Advanced Instrumentation for the Biofuel Industry

- Process Analyzers
- Nuclear Density Gauges
- Liquid Density Meters
- Gas Density Meters
- Flowmeters

Part of Thermo Fisher Scientific

Thermo SCIENTIFIC

Engineered Solutions for the Biofuel Industry

World Class Instrumentation

For over 30 years, Thermo Fisher Scientific has been designing and manufacturing world class process instrumentation. Our solutions have proven to enhance operational efficiency, ensure optimal product quality, maximize product yield and reduce manufacturing costs. We engineer every Thermo Scientific instrument for accuracy, durability and ease-of-use to ensure you have the right tools to help you advance process understanding, reduce downtime and achieve an ongoing return on investment.

Industry-Specific Solutions

Gaining a competitive advantage via process optimization is driving the demand for advanced instrumentation. By working hand-in-hand with our customers, we have created a broad range of biofuel-specific solutions that combine our extensive application knowledge with industry leading technology. The result: your organization will realize immediate, tangible benefits upon implementation.

A Range of Benefits

- Reliable, accurate and field-proven
- Easy-to-operate
- Durable and long lasting
- Low maintenance requirements
- Cost-efficient

Optimizing Your Plant Processes in Real-Time

From bioethanol to biogas, we understand the exacting challenges biofuel producers face. Our instrumentation and technology have been engineered to help you manage your production and distribution in real-time, enhance process efficiency, and improve product quality and environmental compliance. Thermo Scientific process analyzers and density and flow measurement systems streamline operational management, increase productivity and lower operating expenses related to:

- Sulfur and H_2S measurements in final products (liquid and gas)
- Biogas purity determination
- Biogas and fuel gas blending
- Fermentation profiling for corn and cellulostic bioethanol production
- Stochiometric control, end-point prediction and product quality/consistency in biodiesel production
- Product density measurement for custody transfer and product blending
- Process flow measurement throughout production processes.

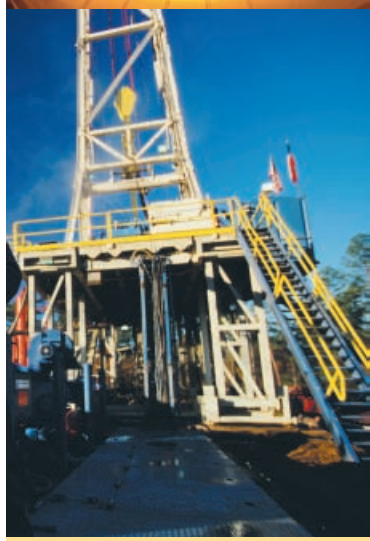
Having served many of the world's largest process licensors and plant operators, we bring a wealth of hands-on experience to product development and deployment. We work closely with our customers to design new solutions, or enhance existing ones, to ensure we continue to deliver the products and services your industry needs most.

Ongoing Support to Maximize Your Return

We offer a range of support options to ensure your Thermo Scientific products remain in peak operating condition. Maintenance, calibration and repair services are available on an ongoing basis to help you with instrument optimization and to reduce downtime. Because needs vary from one customer to the next, our company offers a number of support agreement levels, including field and depot repair services. We also maintain a spare parts inventory for rapid replacement and repair. Regardless of your needs, our staff is committed to providing you with outstanding customer service and support.

Service & Support Options

- Factory acceptance testing
- Installation and commissioning
- Spare parts kits
- Service and training
- Diagnosis and repair
- Technical support
- Application engineering
- Application upgrades
- Sample conditioning systems



Enabling customers to make the world healthier, cleaner and safer

Thermo SCIENTIFIC

Industry Leading Process Instrumentation
Thermo Scientific Analyzers

Solutions for the Biofuel Industry

SOLA II

Sulfur Detection in Parts per Million (ppm)

