Schlumberger

Fluid Preparation and Compositional Analysis

Determines reservoir fluid composition for better-representative reservoir sampling

APPLICATIONS

- Determination of reservoir fluid composition
- Validation of sample quality
- Preparation of samples for advanced or routine PVT, wax, and asphaltene analysis

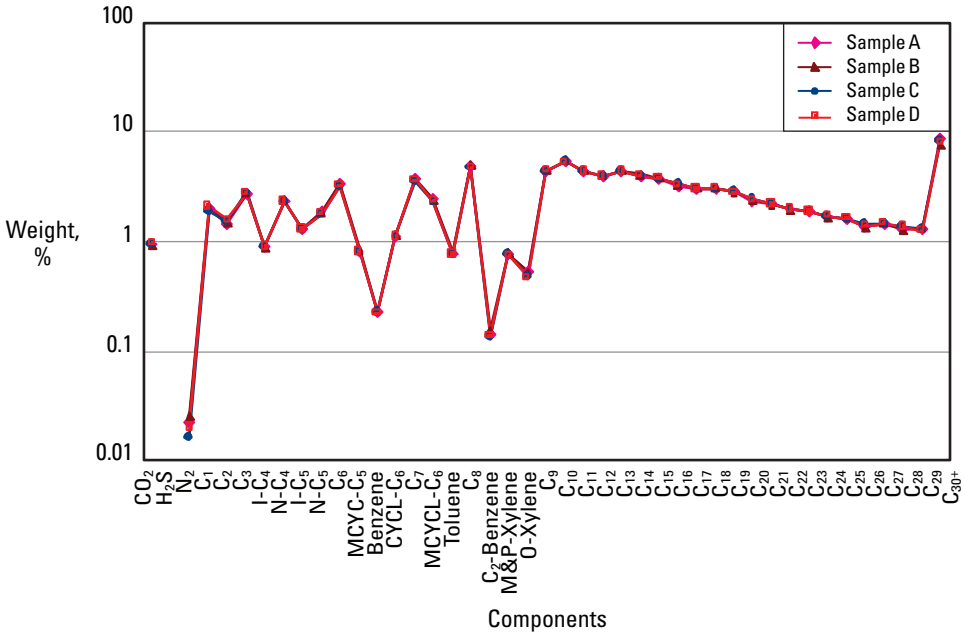
FEATURES

- Sample restoration to reservoir conditions
- Equilibration of vapor and liquid by recirculation
- Isobaric fluid displacement
- Analysis of gas composition C_{12+} and liquid to C_{30+}

Pressurized fluid samples arriving at the laboratory from the wellsite are connected to a high-pressure (e.g., 20,000-psi [138-MPa]) pump to measure opening pressures at ambient temperature. Sample cylinders are then heated to reservoir temperature and pressurized to reservoir pressure or greater (if needed). The fluid samples' equilibrium is subsequently restored through continuous mixing—for a period ranging from 24 h to 7 d, depending on fluid types and overall conditions—to allow for redissolution of precipitated asphaltene, wax particles, or both.

After samples are conditioned and restored, a subsample of each equilibrated live fluid undergoes compositional analysis to C_{30+} using an equilibrium flash procedure. For this procedure, some of the single-phase fluid is isobarically and isothermally displaced into a pycnometer and evaluated for mass and density. The pycnometer is then connected to a gas/oil ratio (GOR) single-stage equilibrium apparatus in which the oil is flashed to ambient pressure and temperature conditions. The evolved gas recirculates through the residual liquid until the phases achieve equilibrium.

After circulation, the volume of equilibrium vapor and the mass of liquid remaining in the pycnometer are measured. The vapor phase is compositionally analyzed by gas chromatography to C_{12+}, and the residual liquid is analyzed by gas chromatography to C_{30+}. The composition of the original live oil is calculated by mass balance using the measured composition and total mass of each phase. A quality assurance process such as that described above helps in the selection of the most-representative sample for further study.



Gas chromatography results showing the composition of four subsamples of an equilibrated live fluid; the quality of the comparison indicated by the precise compositional matches validates the test's accuracy and repeatability.