

## Vegetable Oil Hydrogenation Process Relies On H<sub>2</sub> Gas Measurement With Thermal Flow Meter

*Precise Mass Flow Metering, SIL Rated and ATEX/FM Approvals*

**San Marcos, CA** — Process and plant engineers in the food/beverage industries who are responsible for vegetable oil hydrogenation processes will find the precision [ST80L Series Thermal Mass Flow Meter](#) from [Fluid Components International \(FCI\)](#) provides accurate H<sub>2</sub> gas mass flow measurement that helps them deliver a tasty product.

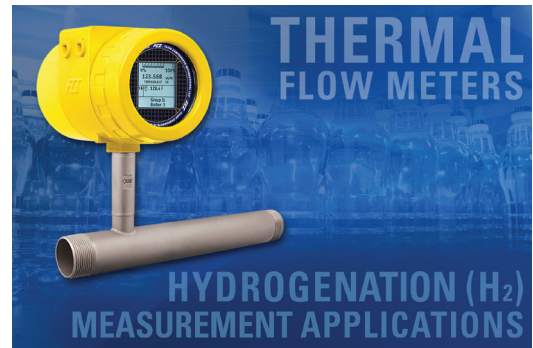
In hydrogenation, H<sub>2</sub> gas is added to oil from soybeans, sunflowers, palms, olives and other fruit/vegetable sources to make them more solid or spreadable, as in the case of butter substitutes. The oils are either partially hydrogenated (still liquid), which include trans fats, or fully hydrogenated (semi-solid) with no trans fats. In addition to spreads, hydrogenated oils are added to many foods as flavor or texture enhancers and shelf-stabilizer preservatives.

The process of plant oil hydrogenation in the food industry requires a chemical reaction between the plant oil, the H<sub>2</sub> gas and a catalyst that is typically nickel or other precious metals. The flowing of the oil and carefully controlled amounts of H<sub>2</sub> gas under high pressure and at high temperature in the presence of the catalyst results in hydrogenation of the oil.

No matter the food product, oil hydrogenation can be expensive due to the relatively high cost of H<sub>2</sub> gas, its storage and plant safety requirements. Food industry process engineers have found that not all air/gas flow measurement technologies are suitable for this application because the process requires a 435 psig (30 bar[g]) pressure level, which results in an H<sub>2</sub> density that is too low for some flow measurement technologies, such as Coriolis, to offer sufficient range-ability and high accuracy.

FCI's ST80L Series Thermal Mass Flow Meter, however, is wide-ranging direct mass flow instrument, which is well suited for H<sub>2</sub> measurement in small 1- to 2-inch (DN25-DN50) sizes in pressures up to 70 bar (g), 1000 psig. It features accuracy of up to ±1% of reading with ±0.5% repeatability over a wide flow range of 0.0062 to 838 SCFM (0,01 to 1425 Nm<sup>3</sup>/h) under variable process temperatures, making it ideal for measuring many other process gases, waste gases and compressed air applications in food/beverage industry plants.

All FCI flow meters are calibrated in the company's own one-of-a-kind Calibration Laboratory where the instruments are calibrated in the actual gas they are to measure under the customer's



unique pressure and temperature conditions, such as H<sub>2</sub> at up to a pressure of 70 bar(g). Flow meter calibration using the actual gas method under customer plant operating conditions helps ensure accurate, consistent measurement rather than using the inferred gas method used by most manufacturers.

The ST80L Inline Flow Meter's thermal dispersion flow sensor's design is elegant in that it does not utilize any moving parts by employing solid-state platinum RTD sensors that are precision matched and embedded in equal mass thermowells. The sensor's design requires virtually no cleaning and is less prone to fouling than other flow measurement technologies when there is a concern about particulate laden gas streams.

Hydrogen molecules are extremely small and can leak through the threaded connections typically provided with many flow meters. FCI's inline H<sub>2</sub> flow meters, however, with their all-welded design in which the sensor is welded to the inline pipe spool eliminates concerns about potential instrument H<sub>2</sub> leaks for user peace-of-mind. Additionally the process connections of the inline pipe spool can be flanged or provided with a butt-weld joint that allows the inline thermal mass flowmeter to be welded directly into the user's piping or application equipment.

The ST80L inline thermal mass flow meter (pipe spool length of 9xDN) can be delivered with a unique low pressure drop Vortab Flow Conditioner. This flow conditioner is welded at the inlet of the flow meter allowing for very short piping installation lengths (only 3xDN required for upstream straight length) to provide accurate measurement in crowded plant equipment areas.

The durable and highly reliable ST80L Inline Flow Meter is optionally available with remote mounting capabilities where space is at a premium or the measurement point is not easily accessed. The remote mount transmitter, which has an option for local indication of flow, temperature and totalized flow, can be mounted up to 1000 feet (300 meters) away from the local flow element in the process piping.

The ST80L Flow Meter Series features scalable dual 4-20mA outputs that are standard. They are user assignable to flow rate or temperature. Outputs are user programmable to full flow range or subsets of full flow range. They are also isolated and have fault indication per NAMUR NE43 guidelines, and they are user selectable for high (>21.0 mA) or low (<3.6 mA). Standard digital outputs available include: HART (v7 compliant), Modbus RS-485 RTU/ASCII and USB Serial I/O. Optional: digital outputs that can be added are Foundation Fieldbus H1, PROFIBUS-PA, or PROFIBUS-DP.

Offering mass flow measurement for higher performance at an economical price with proven thermal dispersion technology, the ST80L Flow Meters eliminate the need for additional pressure and temperature sensors, flow computers, or other devices that are required with orifice plates, Venturis, Vortex shedding, and other volumetric meters.

The highly reliable ST80L Flow Meter also carries numerous agency approvals and certifications, including: ATEX, CE, CPA, CRN, FMc, FM, EAC/TR CU, EQM/ECAS, IECEX, NEPSI, SIL (IEC 61508), UKCA (UKEX).

Fluid Components International is a global company committed to meeting the needs of its customers through innovative solutions for the most challenging requirements for sensing, and measuring flow, pressure and temperature of gases.