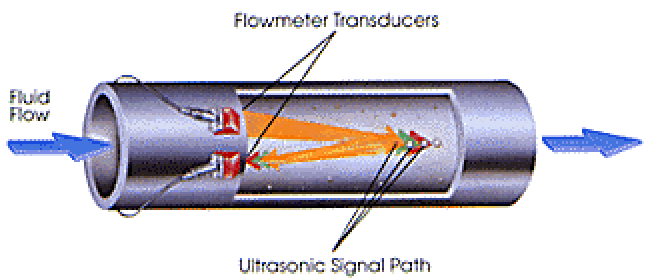
Latest Technology

Flowmeters for Fluids and Gases

New Generation Ultrasonic Flowmeter Technology for Enhanced Multiphase Flow Capability



GE Panametrics announces the introduction of the TransFlection® technique, a new generation of ultrasonic flowmeter technology for difficult, multiphase fluids. TransFlection is a breakthrough measurement technology available exclusively from GE Panametrics. This patented technique was developed for flow measurements in multiphase fluids such as raw sewage, sludge, slurries, tar sands, oil-water-gas mixtures, highly aerated fluids, and other demanding applications. TransFlection mode is available, in addition to GE Panametrics' patented Correlation Transit-Time™ mode, in many of GE Panametrics' portable and fixed-installation flowmeters.

These flowmeters use Correlation Transit-Time mode for a high signal-to-noise ratio and accurate, drift-free flow measurements in fluids ranging from completely clean liquids (containing no "scatterers"), where Doppler-type meters cannot work, to moderately dirty liquids with enough entrained solids, second-phase liquid droplets or gas bubbles to cause conventional transit-time meters to fail. When conditions become too attenuating, the meter's Digital Signal Processing (DSP) circuits are switched to TransFlection mode to measure multiphase streams that cannot be measured by any other technique. Switching between Correlation Transit-Time and TransFlection modes is easily accomplished via the meter's keypad. Both modes employ all the same equipment. Using clamp-on transducers, the meters measure flow rate through metal, plastic or even concrete-lined pipes without penetrating the pipe wall, in pipes from 1/2 inch to over 200 inches in diameter. Measurement in either mode is noncontaminating and obstructionless, causing no pressure to drop.

The DF868 Automatically Adjusts to Changing Fluid Properties

Standard in all DF868 meters, our unique Automatic Tracking Window (ATW) feature ensures accurate flow measurements even when fluid properties are unknown or changing. Like the seek mode on your car stereo, ATW dynamically sweeps the receiver window whenever the sound speed of the fluid changes. This powerful feature lets you measure flow when the fluid sound speed is unknown, is changing due to large temperature shifts, or when a new liquid starts to flow in a multiproduct pipeline.

ATW works for both clamp-on and wetted transducer applications by searching for a reliable ultrasonic receive signal. It does this by varying the time between the transmit signal and the receive signal window until the receive signal is found. The tracking window automatically sweeps through a range of time intervals based on the minimum and maximum expected sound speeds programmed by the user.

The window moves (tracks) in response to changes in the fluid sound speed. Once the optimal signal is found, ATW locks onto it until another large change in sound speed occurs. When this happens, ATW returns to the seek mode until the optimal signal is found again.

Moisture Analyzers

Aluminum Oxide Hygrometry Theory

The thin-film aluminum oxide hygrometer sensor is a transducer that converts water vapor pressure into an electrical signal. The sensor has found numerous applications in the measurement and control of moisture because of its small size, rapid response time, ability to cover a wide range of dew points from -110°C to 60°C, capability of measurement in on-line process streams, and ease of installation. The sensor can be used to measure the moisture content in liquids as well as gases. This sensor will measure dew points at all pressures from a few microns of mercury to 5000 psig, thus providing a pressure dew point and minimizing system effects. The sensor can be used in situ for many applications or can be used in simple by-pass stream when necessary.

Theory of Operation

The aluminum oxide sensor consists of an aluminum strip that is anodized by a special process to provide a porous oxide layer. A very thin coating of gold is evaporated over this structure. The aluminum base and the gold layer form the two electrodes of what is essentially an aluminum oxide capacitor.

