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Application of Gas Chromatographic Fingerprinting to Reservoir Management: Successes and Pitfalls from the Niger Delta

Gas Chromatography has been used for decades to obtain the hydrocarbon fingerprints of formation and reservoir fluids. This is based on the principle that fluids from the same reservoir possess identical hydrocarbon fingerprints and those from different reservoirs possess chromatographically measurable differences.

This paper summarizes selected successes and pitfalls encountered in eight years of Gas chromatographic fingerprinting work as a tool for Reservoir Management in Chevron Nigeria's concessions in the Niger delta and concludes that :

The existence of wide hydrocarbon compositional variations in reservoir fluids in the Niger delta (which are primarily driven by biodegradation, organic source input, maturity etc) make this tool excellent for identifying well bore or tubing string communication in dual well completions and identifying producing horizons based on oil-oil correlation. Determination of lateral/vertical reservoir continuity, cross-fault fluid communication (leaking/sealing faults), formation fluid identification where electric logs prove ambiguous, down-hole con-mingled production are other areas where this techniques has been applied with great success. Finally, the identification of origins of oil spills is one of the environmental applications routinely used in CNL.

However, pitfalls are encountered with reservoir fluids that are similarly and highly biodegraded, or non biodegraded, differentiating between very light oils (API ~ 40) and condensates and correlation of oils contaminated with hydrocarbon based drilling fluids during well tests.