During biofuel processing, sulfur can be present in bioethanol product if sulfuric acid is used for hydrolysis or if the hydrolysis of plant cell structures frees up amino acids and other sulfur containing proteins. Residual sulfur can also be found in biodiesel, especially when sulfuric acid is used to fix the end-point of the transesterification process. By implementing the Thermo Scientific SOLA II, biofuel producers replace labor-intensive laboratory grab samples with online analysis to continuously receive process sulfur data, enabling rapid determination of sulfur contamination sources and timely corrective action. As a result, biofuel producers employing continuous manufacturing processes prevent a sulfur contamination spike from adulterating the finished product as well as negate the possibility of undetected sulfur by offline analysis. By providing reliable online sulfur detection, the SOLA II ensures higher product quality, greater operational efficiency and reduced manufacturing costs.

Applications

- *Bioethanol sulfur contamination*
- *Biodiesel sulfur contamination*

The SOLA II utilizes UVF technology, the same technology selected for ASTM D6751 and EN14214.

Prima δB

Process Mass Spectrometer

Bioethanol production processes must be continuously monitored to ensure optimal product yields. The Thermo Scientific Prima δB accurately monitors concentrations in real-time for rapid determination of process changes and enables users to efficiently perform critical startup or scale-up operations to expedite online production processes. It helps mitigate inherent fermentation broth sampling problems by monitoring the ethanol concentration in the vent gas or headspace that directly correlates to the ethanol production rate. By monitoring the metabolic state of the microorganisms according to the O_2 consumed and the CO_2 evolved in real-time, the Prima δB also allows for accurate and complete end-point prediction, more efficient throughput and better product consistency. In addition, sample points can be multi-plexed to provide a cost-effective production system.

Applications

- *Bioethanol fermentation profiling and end-point prediction*
- *Critical startup*
- *Process scale-up*

Flo-Cal

Measuring the Heating Value of Combustible Gases

With gaseous fuel blending operations, it is critical to stay within environmental regulations and burner specifications. Effective monitoring of biogas content and purity requires effective instrumentation. The Thermo Scientific Flo-Cal is an online, high-speed calorimeter that measures the heating value of gas compositions in either Wobbe Index or Calorific Value. It features quick response and is easy to maintain and calibrate. When used for biogas measurement, the Flo-Cal provides critical information that enables automatic control of auxiliary fuel additions to ensure regulations are safely and continuously met.

Applications

- *Biogas purity monitoring*
- *Gas blending operations*
- *Off-gas heating value*

Antaris EX

FT-NIR Process Analyzer

Ensuring product quality via the completion of transesterification and glycerol removal requires rapid, precise analysis. The Thermo Scientific Antaris EX is a process-designed, near-infrared spectroscopy system that enables biodiesel and bioethanol producers to reliably perform continuous online monitoring of key production parameters, including ethanol, glucose, maltose, maltose-triose, DP4+, glycerol, lactic acid and acetic acid in bioethanol production, or oil quality, end-point neutralization control, and ester content in fatty acid methyl ester (biodiesel) production. The ester content can be monitored as part of the production process for end-point prediction or to establish blend proportions in B0 to B100 products. By assessing parameters simultaneously, the Antaris EX provides valuable information for closed-loop control and process monitoring. In addition, its ability to perform multiple sample point monitoring ensures a cost-effective solution.

Applications

- *Bioethanol fermentation profiling and end-point prediction*
- *Biodiesel ester content and end-point prediction*
- *Biodiesel blend ratio assessment from B0 to B100*
- *Biodiesel feed oil characterization*
- *Biodiesel water content and acid value*

Tracker XP

H_2S Detection

While online detection offers many advantages, the Thermo Scientific Tracker XP fills the need for a more cost-effective H_2S measurement system. Capable of measuring in ppb or at percent levels, it uses a lead acetate tape detector and can automatically switch between two independently calibrated ranges based on the measured concentration in the system. Simple to operate, the Tracker XP offers the ability to reliably monitor H_2S levels in the biogas process, enabling producers to meet environmental regulatory requirements and process parameters.

