Reaching goals efficiently

Intelligent measuring technology for the biofuel industry
Climate change affects us all. All over the world people are researching environment-friendly fuels such as bioethanol or biodiesel. The main focus of research is the car and fuels which do not increase CO₂ emissions. It’s important that we start now. After all, one of the earliest cars, the world-famous Ford Model T was originally powered by ethanol before Henry Ford switched to mineral-based fuels. Biodiesel presents a convincing alternative because not only is it CO₂ neutral, but it is also sulfur-free, biodegradable and has good lubrication qualities. The challenge is to create manufacturing processes for alternative fuels that are CO₂ neutral while keeping operating costs low. Achieving these goals requires precise maintenance of pressures and temperatures, careful dosing of raw materials and precise measurement of material flows. Intelligent measuring technology provides plant managers with the best tool for precisely controlling these processes.

KROHNE moves with the times and offers innovative measuring technology for efficiency in bioethanol and diesel production processes. With a wealth of measuring devices for the critical points in the process, KROHNE ensures that the CO₂ balance is correct not only in the engine combustion process, but also during manufacture. The spectrum of products ranges from classic flowmeters to reliable radar level meters in storage silos and innovative mass measuring devices for fermentation and distillation processes.
The main processes

Manufacturing biodiesel is nothing more than refining vegetable oil. Rapeseed oil or another suitable raw material is mixed with methanol. This mixture is then heated in the presence of a catalytic converter. Finally, a variety of purifying measures remove the excess methanol and other impurities from the biodiesel. Only in this way can biodiesel attain the required purity and quality. This process also produces glycerin, a valuable by-product, that can be used for other applications in the chemical industry.

The carbohydrates contained in plants form the basis for bioethanol. When enzymes and yeast bacteria are added, they produce alcohol. Plants such as corn or potatoes that contain starches must undergo a pulping process with enzymes before fermentation can begin. Water is removed from the alcohol produced by this process until only a very pure bioethanol remains. The spent grain left behind as a by-product is used as high-quality animal feed.

A quick guide to biodiesel production
- Raw materials include vegetable oil and methanol
- Transesterification at high temperatures and with a catalytic converter
- Separation of glycerin and biodiesel
- Reclamation of the methanol from all products and by-products
- Distillation to purify the methanol and the water for further use in the process

A quick guide to bioethanol production
- Addition of biomass (corn, rapeseed, ...)
- Producing a mash (addition of water and enzymes)
- Fermentation (addition of yeast)
- Distillation
- Dewatering
- Purification and drying of the by-products
KROHNE measuring technology solutions for your biofuel facility

Modern facilities for manufacturing biofuels are models of efficiency. By-products are either reused in the process or are recycled for use in other applications. Steam and heat are recovered and even the smallest sections of the process are optimized to maximize efficiency. But there is still plenty of room for improvement. Researchers worldwide are investigating methods for increasing the yield to bring these facilities to maximum production.

Plant operators need full, real-time information about the performance of each single component in their production facility. Measuring technology delivers this information.

And this technology must not only deliver precise data, but perform robustly and reliably for years and years. That’s why leading biofuel producers have been choosing KROHNE’s experience and expertise for many years. In state-of-the-art biodiesel and bioethanol production facilities, positioning KROHNE devices for measuring flow, fill level, temperature and pressure located at a wide variety of measuring points, ensures an efficient, safe and cost-effective process.

Rise above the difficulty – level measurement with OPTIWAVE

The raw material, rapeseed or sunflower seed is delivered in bulk and stored in large silos. Level measurement in tanks and silos is difficult. High dust levels, swirling dust clouds, cone-shape piles and complex plant components combine to make the precision measurement of fill levels very difficult. The KROHNE OPTIWAVE was designed specifically for applications in the bulk materials industry and is not affected by unfavorable measuring conditions. The FCMW radar device has great dynamics so that even products with poor reflective qualities can be measured reliably and the production process will not grind to a halt.

Contactless radar features:
- Precise resolution and high accuracy
- High signal dynamics
- Reliable measurement, even in the most difficult measuring environments, such as in dust or in environments with stirrers and other complex plant components
- Easy installation, no calibration necessary in the tank or silo
Stay on the safe side – vortex flow measurement with OPTISWIRL

OPTISWIRL by KROHNE is unbeatable, particularly for drying processes or for washing biodiesel. OPTISWIRL is the only vortex flowmeter with integrated pressure and temperature compensation in 2-core technology. It provides accurate measurement of operating, standard volumetric and mass flow of conductive and non-conductive liquids, gases and vapors. Full, precise data about these operating parameters ensure that plant managers are safe in the knowledge that their processes are running at optimal levels. These data also form the basis for calculating the energy balance.

