




# VG MPFM

## Inline Multiphase Flow Meter



-  Surface Instrumentation
-  Inline Measurement
-  Mobile & Permanent Configurations



## VG MPFM Features:

- **Online Measurement and Monitoring**
- **Accurate and Precise Measurement**
- **Long-Term Stability and Reliability**
- **Remote Access and Monitoring**

**Paya Petro-Technology Company (Petroyatech™)** is a domestic knowledge-based company providing metering solutions to the oil and gas industry. Technical and R&D team of the company have over a decade of experience in design and production of density, thickness and flow measurement instruments.

VG Multi-Phase Flow Meter makes advantages of Gamma-ray absorptiometry in combination with venturi tube and capacitance-based water cut meter to give sense about fluid velocity, phase fractions and phase features as well as flow regimes. Measurement of oil/water/gas three phase flows independent of flow regime and water salinity is what a field operator expects from an ideal MPFM and our proposed configuration can meet this requirement.



## Advantages

- Cost Effective
- Accurate & Repeatable with Long-Term Stability
- Easy Installation and Operation
- Low Pressure Loss/Low Back Pressure
- Compact and Light Weight Design
- Covering Wide Range of Oil Reservoir Conditions
- Field Proven Technology
- Remote Access to Meter
- In-line Fluid Sampling

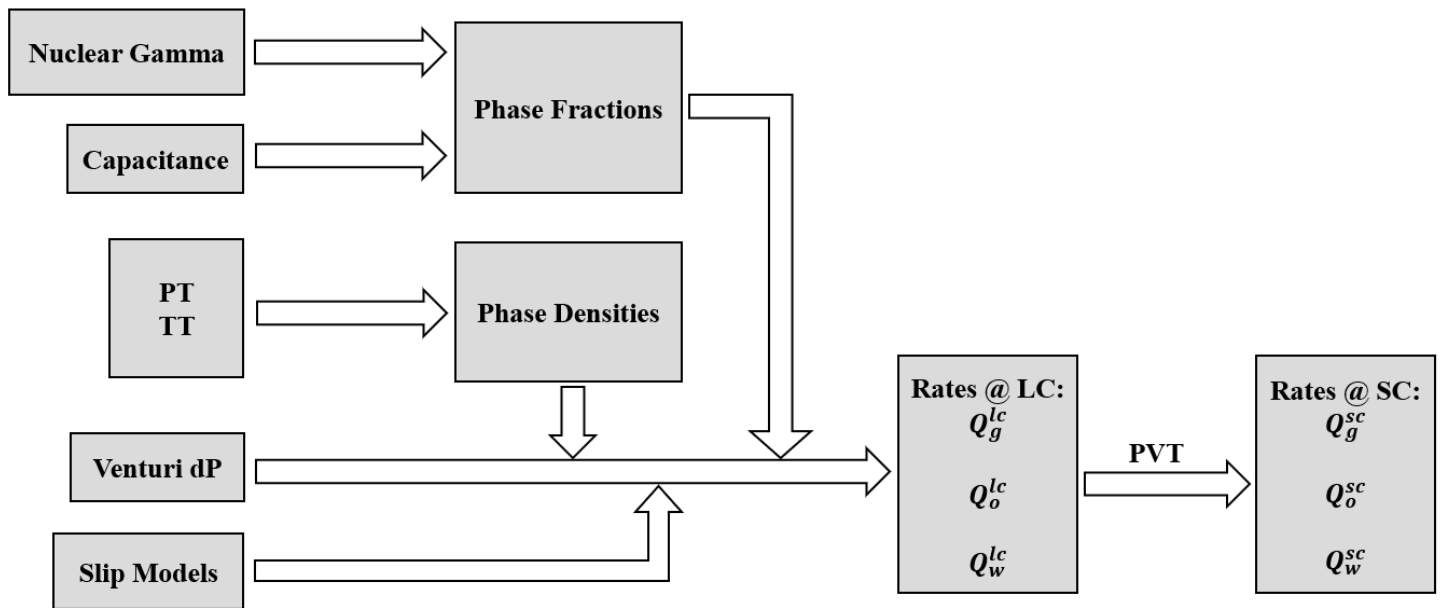
## Applications

- Well/Field Rate Monitoring
- Test Separator Replacement
- Well Testing
- Production Optimization
- Gas Lift Optimization
- Water Detection & Injection

