An Innovative Solution: Applying Capacitive Sensors to Density Measurements

For Saint-Gobain, controlling the manufacturing process is a must—that's how it ensures the highest quality products and materials. But developing non-destructive measurement methods for various manufacturing systems was proving costly in time and money. MTI Instruments and the Accumeasure Series provided a precise, budget-friendly, factory-ready solution. Now it's all systems go.

Owning the process

Saint-Gobain is a French multinational corporation that designs, manufactures, and distributes materials for industrial, commercial, and consumer applications. Dr. Mickael Boinet leads a research and development (R&D) team that develops non-destructive (ND) measurement methods for use with the company's manufacturing systems.

The goal? To bring ND measurement from concept to laboratory to factory implementation.

Dr. Boinet's team investigates and uses different ND technologies for thickness and density measurements. (Areas of study also include flow, delamination, and cracking.) But there are limits in his lab: Saint-Gobain is seeking to move away from ND measurement technologies that are cost-prohibitive. And methods that use beta or gamma radiation raise concerns about the security of radioactive materials.

To R&D? Or not to R&D?

At Saint-Gobain, only about 30% of the ND measurement methods developed by Dr. Boinet's team reach factory implementation. Barriers include a lack of human resources and capital expenditures (CAPEX), but the challenges don't end there.

ND measurement requirements vary widely. Impedance measurement, a technology Dr. Boinet used previously with polytetrafluoroethylene (PTFE) films, can operate at different frequencies to distinguish between thickness and density. However, the impedance measurement tools were more for R&D than for factory implementation.

In a Saint-Gobain factory system, the ability to measure thickness and density of foam material is important, Dr. Boinet says. Among his key considerations for a solution: precision, ease, and

FAST FACTS

Industry

Non-woven material manufacturing

Customer

- 75% of sales in construction and renovation markets
- Also serves automotive, aeronautical, health, security and protection, and food and beverage industries
- Customers seek innovative, high-performance, planet-friendly materials

Challenges

Developing new, in-house measurement solutions to distinguish between thickness and density in factory systems was proving to be time-consuming and expensive

Solution

MTI Instruments' Accumeasure Series Capacitance Sensors

Results

Reliable, precise technology meant less time—and money—spent on non-destructive measurement R&D

cost, as well as user-friendly software, amplifier-to-PLC/data logger interface, ATEX compliance for use in potentially explosive atmospheres, and wireless-sensor capabilities.

To address these challenges, Dr. Boinet's team needed an alternative to impedance measurement—one without the problems posed by radiation-based methods. They chose laser-triangulation sensors to measure thickness but still needed a new way to measure capacitance, which is key to determining density of foam.

MTI's Digital Capacitance Sensor Solves the Problem

While researching technologies, Dr. Boinet discovered MTI Instruments and met MTI's Don Welch, who was then the Director of New Business Development. This led to Saint-Gobain's implementation of MTI's capacitance-based technology to measure closed-cell foam density.

"We chose MTI's digital Accumeasure product for many reasons. The non-contact technology was just one of the pluses," Dr. Boinet says. "We investigated various impedance measurement companies in Europe, but ultimately determined that the amplifier made by MTI Instruments was superior."

No wonder: MTI's Digital Accumeasure amplifier and probes were able to be reconfigured through software programming to measure the capacitance—and thus the density—of the closed-cell foam. It is well known that a non-conductive material's capacitance is directly proportional to the density, provided the thickness of the foam material is also known; although the relationship is a slightly complex formula, a simple representative calibration procedure removed the need for an intricate mathematical calculation. Subsequent factory testing proved that it worked.

Ultimately, Dr. Boinet's team found a solution that not only checked the boxes—it was ready-made for factory implementation. (And helpful for R&D, too.)

What's the secret?

MTI's digital capacitive amplifier uses a direct-conversion approach that eliminates the errors of traditional amplifiers: there's no analog filtering, linearization, range extension, or summing of channels. Instead the measurements are all computed digitally.

The benefits of MTI's capacitance-based technology include accurate data capture, lossless processing, and the freedom from having to purchase additional data acquisition hardware.

An extension of the team

Dr. Boinet says he's received top-notch customer service from the MTI team. They've been available every step of the way, from sample testing to technology development.

In fact, MTI and the problem-solvers at Saint-Gobain have an ongoing partnership—their conversations are evolving right alongside the R&D team's ever-advancing manufacturing systems. Today, MTI continues to research methods to improve non-contact thickness and density measurements for Saint-Gobain's non-conductive materials. "This is more than technology. MTI brings value to the whole process," Dr. Boinet says. "Its people are an extension of my R&D team, and as our needs change, I can count on them to bring solutions."

As the leader in capacitance-based measurement technologies, MTI Instruments of Albany, New York (USA) is committed to continued development and to innovative solutions that meet customer needs. Tell us how we can help your business!

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325 WASHINGTON AVENUE EXTENSION
ALBANY, NY 12205-5505
PH. +1-518-218-2550
OR USA TOLL FREE: 1-800-342-2203

FAX: +1-518-218-2506
EMAIL: SALES@MTIINSTRUMENTS.COM
WWW.MTIINSTRUMENTS.COM