



Mixmeter

Multiphase Meter

Mixmeter is a simple, compact, in-line multiphase meter for well test, reservoir management and allocation metering applications. It forms one of the key products in our integrated multiphase solutions programme. Suitable for choke bridge or wellhead installation, it can be used to replace a test separator or extend the throughput of a test facility.

Mixmeter provides accurate, repeatable and simultaneous measurement of oil, water and gas without the cost or time penalties incurred by separation technology. A fully developed second-generation multiphase meter using the best available technology, Mixmeter is a reliable solution for production measurement providing you with the information to enhance your production capability.



Mixmeter is a simple, installation independent, multiphase meter. A combination of proven technology, established measurement techniques and simple design, its performance is unaffected by flow regimes or the dominant phase (oil or water) and it requires only minimal configuration and calibration.

Mixmeter has no moving parts. It comprises a single spool (less than 900mm in length) containing pressure and temperature sensors, a patented mixer and a dual energy gamma phase fraction instrument.

The elimination of the velocity differences (slip) which occur between gas and liquid phases (often in excess of 100:1) are critical to multiphase measurement accuracy and a key operating principle of Mixmeter. Mixmeter achieves this by mixing the flow with an innovative homogeniser ensuring that evenly dispersed flow is always present and allowing the use of simple, established techniques for bulk velocity and phase fraction measurement. This renders Mixmeter immune to installation effects or changing flow conditions and allows it to avoid the use of

complex slip flow models that can be unpredictable and unreliable in new applications. The turbulent flow caused by the dual vortex effect of the mixer also discourages the formation of scale or wax precipitation in the measurement section.

The homogeniser in Mixmeter is also designed to generate a characteristic differential pressure (DP) for bulk measurement, a technique well established for its stability in multiphase flow. The DP provides accurate measurement and has been proven in laboratory and field applications over a wide range of fluids.

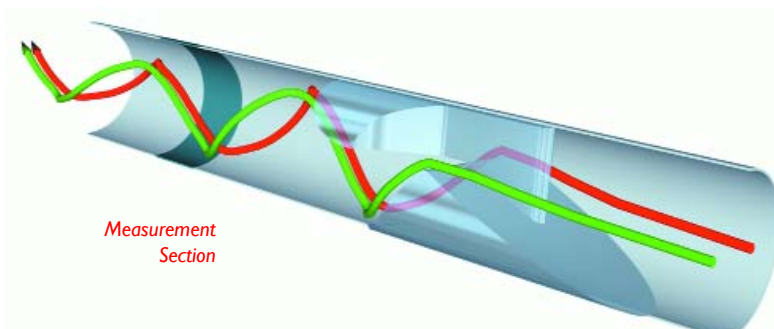
Phase fractions are measured by a dual energy gamma absorption instrument. Dual energy gamma is used because of its stability in varying process conditions such as dominant phase or fluid properties. Mixmeter uses a single Caesium¹³⁷ source which is already used extensively for density measurement in oil production. This technology provides high resolution and low uncertainty giving Mixmeter accurate measurement and differentiation between the three phases throughout the full operating envelope.

Mixmeter field equipment is designed for minimal power consumption and each component has been selected for its simplicity and reliability. All data processing is performed by the safe area controller and the field interface is industry standard RS485.

The controller has a configurable graphical interface running under WindowsTM NT that can be operated by semi-skilled staff and features multi-level security access. Mixmeter can operate continuously or as a 'start-stop' well test device and is operated via simple 'click' buttons and drop down menus. The controller can be interfaced to or operated by a distributed control system (DCS) using Modbus protocol.

Measurement results are displayed in both tabular and graphical formats (in US or SI units) and the display screen also shows process variables and operating alarms. Results can be displayed at process conditions or corrected to standard (or other) conditions with the use of look-up tables. All results are saved and can be imported into a WindowsTM program for later evaluation or re-processing. Well test reports can be printed locally or saved. Fluid data (such as PVT correction data) can be updated directly from the controller and Mixmeter can store and automatically use the fluid properties for a number of different wells.

Calibration is performed from the controller and verification against previous calibration is a 'single-click' operation. The software has full on-line help and manuals to support your operating staff.



Mixing Effects of Homogeniser

Compact

Mixmeter is a full-bore, in-line, multiphase meter. It is less than 1 metre in length and can be installed either horizontally or vertically. It has an extremely simple interface and can be operated by semi-skilled staff.

Reliable

All components are field proven and certified for hazardous area use.