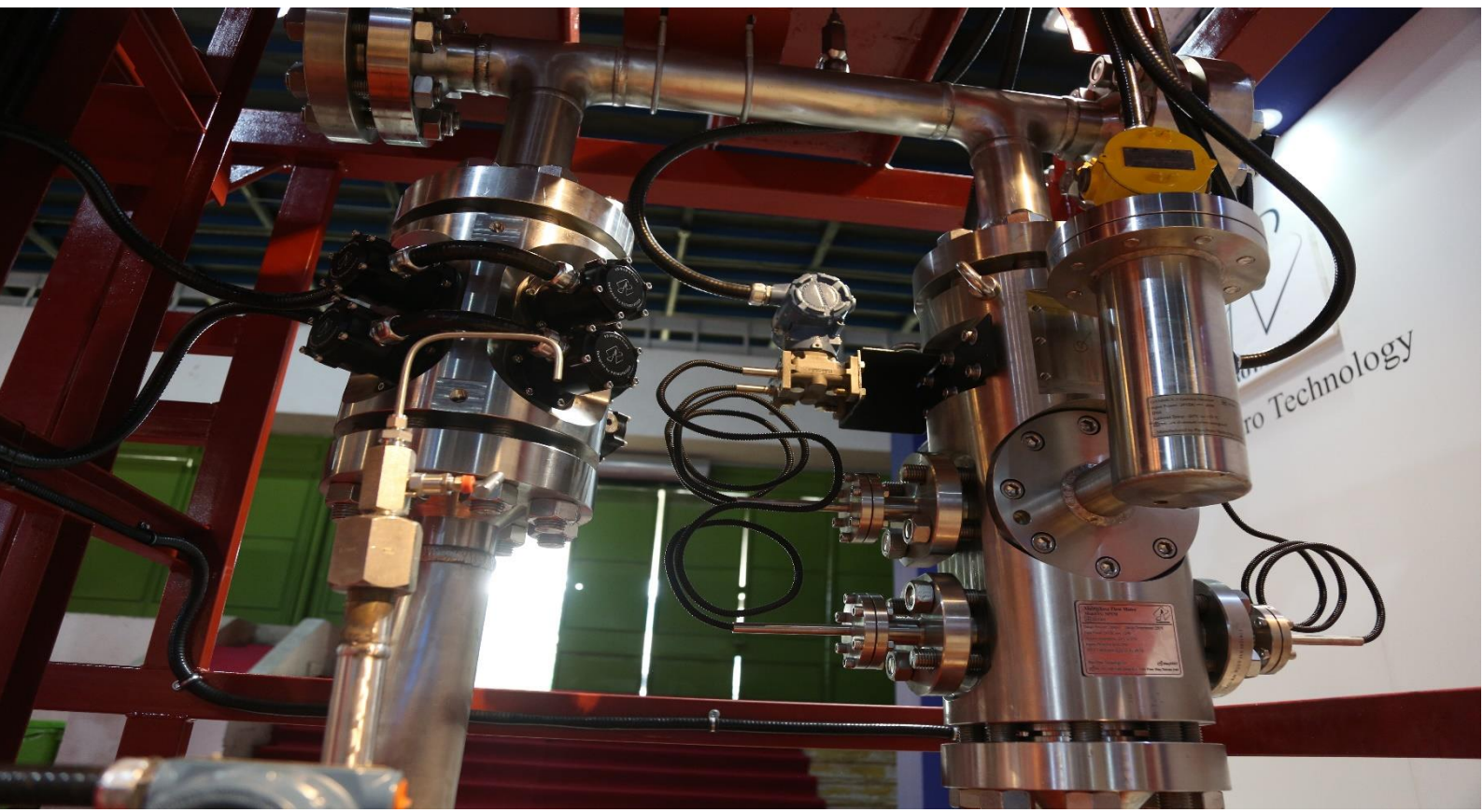
**Petroyatech™** has established a liquid-liquid-gas multiphase flow loop, named *PetroLoop*, for performance evaluation of developing VG MPFMs. The flow loop covers wide range of individual and mixed flow rates up to 30 cubic meter per hour at constant pressure of 5 bars. The main line is 3" pipe size and test section can be installed either horizontally or vertically. The PetroLoop has been applied to be certified by ISO 17025.



