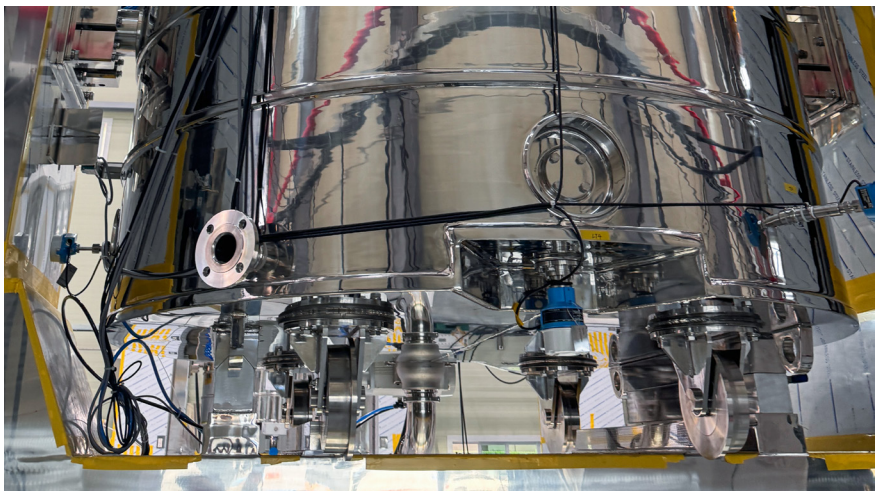
Slurry mixing for the production of battery cell electrodes

Benefits at a glance

- Reliable temperature measurement guarantees process and product safety
- Fast reaction time ensures highest quality of the electrode material and leads to energy savings during production
- Short immersion length of the iTHERM QuickSens enables uniform mixing of the medium even in the small volume between the inner vessel surface and the blade tips, while ensuring contact between the sensor and the medium
- Individually tailored solution to the process conditions optimizes the workflow

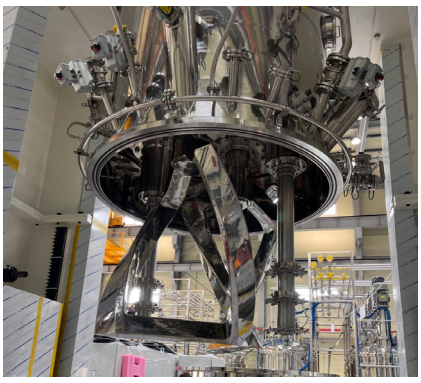
Process conditions

- Temperature: 20-25 °C (68-77 °F)



Sub-processes in battery production present manufacturers with tough challenges when it comes to temperature measurement. While raw materials are mixed together during the electrode process, the temperature measurement of the mass is of fundamental importance and must be carried out within the mixing process, but protected from the agitator blades.

The process conditions require accurate and fast temperature measurement with extremely low immersion of the measuring equipment. With the innovations from the outstanding temperature portfolio, Endress+Hauser has the perfect solution for the challenges in this application and impresses by solving the customer problems.



open mixing unit with agitator blade (planetary disperser)

Endress+Hauser

People for Process Automation

The challenge In the production of batteries, fast and accurate temperature measurement is of central importance for the quality of the product. The challenge arises in the electrode process, the core process for manufacturing the positive and negative electrodes of a battery. In the first step of the electrode process, the various raw materials are measured and mixed. The active materials required to produce the anode and cathode form the basis of the battery materials and are mixed together with binders to create a slurry.

As the active material of the cathode has a very weak crystal structure, a machine that applies a strong shear stress cannot be used for mixing. For this reason, the mixing process is carried out using a PD (Planetary Disperser) mixer, which looks similar to a machine used for kneading flour. During the production of the slurry, the temperature change is an important value to control. The temperature of the mixture must be reliably measured in real time while adding substances that increase the adhesion between the particles of the active material.