OPTISWIRL features:
- 2-core field unit with integrated pressure and temperature compensation
- Strong construction and therefore excellent long-term stability
- Intelligent signal processing (ISP) for accurate measurement processing, eliminates external interference
- Easy to install
Precision dosing to exact recipe specifications – mass measurement with OPTIMASS

The number of catalytic converters and the precision dosing of raw materials, such as methanol, are critical factors in the biodiesel production process. OPTIMASS measures the actual mass which means that the operator can add the exact quantity of raw material specified in the recipe. Precision dosing means that the measuring device pays for itself quickly especially in processes using very expensive raw materials.

Thanks to its straight measuring tube and adaptive sensor technology (AST) the unit can be used in any location. A single units provides users with all of the process parameters - mass, flow, density and temperature. This unit even measures viscous products like glycerin with absolute precision. For this reason, OPTIMASS can be used at many points in the manufacturing process. It is ideal for measuring flow rates between individual steps in the process or for the precision calculation of fuel flows and quantities.

OPTIMASS features:
- High precision measurements (measuring accuracy: 0.1%) regardless installation position
- Multifunctional sensor for direct measurement of density, mass, volume and media temperature
- Measurements do not depend on product temperature, density or viscosity
- Low energy consumption, low operating and installation costs
Always ready – variable area flow measurement

Features of the H250 variable area flowmeter:
- No power supply required
- High accuracy even at very low flow rates
- Low maintenance and service costs

The H250 variable area flowmeter is the ideal solution for any measuring location in a biofuel facility that requires reliable, simple flow measurement that does not require a power supply. Gases such as air, ammonia, propane and nitrogen as well as fluids such as air or methanol can be easily measured. These flowmeters have a modular design, so that even older units can be upgraded step-by-step to modern communications technology and standards such as Profibus PA.
At home in any measuring situation – electromagnetic flow measurement with OPTIFLUX

Dosing enzymes and yeast bacteria requires precision control – exactly the right task for an OPTIFLUX electromagnetic flowmeter. High reliability and accuracy, (0.15% of measurement value), low maintenance requirements, low power consumption and negligible pressure loss. These are all features that have made the OPTIFLUX the flowmeter of choice for more than 40 years. There is no measuring situation in which OPTIFLUX could not be used. It will measure liquids with a high bubble content and very turbulent solids and liquids. Installing the OPTIFLEX is easy, too - thanks to the wide range of connectors available [flange, Tri-Clamp or milk pipe].

OPTIFLUX special features:
• Robust and reliable
• 3 x 100 percent diagnostics, includes application diagnostics, out-of-spec testing and equipment diagnostics
• Calibration accuracy in standard unit

Stay informed about your process – temperature and pressure measurement with KROHNE sensors

Knowledge of the exact pressure and temperature is crucial for moving a process forward to achieve optimal performance. These are the key values for efficient energy use and for ensuring the highest yield rates. With KROHNE sensors, plant operators have accurate, real time information about the fermentation, rectification and drying processes.

Features of KROHNE temperature sensors:
• Wide variety of process connections
• Cable sensors and surface temperature sensors available
• Backed by 60 years experience and expertise
• Suitable for the most difficult applications

Features of KROHNE pressure sensors:
• No dead space, flush membrane
• Vacuum-resistant and overload-protected
• 2-core connection
Exactly calibrated calculation

Like all fuels, biodiesel and bioethanol are subject to taxes and duties. Exact measurement of turnover is therefore essential in order to make sure that the calculations are correct. Likewise, buyers and dealers must also be able to depend on the accuracy of measured quantities. This measurement can be carried out in terms of volume or mass.

KROHNE has already gained valuable experience in this area and consults closely with contractors and end users regarding the installation of flowmeters and the necessary peripherals. Our mission is to ensure that everyone from the producer right to the end user has exactly the precision information they require.
The true quality of a flowmeter shines through in extreme operating conditions. Extreme in this case means processes where pressures and vacuums fluctuate widely during the measurement of inhomogeneous material or media containing a high proportion of solids.

Therefore, starting with the calibration, we at KROHNE do everything to ensure that our flowmeters perform impressively, with the highest degree of accuracy, reliability and reproducibility, even under extreme conditions.

To ensure top performance, each KROHNE flowmeter is wet-calibrated with direct comparison of volumes - by far the most accurate calibration method currently available. The calibration of electromagnetic and ultrasonic flowmeters is performed on the world’s largest calibration system at the KROHNE-Altometer facility in Dordrecht (Netherlands).

It comes as no surprise that the accuracy of the KROHNE calibration stations is generally ten times higher than that of the flowmeters under test. For our customers this guarantees maximum levels of measurement certainty and precision for our flowmeters under reference conditions.

Another benefit for our customers: KROHNE supplies the largest NKO-certified flowmeters worldwide. This guarantees the highest degree of measuring accuracy – even under difficult operating conditions.