## Measurement principle



VG Multiphase Flow Meter is based on combination of standard Venturi tube, Gamma-ray densitometer and conductivity/capacitance-based water cut meter. To determine individual flow rate of each phase, it is needed to know phase fractions and phase velocities. Phase fractions are calculated by gamma-ray attenuation and electrical capacitance/conductance while phase velocities could be determined by well-understood Bernoulli equation. In contrast to conventional test separators inline MPFM uses a combination of non-intrusive techniques to measure flow rates in line condition without need of separation and gives profile of flow parameters and rates over measurement period.



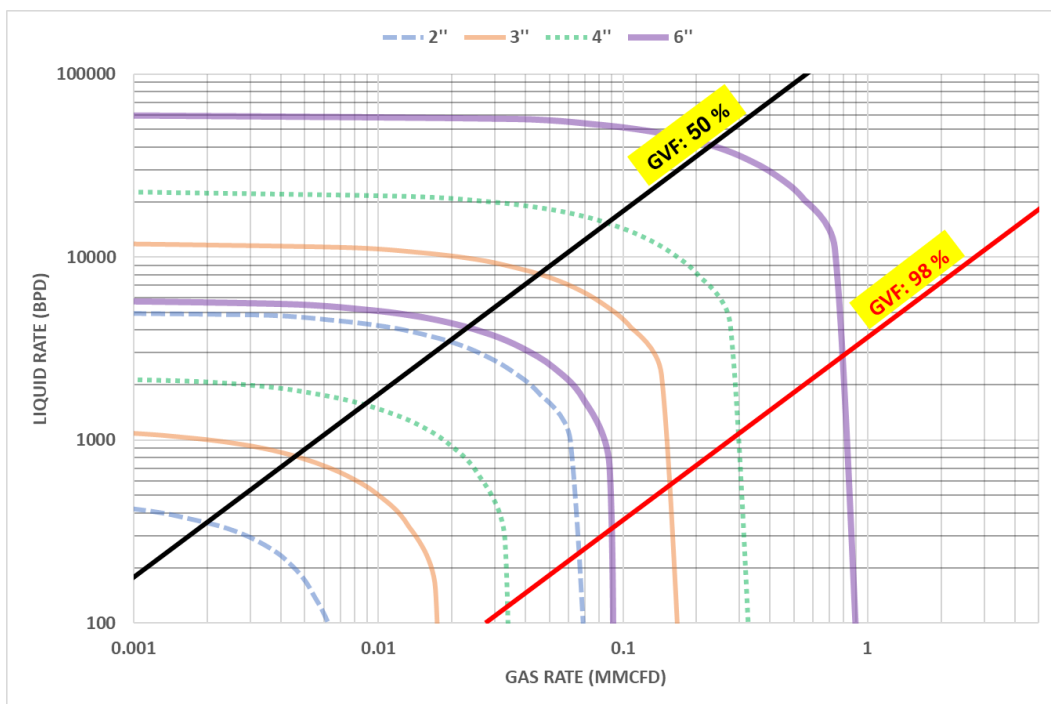
## VG MPFM Specifications

<b>GENERAL</b>		
<b>Configurations</b>	Spool-Piece Inline Permanent Installation, Skid-Mounted Relocatable/Mobile MPFM Truck-Mounted Service MPFM Package, Multi-size Venturi Option	
<b>Sour Service Specification</b>	NACE MR0175/ISO15156	Wetted Parts
<b>METER BODY and STRUCTURE</b>		
<b>Inlet Pipe Size</b>	2-6 inch	
<b>Interface Connections</b>	ANSI Flange/Wing union	
<b>Venturi Tube</b>	Comply with ISO 5167-4	
<b>Venturi Beta Ratio</b>	0.4-0.6	
<b>Wetted Material</b>	SS 316L	
<b>OPERATING RANGE</b>		
<b>Design Pressure</b>	0-2000 psi (5000 psi Option)	
<b>Design Temperature</b>	-20-120°C	
<b>Ambient Temperature</b>	-20-55°C	
<b>Water cut Measuring Range</b>	0-100%	
<b>Gas Volume Fraction Range</b>	0-98%	
<b>Liquid Flow Rate</b>	Refer to VG Operating Envelope	
<b>Oil Viscosity</b>	0.01-1000cp	
<b>TRANSMITTERS</b>		
<b>Transmitters</b>	Differential Pressure, Pressure and Temperature (MVT Option)	
<b>Connection</b>	Impulse Tubing/Capillary/Isolated Valve (Thermowell Coupled TT)	