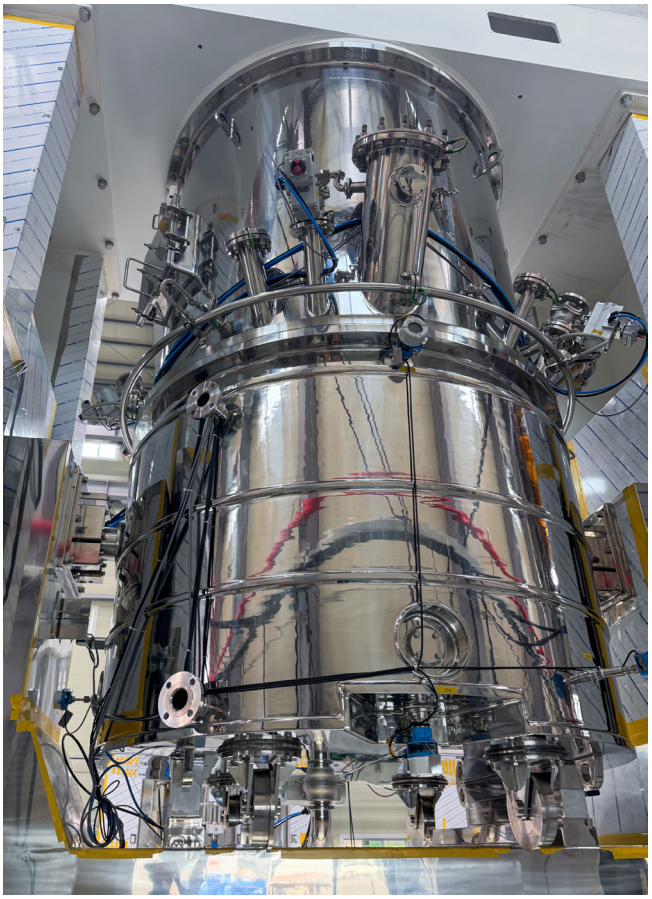
The blade used to mix the materials is designed to also remove the material that sticks directly to the wall of the mixing container. A typical thermometer with the necessary accuracy and speed of temperature measurement in this demanding process requires sufficient insertion length. Manufacturers are faced with the problem that a thermometer with the appropriate insertion length cannot be placed in the optimum position for measuring the process temperature, as the thermometer would otherwise be damaged by the mixing blade.

The challenge is therefore to install a thermometer that has an extremely short immersion length and still provides the necessary speed and accuracy of temperature measurement to ensure process quality.

Sensor mounted in the wall of the mixer with an extremely short immersion length

Our solution Endress+Hauser can solve this challenge with the unique iTHERM QuickSens temperature sensor. The highlight of iTHERM QuickSens is the fastest response time of an industrial temperature sensor in the world of t90 = 0.75 seconds. In combination with this, the iTHERM QuickSens can be installed with a minimum immersion length as the temperature sensor is mounted in direct contact with the base of the insert.

This unique combination of short immersion length and fast response time makes the iTHERM QuickSens from Endress+Hauser the perfect choice when it comes to temperature measurement in the electrode process during battery production.



Mixer with instrumentation

Components

- iTHERM ModuLine TM131 thermometer
- iTHERM QuickSens temperature sensor

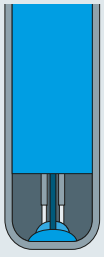
iTHERM ModuLine TM131

Result Having used the combination of the powerful iTHERM ModuLine TM131 thermometer with the iTHERM QuickSens temperature sensor in battery manufacturing applications in the PD Mixer, Endress+Hauser's technologies have been validated for this industry. Based on this positive experience in this challenging application, the measurement products can also be used in similar industries with similar challenges. With its comprehensive temperature portfolio and exciting innovations in the field of temperature measurement, Endress+Hauser provides solutions to solve customer problems in a wide range of industries and business sectors.

iTHERM ModuLine TM131 applied to PD Mixer

QuickSens

Insert for fastest response times



T90 = **1.5s**

- Pt100 thinfilm sensor
- Sensor-on-tip technology
- Minimum immersion length can be reduced by > 70% (20-30 mm (0.78-1.18 inches))
- Measuring range from -50 to +200 °C (-58 to 392 °F)

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