

Introduction to ISO-SPLIT sampling of gas/condensate and volatile oil reservoirs

For testing of gas/condensate or volatile oil zones Expro recommend that ISO-SPLIT® isokinetic split phase sampling be performed both upstream of the choke manifold and down stream of the test separator in the gas outlet. Isokinetic split phase sampling at the well head provides representative sampling of well fluid that is closest to the reservoir conditions, dew point and is least affected by phase changes. The sampled fluid will also be in good equilibrium at the wellhead conditions.

Well fluid sampled after the choke manifold has been subjected to severe conditional changes, due to high pressure drop (Joule Thompson effect). This cooling results in a large volume of liquid drop out, and also possible wax and asphaltene drop out. Heating in a heat exchanger up to 120°C plus can follow. These excessive changes in conditions are not conducive to obtaining good equilibrium and representative sampling of the produced fluids.

In the test separator there is also a temperature and pressure change which influences the equilibrium composition of the gas and liquid phases. In this sequence of phase changes (choke, heat exchanger and separator) volatile oil and gas systems create droplets smaller than 2 microns which are too small for separation by standard test separators.

Expro Minilab and manifold are situated upstream of the choke manifold. The separation vessels in the Mini lab, though of a small scale provide for a longer residence time than the test separator (10 - 16 times longer). The Mini lab also allows manipulation of pressure and temperature of the sample-stream, thus giving better equilibrium conditions.

Therefore, we recommended that both PVT and compositional sampling are carried out from the ISO-SPLIT® Mini lab as it can provide improved equilibrium conditions and higher quality samples than the test separator. The possibility of introducing errors during physical recombination in the PVT laboratory due to differences in the conditioning procedures are also reduced.

Mini lab sampling provides an independent measurement of the Condensate Gas Ratio (CGR) that is not influenced by inherent errors in the gas and liquid phase rate measurements of the test separator. The test separator CGR is also influenced by reduced efficiency at higher loads.



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The properties of the stabilised liquid from the Mini lab can also be used to track the well stabilisation. Monitoring the density of produced liquid can provide an indication of the relative amounts of retrograde condensation lost in the well.

Gas/condensate reservoirs are saturated with water which drops out during conditional changes. Water accumulated in the test separator can introduce errors in rate measurements. The Mini lab uses glycol to absorb the produced water hence is not affecting rates. Expro has equipment that can collect samples to determine separator efficiency on site.

Both ISO-SPLIT® isokinetic split phase sampling at the wellhead and test separator gas outlet should be used to measure the producing gas/liquid ratio. They are comparative methods, the well head measurement being independent of the test separator.

The isokinetic split phase sampling in the gas outlet of the test separator provides a correction of the measured separator CGR. It can be used for separator efficiency studies, but will always be influenced by the degree of uncertainty in the separator flow measurements.

A flow-after-flow test starting with increasing and followed by decreasing rates can be used to study liquid loading in the formation. Samples are analyzed by a laboratory with a good control of their compositional analysis. GC compositions to C10+ is generally sufficient, provided this is supported by detailed Paraffin, Naphthene and Aromatic (PNA) analysis and/or True Boiling Point (TBP) analysis data.

Further information is provided in the brochures for ISO-SPLIT® wellhead sampling (N° 1010), ISO-SPLIT® separator sampling (N° 1020) and PVT separator sampling.

