esmerMPFM^{TM}

Technology Overview

esmerMPFM™ is a non-radioactive multiphase flow meter for measuring the flow rates of all phases in oil and wet gas production lines across the entire GVF and water cut range without the need for separation or complex sensor technologies.

esmerMPFM™'s distinctive features are its suitability for varying harsh conditions, adaptability to wide range of well types and above all its *light and compact design* which renders it suitable for fixed use per well and for mobile use with a light truck.

esmerMPFM™ comprises two assemblies; the Field Unit and the Flow Computer and a software application package named **esmerDigital™**
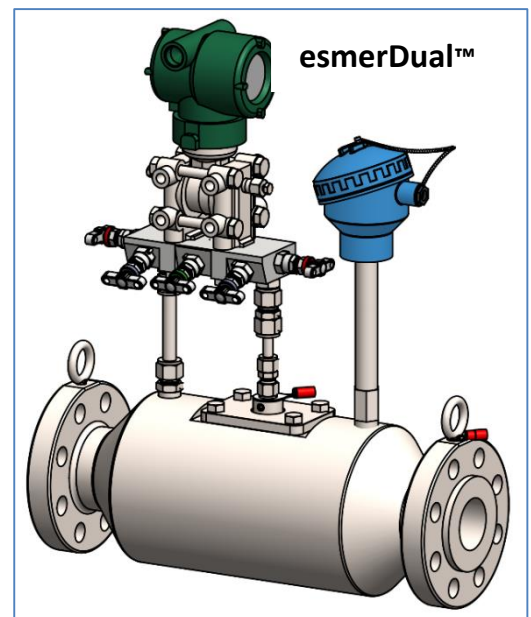
The Field Unit can be configured in two different ways and gives rise to two models, both performing equally well.

esmerDual™ uses a cone as its flow and impedance probe element. The cone is retrievable (for maintenance) and replaceable (for wider turn down ratio).

esmerGSE™ uses a conventional venturi for total flow rate measurement and a ¼" bypass line for watercut measurement by means of an innovative impedance probe integrated into the bypass.

esmerDual™

Typical dimensions and weights (ANSI 600)				
Size	L (cm)	H (cm)	W (cm)	WEIGHT (kg)
2"	55	110	70	90
4"	70	110	75	100
6"	85	110	80	120

An industry standard **multivariable transmitter** is used for flow rate measurement. Our proprietary **esmerMux™** impedance transmitter is used for water cut measurement.

Processing and I/O tasks are carried out on the Windows PC by **esmerDigital™** application software, brains of esmerMPFM. Industry standard fluid dynamic and thermodynamic (equation of state – EOS) Flow Models are executed in real time to measure and transmit the flow rates of phases.

esmerMPFM as a Fixed MPFM / One per Well

The low cost and digital implementation of the system renders an MPFM per well connected to the company network in the realm of reality. esmerDual can be "dropped" into the process line horizontally or vertically (with or without a box frame). An equipment room is required for the Flow Computer assembly.

The Flow Computer assembly comprises a small Exe enclosure housing the 24V power supply, the digital converters and a PC. For wiring, a single 24V power cable and a single RS485 digital cable is required between the Field Unit and the Flow Computer.
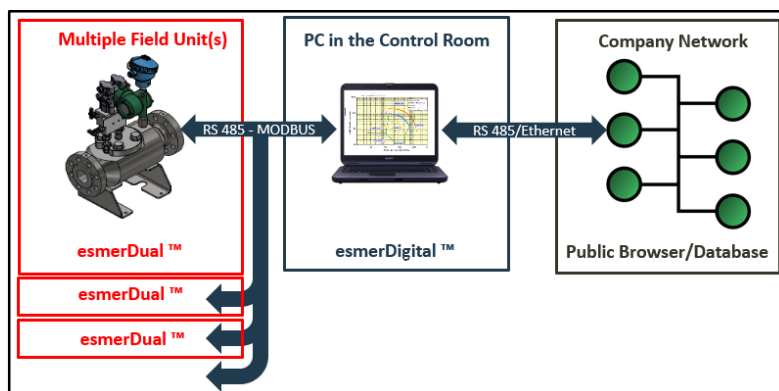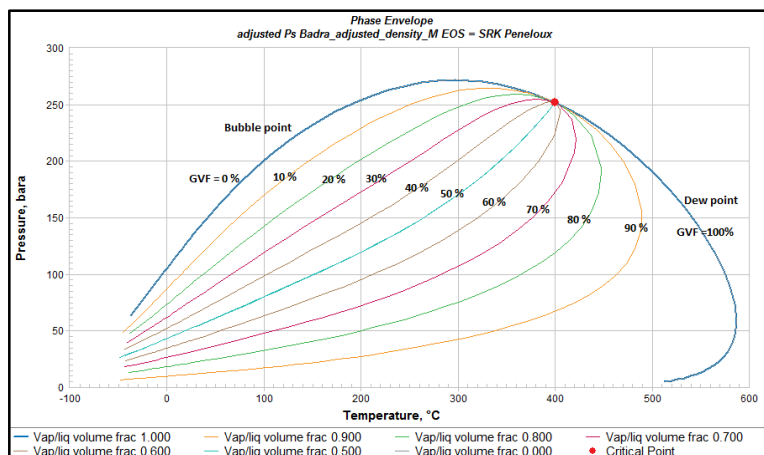