Applications

- *Biogas sulfur contamination*
- *Biogas process exhaust gas monitoring for scrubbing and cleanup*

Industry Leading Process Instrumentation
Thermo Scientific Sensors

Solutions for the Biofuel Industry

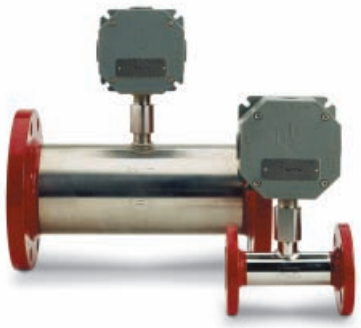
DCT6088, TX10 & Model 6500

Ultrasonic and Inline Turbine Flowmeters

Flow variables including velocity, flow rate and volumetric flow require continuous measurement to ensure accuracy and accountability within process operations. Thermo Scientific ultrasonic flowmeters, including the DCT6088 and TX10, combine digital signal processing (DSP) with correlation detection methods to provide superior performance under the most demanding conditions. These non-intrusive models are ideal for process pipes, configure quickly, and install easily without process interruption or downtime. The Thermo Scientific Model 6500 inline turbine flowmeter is an economical and highly reliable solution for smaller pipes ranging from 13 mm to 300 mm (0.5 in to 12 in) in diameter. Designed to handle tough industrial applications, turbines are also easy to install and maintain for maximum process efficiency.

Applications

- *Industrial measurement (liquid or gas)*



DensityPRO, DensityPRO+, CutPRO & 3680

Nuclear Density Measurement

Spill and leak prevention is a major concern of pipeline operators. Thermo Scientific gamma-based, non-intrusive nuclear density gauges lead the industry, and are designed to detect and measure using extremely small sources in the most challenging process conditions, including pipes that range from 25.4 mm to 1020 mm (1 in to 40 in). Using an integrated transmitter/detector, the gauges significantly lower installation and wiring costs and mount around existing process pipes, eliminating the need for pipe modifications and process downtime.

Applications

- *Product process lines*
- *Product interface detection*

M-PULSe®

Multi-Path Ultrasonic Liquid flow measurement System

Rapid, accurate flow metering on large pipes is essential during fiscal and custody transfer. The multi-path, intrinsically safe Thermo Scientific M-PULSe ultrasonic flowmeter features patented transducer technology which eliminates the possibility of sparks. The spool piece has been certified as ATEX Zone 0 Intrinsically Safe, allowing it to be used in the world's most hazardous environments. In addition to ensuring operator safety, the system provides superior performance via four-path transit time technology, enabling the highest attainable accuracy and repeatability on liquid fuel products. The explosion-proof M-PULSe features a compact design, is easy to install and maintain, and features transducers that can be changed under line pressure without interrupting the process, significantly reducing downtime.

Applications

- *Fiscal/custody transfer*
- *Leak detection*

Sarasota
PD900, FD900, ID900 & SG900

Gas Density Measurement

Continuously and accurately monitoring the density of a gaseous process is necessary to ensure both product quality standards and process optimization are achieved. Thermo Scientific gas density meters have proven to meet the challenge of fiscal/custody transfer gas metering, liquefied gas metering, fuel gas management and burner control. When compared to sampling methods, the meters enhance productivity, minimize product waste and reduce costs by providing real-time control.

Applications

- *Gas flow*
- *Fuel gas feed forward CV control*
- *Mass flow for boiler feed*
- *Specific gravity*

Sarasota
910, 950 & 960

Liquid Density Measurement

Rapid, accurate and repeatable density measurement of liquid biofuels facilitates custody transfer. Using Thermo Scientific liquid density meters, biofuel manufacturers capitalize on continuous, online density monitoring to achieve process optimization and less labor-intensive quality control. The compact, lightweight, easy-to-install density meters reduce sampling costs and are immune to plant vibration, enabling installation directly into existing pipe work without the need for upstream flow conditioning, instrument supports or pipeline clamps.

Applications

- *Product blending*
- *Batch control*
- *Dilution measurement*
- *Interface detection*
- *Product identification*
- *Tanker loading*
- *Fiscal metering / custody transfer*

Process Instruments

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