Integration

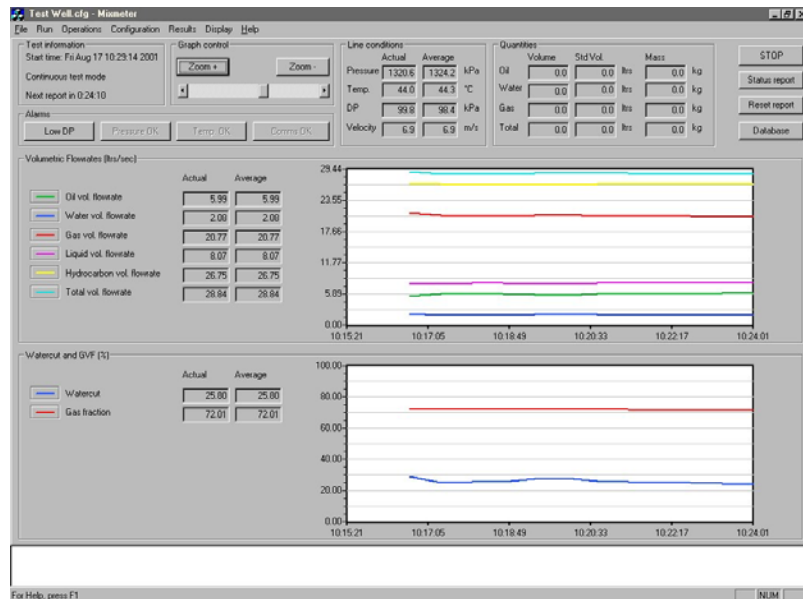
Mixmeter is capable of integration with a plant-wide control system and can report to and be operated by a distributed control system. All Mixmeter data is stored and can be downloaded for processing off-line in Windows™ software.

Installation independent 'Plug & Go'

Mixmeter is isolated from any installation effects by the homogeniser. It requires minimal calibration and configuration and can be installed in any site without needing complex site specific calibration.

Continuous phase independent

Mixmeter uses dual energy measurement that measures the amount of each phase in the measurement section at a molecular level. It is not affected by dominant phase and operates



Mixmeter user interface

throughout the inversion region. Mixmeter is unaffected by process and velocity fluctuations resulting from varying flow regimes.

Flow regime & slip independent

Mixmeter eliminates the slip that occurs between the liquid and gas phases and uses simple measurement rather than complex modelling which is subject to variations in fluid properties.

Easy configuration

Mixmeter can be configured from a chemical analysis reducing set-up costs. It does not need to 'learn' a new application because it is isolated from the effects of installations and fluid variations by

the homogeniser.

Simple calibration

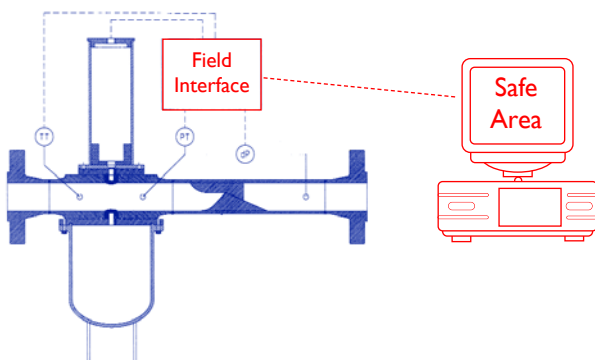
Mixmeter performance can be easily verified whilst in operation through the use of a 'purge loop' containing a single phase (such as instrument air).

Low scale deposition

Mixmeter produces vigorous swirl flow in the measurement section of the meter that reduces the formation of scale and wax.

Low pressure drop

Pressure drop in the Mixmeter is a function of velocity and gas void fraction (at actual conditions). Mixmeter is designed to produce a minimal pressure drop.



Calibration

Calibration and performance verification is extremely simple and a procedure is provided for each application.

Configuration

Configuration can be performed using a full fluid analysis or samples. Updates can be simply performed from a disk.

Patents

Mixmeter is patented technology. The following patents are granted or pending:

Norwegian (321078), Canadian (2201114), European, Australian, American, Brazilian, Japanese, Russian, International.

Mechanical & Electrical

Sizes	2 - 6"
Weight	Less than 500kg
Materials	316L (others available by request)
Rating	EExd Zone I IIb T4 IP66
Power	24vDC or 100vAC - 240vAC
Consumption	30W (max) at 24vDC
MTTF	5 Years CE Compliant

Flow Computer & Interface

Rating	Safe Area IP42
MTTF	5 Years CE Compliant
Operating modes	Well test or continuous Multiple level security access Can be run remotely using Modbus protocol US or European unit available
Interfaces	Field to Flow computer RS485 Flow computer to plant DCS RS232/Modbus Fluid, PVT and process data can be stored for individual wells
Available data outputs (configurable)	Volumetric flowrate (of each phase at actual or standard conditions). Mass flowrate for each phase. Multiphase flow velocity Density Temperature Pressure Water Cut % GVF (Trending of all of the above is available)
Alarms	High/low pressure, High/low DP, High/low temperature, communications failure

Performance Data

Operating envelope	Watercut 0 - 100% GVF 0 - 90% Velocity 1 - 30m/s multiphase velocity (under high GVF conditions the gas velocity may exceed these figures, contact Jiskoot for details)
Accuracy	0 - 65% GVF Watercut ±4% (of full range) Liquid ±2.5% (of reading) Gas ±9% (of reading) 65 - 90% GVF Watercut ±5% (of full range) Liquid ±5% (of reading) Gas ±10% (of reading)

**Above 90% errors increase but the meter still operates. Please contact Jiskoot for more details*

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