Phase Dynamics, Inc.
1251 Columbia Drive
Richardson, TX 75081 USA
E-Mail sales@phasedynamics.com
Tel: 972-680-1550
Fax: 972-680-3262

Phase Dynamics

Technology for Precision Measurements

Compact Cyclone Multiphase Meter (CCM)

- **Compact And Simple to Repair by Local Personnel**
- **2 Phase Separation Assures Measurement Quality**
- **Unique Swirl Elements Assure Separation & Control of Slugging Conditions**
- **Highest Quality Components Fisher Valves/Actuators & MicroMotion Coriolis**
- **Control and Measurement Electronics in One Package**
- **Fast Well Testing Typically 4 Hours per Well or Less**
- **Turn Down Is Primarily Line Size & Instrumentation Dependent**

The system is a modern version of a traditional 2 phase separator. Standard industry methods for water cut and gas/liquid flow measurement are used.

Well testing can be done quickly and accurately. This is due to the small liquid volume and short time required to establish equilibrium.

Finite element analysis of well conditions and fluid parameters is performed to optimize the CCM's design. This provides assurance of the product's operational envelope at delivery.

An integrated control system has been designed by Phase Dynamics to simplify and improve performance for maximum system reliability. Simple operator commands start, stop and display well test results. There are no extra transmitters, PLC's or PC's required. The CCM can be used as a stand-alone system using the local operator interface, control and display, or remotely using the digital interface via Modbus.

The first stage of gas liquid separation has a swirl element to create tangential velocity for separation. This creates a force of more than 50 g's on the 3 phase flow. Unlike other systems, which use a simple nozzle to impart the tangential velocity.

The second stage completes the separation of liquids from the gas by using additional swirl elements. This provides for very dry outlet gas. The gas is then recombined with the liquid after the control valves.

The separated liquid is routed through a full-range microwave water cut analyzer forming an integral part of the CCM. There are no issues with salinity affecting the measurement because of Phase Dynamics' ability to properly handle salinity based on the measurement physics.

Coriolis flow meters for the gas and liquid measurement are used for mass flow and density. Observing the density allows determination of the quality of the overall performance of the system. The user then knows that the measurement uncertainty is minimized.

The CCM system has been accepted for fiscal well testing in Alaska.

TECHNICAL SPECIFICATIONS - COMPACT CYCLONE MULTIPHASE METER (CCM)

The CCM meter is an engineered product to the specific customer requirements. The following is a general description of the system specifications.

General

Inlet & Outlet Pipe dimensions	2 – 6 inch Available
Materials	316L Stainless steel typical, skid is painted black iron
Wetted parts	316L Stainless steel, restricted to instrument specifications
Pressure range	0 to 100 bar
Flowing Temperature range	0 to +100°C Standard – other Temperatures available
Instrument Temperature	0 to +55°C ambient
Installation	Skid mounted in horizontal or vertical pipe
Power supply	120 VAC, 230 VAC 50/60 Hz or 24 VDC
Power consumption	Approximately 160 Watts
Pressure drop	Typically 1 bar (15 psi), depends on flow rates
Weight and size	Dependent on design flow rates

Performance

Measuring range

Water Cut	0 to 100%
GVF at operating conditions	0 to 100% GVF: Gas Void Fraction
Liquid and gas flow rates	The configuration of flow meters and instruments to be designed according to the actual flow rates and specifications
Flow regimes	All, but for some special conditions, such as severe slugging flow, contact manufacturer

Individual flow meters

Gas flow meter	Coriolis
Liquid flow meter	Coriolis
Water Cut Analyzer	Phase Dynamics Inc. Microwave Water Cut Analyzer

Typical overall uncertainties

Liquid flow rate	Relative uncertainty of +/- 5 %
Gas flow rate	Relative uncertainty of +/- 5 %
Water Cut	Absolute uncertainty of +/- 3 to 5 %, depending on application

Signal Interfaces

Inputs

Digital	ModBus RTU

Outputs

Digital	Total Oil, Water & Gas, Water Cut, Pressure, Temperature, Level, Initiate Test, more
	ModBus RTU, other options available

Approvals and Compliance

European standard	Zone 1 and 2, EEx de IIC T6, GOST Standard
Factory Mutual & CSA	Class I, Div. 1, Groups,C,D Class II,Div. 1, Groups E,F,G
Electromagnetic radiation	EMC

Installation and site requirements

Calibration (not required in the field)	Standard calibration procedures for single phase flow meters
Pneumatic air valve controls	Typical instrument air @ 7 barg (100psi)

Visit our Website at ***WWW.PHASEDYNAMICS.COM***

PHASE DYNAMICS