

# Multiphase Flowmeters

## FAQ

- **What are Multiphase Flow Meters?**

Multiphase Flow Meters (MPFM) are devices used to measure the individual oil, water and gas flow rates in a multiphase flow. The term MPFM is used to define also the metering of wet gas streams (i.e. multiphase flow where the gas content is very high).

- **Where MPFMs can be applied?**

Multiphase streams are typical of the O&G fields, since the producing wells normally generate mixture of liquid and gaseous hydrocarbons with a variable quantity of water. Knowing single rates of gas liquid and water is crucial for the production industry in order to monitor the reservoir, to improve the well performances and to optimize the production. The traditional solution is represented by the test separators, large vessels where the different phases are divided and then measured through standard single-phase techniques. However, MPFM are becoming more and more appealing to the O&G Upstream industry, proving as a valuable alternative to the test separators.

- **Why MPFMs? (Can MPFMs work as an alternative to traditional test separators?)**

An MPFM is able to provide the same kind of information concerning produced streams of a test separator in a very small footprint: typical MPFM dimensions are in order of one meter, much more compact than conventional separating equipment. This is of particular importance for offshore production, where space is the most critical aspect: the adoption of a MPFM minimizes platform space and load requirements for well-testing operation, allowing also the removal of dedicated test lines.

As a further plus, MPFMs provide a real-time measurement of the different phases while test separators are able to provide only values averaged over long processing times (in the order of the hour). This fast response time allows operative costs to be significantly reduced.

- **What kind of benefits can MPFMs provide?**

MPFMs are recognized to provide a number of additional benefits to O&G production:

1. Production allocation metering: MPFM can be employed to reconcile oil, gas and water measurement at all entry and exit points of a production network, minimizing potential serious economic consequences in terms of taxes and custody transfer due to incorrect allocation;
2. Fiscal or Custody transfer: when a single processing facility is shared by different producers, MPFMs can be used to meter the production from each license owner;

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3. Production Optimization: multiphase flowmeters are able to deliver real-time, continuous data concerning production of the different phases; therefore they can be very useful for reservoir management and for optimization of the production;
4. Flow Assurance: The continuous measurement from MPFMs provide further information to detect potential issues in the production system.

- **How does MPFMs compare with traditional test separators in terms of cost?**

Multiphase Flow Meters are consistently cheaper than test separators: test separators costs are typically in the order of 1-5M\$, while the cost of MPFM can be around 100-500k\$ depending on the characteristics of the streams. Also the MPFM's operating cost are much less than the separator. Additional savings from the installation of MPFMs instead of separators may derive from the omission of test lines which may be not necessary for MPFM.

- **Does ABB have a field-proven solution to offer for MPFM applications?**

Yes. ABB can offer VIS (Vega Isokinetic Sampling), a multiphase flow meter developed under TEA Sistemi's patented technology which actually has more than 40 successful installations worldwide.

- **Which are the target applications VIS is designed for?**

ABB VIS typical application field is represented by the Upstream O&G, in particular where the Gas Void Fraction (GVF) exceeds 80%: in applications where the GVF is above 99%, it provides unmatched performances.

VIS is the optimal solution also in aging reservoirs where the gas fraction tends to increase and the performance of other meters drastically decrease. In addition VIS can be applied to oil wells where gas lift procedures are in place and oil extraction is coupled with very large amounts of gas.

- **Is VIS applicable only in Upstream industry?**

Upstream industry is clearly the main application field; however, gas storage fields, where water content is a key parameter to be monitored, are a niche market where VIS proved to be very well suited and that has to be explored and targeted.

- **How does VIS work?**

ABB VIS is based on a proprietary technology developed and patented by TEA Sistemi S.p.A, an Italian company partner of ABB in the multiphase measurement field.

The meter is based on the isokinetic sampling method: this principle involves the sampling of a small part of the multiphase flow; the sampled mixture is then separated

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within the body of the meter with very compact gas-liquid separator. The individual phases are metered and finally re-injected in the main flow line.

ABB VIS is the only solution available on the market exploiting this patented and innovative operating principle.

- **Which are VIS main advantages and selling points?**

VIS has a number of advantages compared with competitors' meters:

1. Its unique and patented technology ensures very high accuracy even in the most challenging applications where the liquid fraction is below 10-4%, or also in slugging streams.
2. Can be successfully applied also to aging oil reservoirs and in gas lift applications.
3. Includes only conventional instrumentation (P, dP, T).
4. It is radioactive free.
5. It has no real limitation based on size and can be customized depending on the particular requirement of each site.
6. Its turndown can be extremely large

- **Which are the basic components of VIS?**

VIS is made essentially of traditional instrumentation: its measuring principle involves the usage of pressure transmitters and a temperature sensor.

A PLC is also included in order to process the different signals and to perform the final calculation of the different flowrates.

- **Is VIS completely field-mounted?**

VIS can be sold in two different configurations.

The basic version has the PLC directly mounted within the junction box of the meter; all the process variables are transmitted (analog output or digital Modbus).

The meter can be equipped with a panel flow computer, suitable in a control room, with a PVT module taking into account also variation on compositional data about the hydrocarbon phase.

- **Does VIS include a Radioactive Source?**

No, unlike most of the MPFM available on the market which adopt gamma-sources to ensure proper accuracies also at high GVF conditions, VIS is radio-active free.

A meter not including gamma sources is a clear advantage in terms of safety of operation and also for import procedures.

- **Which are the typical issues related to gamma sources?**

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Radioactive sources can create significant issues both during the supply of the meter and during normal operation: depending on the local regulation of the production site, the importation of gamma sources requires specific procedures and authorization that, if not properly and timely completed, may lead to consistent delays.

Additional issues can be experienced also during maintenance activities, that need to be performed by high-skilled and qualified personnel.

- **Can VIS be a portable meter?**

Yes, beyond the traditional installation directly on the pipeline, VIS can be provided in a skid-mounted configuration. This solution allows VIS to be moved on truck.

- **Which kind of information are needed to obtain a cost estimation?**

The following information are required in order to provide a preliminary estimation: operating conditions (pressure and temperature), gas and liquid expected flow rates, water cut, different phases density and viscosity. A standard form is available in order to gather properly all the relevant information.

- **What are the requirements at plant for VIS installation?**

The only pre-requisite is the availability of a power supply at plant site. If available, compressed air allows the installation of VIS with pneumatic actuators, otherwise electric ones will be installed.

- **Which type of maintenance/support does VIS need?**

VIS does not require any specific maintenance; being made essentially of conventional instrumentation, ABB field engineer can directly check the proper functioning of the system and performing the traditional maintenance activities on the field devices mounted on VIS.