

# **PROCESS INSTRUMENTATION**

# Better data – and better science – with a digitally powered Coriolis flow system

# usa.siemens.com/coriolis

A food producer removes caffeine from coffee beans to create a decaffeinated version of its most popular blend. A manufacturer of dietary supplements extracts pesticides and organic solvents from ginseng to ensure a higher-quality end product. A crime laboratory measures the amount of morphine in a blood sample to analyze the usage habits of a drug addict.

These scenarios might not appear to share much in common – after all, what does your favorite morning beverage have to do with forensic drug testing? However, there's an important similarity. In each example, a supercritical fluid can be used to carry out precise, efficient, low-toxicity chemical extraction or chromatography.

Regardless of the industry or application, supercritical fluid extraction (SFE) and supercritical fluid chromatography (SFC) require a very specific set of operating conditions. Keeping the environment just right for SFE and SFC requires consistently accurate process measurements – all of which are made possible by incorporating a high-performance Coriolis mass flow meter designed to measure accurately at low flow rates.



The SITRANS FC440 sensor paired with the SITRANS FCT020 digital transmitter ensures accurate low-flow measurement and high-speed communication in supercritical fluid extraction and chromatography systems.



## The application

An analytical science corporation in the northeastern USA develops instruments for laboratory-based applications across a broad range of industrial, academic and government organizations. Among their specialties are SFE and SFC systems tailored to the specific needs of customers and designed to extract and/or measure a variety of chemical compounds.

Their systems rely on supercritical carbon dioxide (CO<sup>2</sup>) instead of organic solvents to provide selective sample extractions and/or measurement. CO<sup>2</sup> normally behaves as a gas at standard temperature and pressure, or as dry ice when frozen.That said, when CO<sup>2</sup> is held at or above its critical temperature of 31.2 °C (87.8 °F) and critical pressure of 73.8 bar (1071.6 psi), it achieves a supercritical state midway between a gas and a liquid, with liquid-like density and solvating power but a viscosity near zero. Using supercritical CO<sup>2</sup> results in shorter completion times and purer extracts – not to mention lower operating costs in comparison to solvent-based systems.

To kick off SFE or SFC, supercritical CO<sup>2</sup> is pumped into the system and passes through an integrated Coriolis flow meter, which measures the incoming mass flow rate, density and temperature. This is a crucial step in both processes, as it's the primary way to ensure that all CO<sup>2</sup> flowing into the system remains in the desired fluid state. Once conditions are verified by the flow meter, the CO<sup>2</sup> helps to extract the compounds (in SFE) or separate and measure them (in SFC).

## The challenge

For more than 15 years, the company has had the option to add a SITRANS FC Coriolis flow meter from Siemens to their SFE and SFC systems, depending on customer requirements. They selected the Siemens solution because of its capability for very accurate measurement – as high as 0.1% of flow rate – under the low-flow conditions required for chemical extraction and measurement with supercritical CO<sup>2</sup>. The robust construction of the sensor also offered the reassurance of long-term durability, even in high-pressure environments.

Over time, the company recognized the need to expand into a broader marketplace by ensuring that all of their supercritical fluid solutions complied with the RoHS Directive for hazardous materials, which would open the opportunity to sell into the European Union. Having come to appreciate the reliability of the SITRANS FC product line and the responsiveness of Siemens customer support, they turned to Siemens for a digitally based, RoHS-compliant Coriolis flow alternative.

### The solution

Part of the next-generation digital flow platform from Siemens, the FCT020 is a powerful, compact Coriolis transmitter designed especially for small-footprint assemblies – a major benefit for the SFE and SFC systems given their limited availability of space.

Another prerequisite for selection was superior performance, and the FCT020 doesn't disappoint.he transmitter measures with advanced digital signal processing technology, so it produces a stronger signal-to-noise ratio than an analog transmitter for higher accuracy, improved resistance to process noise and a more stable zero point. The FCT020 can also detect and respond to even the smallest changes in flow.

Ultimately, they placed an order for 100 new sensors and transmitters to be included with new SFE and SFC systems. Now that the enhanced Coriolis flow solutions are in place, the upgraded systems are benefitting from faster communication coupled with better process data – all of which adds up to higher-precision, more efficient extractions and measurements for laboratories.

With help from the digitally powered SITRANS FC Coriolis flow family, the corporation is equipping manufacturers and researchers with advanced tools that optimize science, commerce and their bottom lines.

### Legal Manufacturer

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