Water vapor is rapidly transported through the gold layer and equilibrates on the pore walls in a manner functionally related to the vapor pressure of water in the atmosphere surrounding the sensor. The number of water molecules absorbed on the oxide structure determines the conductivity of the pore wall. Each value of pore wall resistance provides a distinct value of electrical impedance, which in turn is a direct measure of the water vapor pressure.

Electronic consoles for these sensors are basically AC impedance measuring instruments whose characteristics have been chosen to be compatible with the aluminum oxide element. With a constant voltage applied to the sensor, the change in the impedance of the element, due to a change in water vapor pressure, results in current change. Calibration of signal with dew point then completely defines the sensor response.

Oxygen Analyzers

The GE Panametrics Thermoparamagnetic Analyzer Solves The Problems of Traditional Paramagnetic Analyzers

Paramagnetic oxygen measurement

Most commercially available paramagnetic oxygen analyzers can be classified as either magnetodynamic (dumbbell type) or thermoparamagnetic (magnetic-wind type).

Magnetodynamic (dumbbell) analyzers

Dumbbell analyzers use mechanical movements to measure oxygen concentration. Since they provide a direct measurement of paramagnetic susceptibility, they are influenced by the changing magnetic susceptibility of changing background gases in the form of a zero-shift error. The most significant limitation of the dumbbell type analyzer, however, is that it is a delicate instrument with moving parts and quite sensitive to position (level). It is even more sensitive to vibration, which can cause large errors in measurement. This makes dumbbell type analyzers unsuitable for use in demanding industrial process and shipboard applications.

Traditional thermoparamagnetic (magnetic wind) analyzers

The magnetic susceptibility of oxygen varies inversely with its temperature. When an oxygen-containing gas mixture is heated in a nonhomogeneous magnetic field inside a test chamber, a flow of gas, or magnetic wind, is created that can be measured by its thermal effect on an electrical resistance element.

The magnetic-wind type analyzer resolves the major limitation of the dumbbell type since it has no moving parts and can be made quite rugged in construction. For this reason, it is one of the most widely used types of oxygen analyzer. The traditional magnetic-wind type analyzer, however, is based on an antiquated design and has some limitations of its own. The wind-sensing wire filament must be maintained at a high temperature, up to 300°C. In some applications, sample components can react on the hot filament, causing changes in filament temperature and erroneous readings. High temperatures also mean stability and reliability problems. The most significant limitation, though, is that traditional magnetic-wind type analyzers do not compensate for variations in background gas and/or magnetic and thermal properties.

The GE Panametrics thermoparamagnetic analyzers

The GE Panametrics analyzers were designed to take advantage of the superior characteristics of the thermoparamagnetic technique while eliminating its drawbacks. This modern design replaces the hot filament with thermistors, eliminating a source of erroneous readings, while greatly improving stability and reliability. A microprocessor and unique zero-shift circuit automatically compensate for variations in background gas composition or pressure, while providing real-time error detection. The compact, rugged analyzers are designed for field-mounting at the process measurement point, minimizing sample conditioning and ensuring the best sample and the fastest possible response. The dual-chamber oxygen cell makes it insensitive to contamination and flow variation.

Gas Analyzers

Binary Gas Analyzer Theory

The TMO2-TC measures the concentration of a gas in binary or pseudo-binary gas mixtures by measuring the thermal conductivity of the sample gas and comparing it to the thermal conductivity of a selected reference gas. Two ultrastable, precision glass-coated thermistors are used—one in contact with the sample gas, and the other in contact with the reference gas (such as air in a sealed chamber). The thermistors are mounted so that they are in close proximity to the stainless steel (or Hastelloy) walls of the sample chamber. The entire transmitter is temperature controlled, and the thermistors are heated to an elevated temperature in a constant-current Wheatstone bridge. The thermistors lose heat to the walls of the sample chamber at a rate that is proportional to the thermal conductivity of the gas surrounding them. Thus, each thermistor will reach a different equilibrium temperature. The temperature difference between the two thermistors is detected in the Wheatstone bridge, and the resulting bridge voltage is amplified and converted to a linear 4- to 20-mA output proportional to the concentration of one of the constituents of the binary gas mixture. The TMO2-TC Transmitter has polarity inverse jumpers that permit the measurement of gases (such as CO_2) with relative thermal conductivity less than air or nitrogen.