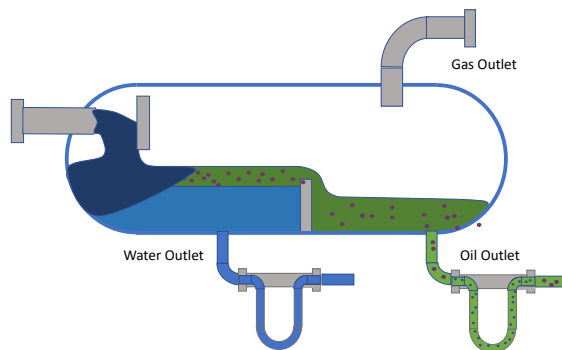




### Introduction

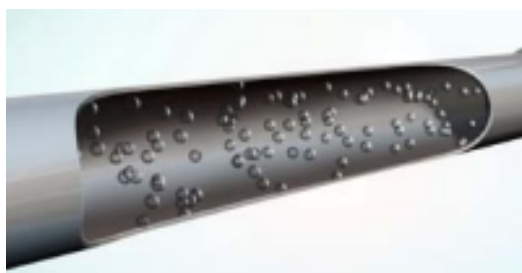
The majority of the world's oil production is allocated using separator-based measurements.



Allocation data is used for many purposes including optimizing reservoir production, maximizing recovery factors, and allocating production and royalties among partners. Thus, multiple stakeholders have interest in accurate and timely reporting of production rates, where errors in measurement impact future production and overall ROI.

### Challenge

Although separator-based measurements of produced liquids are typically performed using highly accurate, single-phase flow meters such as turbine or Coriolis meters, the achieved accuracy of separator-based measurements of produced liquids is directly linked to ability of the separator to effectively separate the gas and liquids phase. Separation efficiency is complex function of multiple parameters



including fluid properties, production rate, water cut, gas-oil-ratio, pressure,

temperature, and retention time. Often, conditions within the separator result in gas carrying under through the liquid outlet. The Gas void fraction (GVF) within the liquid stream is often further increased due to gas break-out from the liquid associated with the pressure drop from the separator through the flow meter. As a result, GVF within the single-phase flow meters on liquid outlets of separators is typically common, variable, and unknown.

GVF is well known to impair the accuracy of Coriolis and turbine meters. Coriolis meters typically have diagnostic features (e.g. drive gain) which provide indications of multiphase conditions, however, depending on the specifics of the application, GVF can cause either over-reporting or under-reporting of liquid mass or volume rates on the order of up to several times the GVF.

Turbine meters typically lack internal diagnostics to indicate presence of GVF, but GVF in turbine meters typically causes over-reporting of liquid volumes on the order of 1 X GVF.

As a result, the presence of unknown and variable GVF with liquid flow meters on liquid outlets of separators is often the largest source of error and uncertainty in separator-based liquid mass and volume measurement.

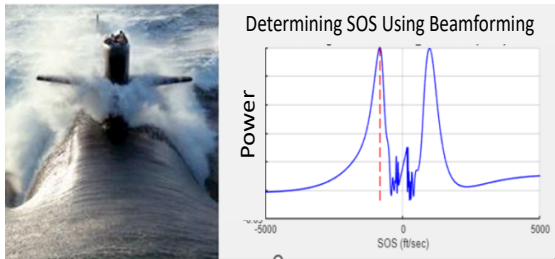
### Solution

CorVera has developed a first principals, physics-based, real-time measurement of gas void fraction within the flow meters operating on the liquid outlet of production and test separators. CorVera's COR<sub>x</sub><sup>TM</sup> Gas Void Fraction Monitoring System leverages SONAR technology to measure the speed at which sound propagate through a flow meter.

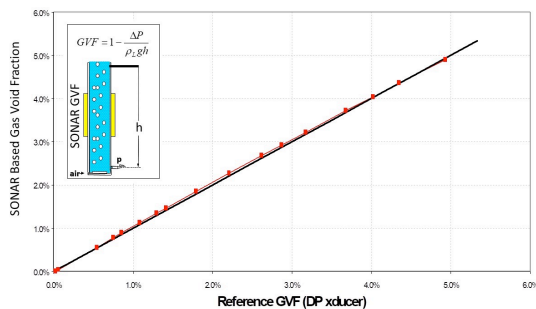


**CorVera**

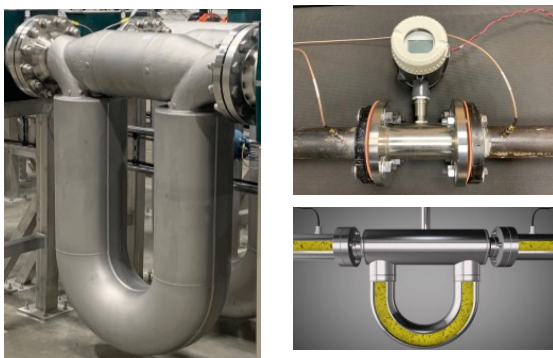
**COR<sub>x</sub><sup>TM</sup> Gas Void Fraction Monitoring System**



COR<sub>x</sub><sup>TM</sup> utilizes SONAR processing to listen to and interpret the output of a pair of ported, acoustic pressure sensors installed in the process piping, one near the inlet and the other near the outlet of the flow meter. The speed of sound is used to determine GVF.



By measuring the sound speed of the process fluid across the flow meter, COR<sub>x</sub><sup>TM</sup> can accurately determine the gas void fraction within the flow meter.



COR<sub>x</sub><sup>TM</sup> is a minimally-intrusive system that can be installed to measure the GVF within new or existing flow meters and requires no modification of the existing flow meter. Since COR<sub>x</sub><sup>TM</sup> utilizes passive-listening technology, it does not impact the operation of the existing flow meter in any manner.

Provided pressure ports are available near the inlet and the outlet of a flow meter, a portable COR<sub>x</sub><sup>TM</sup> instrumentation system can be readily installed to monitor GVF levels within the meter for short duration or extended periods.



COR<sub>x</sub><sup>TM</sup> Gas Void Fraction Monitoring Systems provide a practical means to accurately monitor gas void fraction levels in liquid outlets of separators over extended periods of time over which process and or production conditions can vary.

Accurate GVF measurement provides the feedback necessary to optimize separation processes to ensure GVF levels are sufficiently low to enable accurate measurement of liquid mass and/or volume utilizing new or existing flow meters.

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