<b>Communication</b>	4-20 mA	
<b>Calibrated Range</b>	0-5000 mbar, 0-270 bar, -20-150°C	
<b>Wetted Material</b>	SS 316L	
<b>Certification</b>	Ex ia IIC T4/T5/T6	
<b>GAMMA DENSITOMETER</b>		
<b>Radiation Source</b>	Barium-133 or Cs-137 (~10 mCi)	
<b>Source Container</b>	GAMMSHIELD, Comply with IEC 62598	
<b>Gamma Detector</b>	GAMMEX-II, High Sensitivity & Temperature Controlled Scintillation ATEX Ex-d (Explosion Proof according to EN60079-0 & EN60079-1)	
<b>Radiation Leakage</b>	< 1 µSv/h @1m Distance (Class7, IEC 62598)	
<b>WATER CUT METER</b>		
<b>Measuring Technique</b>	Impedance/Resonance Wide-band Spectroscopy	
<b>Water cut Probe Body Material</b>	SS316L	
<b>Certification</b>	ATEX Ex-ia (Intrinsic Safety according to EN60079-0 & EN60079-14)	
<b>COMMUNICATION</b>		
<b>Local Field Display</b>	HMI Option	
<b>Operator PC to Meter</b>	MODBUS TCP	
<b>Remote Access to Meter</b>	MODBUS TCP/IP	
<b>POWER SUPPLY</b>		
<b>Supply Voltage</b>	20-30 VDC	
<b>Power Consumption</b>	Max. 120 W	

## Performance

PARAMETER	5% < GVF < 90%	90% < GVF < 95%	95% < GVF < 98%
Gas flow rate relative uncertainty	±5%	±5%	±10%
Gas flow rate repeatability	±0.1%	±0.1%	±0.1%
Liquid flow rate relative uncertainty	±5%	±5%	±7%
Liquid flow rate repeatability	±0.1%	±0.1%	±0.1%
WLR absolute uncertainty	±3%	±5%	±7%
WLR absolute repeatability	±0.5%	±0.5%	±1%

## VG Operating Envelope



## Certificates



Designed and Manufactured by **PETROYATECH™**

For Sales and Technical Support Contact us:

**Paya Petro-Technology Co. (ISO9001, ISO14001, ISO45001, ISO29001 Certified)**

Multiphase Flow Metering Department

P.O. 1387663767

Cell Phone: +98-9303999860

Tel-Fax: +98-21-66394902

[info@petroyatech.com](mailto:info@petroyatech.com) For more info: [www.petroyatech.com](http://www.petroyatech.com)