esmerMPFM as a Mobile MPFM

The Field Unit is compact and can be mounted on the deck of a pick-up or a separate small trailer. The Flow Computer can fit into the (double) cabin of a pick-up from where the operators can run the **esmerDigital** application on a notebook PC.

esmerMPFM consumes little power. Power can be provided from the mains or from a portable power station charged from a solar panel or from the vehicle charger.

# esmerDigital^{TM} – How Does It Work?

Processing and I/O tasks are carried out on the Windows PC by **esmerDigital^{TM}** application software.

esmerDigital is founded on fluid dynamic and thermodynamic (equation of state – EOS) Flow Models. esmerDigital runs in real time to determine the physical properties and the flow rates of the individual phases second by second. Archiving, reporting and communication functions are also provided.

The factory model for the coefficient of discharge (C_d) of the cone/venturi is based on our own multiphase flow loop tests. The factory model for EOS is based on compositional PVT data provided by the user. C_d and EOS models are tuned up in-field to match the process conditions by means of the **esmerConfigurator^{TM}** application software. Separator and/or esmerDual by-pass sample measurements can be used for tuning up the factory calibration.

The procedure and the tools provided for configuration are in compliance with API 2566 guidelines. Petroleum Software Ltd. has a long track record of testing and applying the tune up methods in the field.
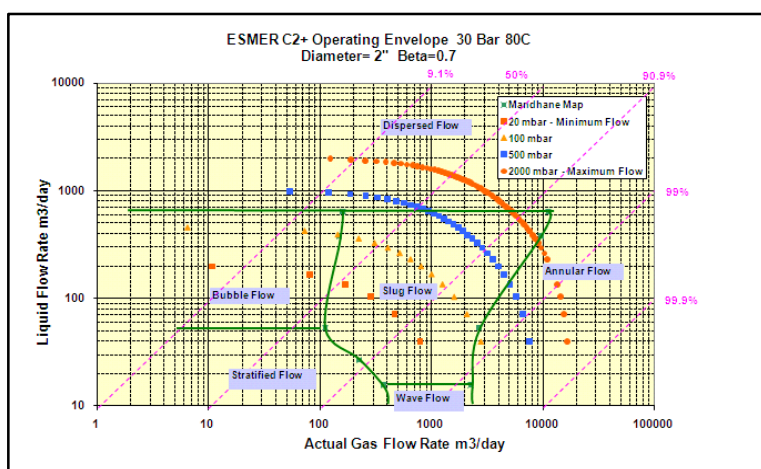
Range & Uncertainty

esmerMPFM™ Operating Envelope:

Flow Range: Sized to suit given process conditions.

Water Cut: 0 – 100%

GVF: 0 – 100%

Pressure: up to 150 bar

Temperature: up to 140˚C

Materials and rating: To suit given requirements.

esmerMPFM™ Measurement Accuracy:

esmerMPFM™ calibration will be tuned up to field conditions. Accuracy will depend on PVT data quality, GVF and flow rates. A specific accuracy target will be provided for each application.