GEOLOGY POSTER 29

EFFECTIVE RESERVOIR FLUID SAMPLING SUPPORTS RESERVOIR CHARACTERIZATION

Rahimah Abd Karim[1], Pedro Elias Paris Acuna[1], Wa Wee Wei[2] & Sammy Haddad[2]

[1]Petronas Carigali Sdn Bhd, Level 9, Tower 2, Petronas Twin Towers, KLCC, 50088 Kuala Lumpur, Malaysia.
[2]Schlumberger, 18th Floor, East Wing, Rohas Perkasa, No.8, Jalan Perak, 50450 Kuala Lumpur, Malaysia.

Good quality reservoir fluid samples are critical to ensure the accuracy of the captured fluid composition and thus accurate key reservoir fluid properties' description, namely GOR, saturation pressure, density, and viscosity. Reliable characterization of reservoir fluid properties during the early stages of exploration and development is critical for understanding fluid composition, estimating reserves, and optimizing production or completion strategies.

Miscibility and time limitation allocated by the drillers have been the main challenges in the open-hole sampling. A quick cleaning process and real time monitoring of contamination level are essential in assuring clean reservoir samples. Fluid cleaning process using conventional openhole sampling technique1 (see Figure 1) typically required long pumping times to reach acceptable contamination level.

This work presents an optimized wireline sampling technique with full utilization of downhole fluid analysis applications to address the open hole sampling challenges in an offshore Malaysia field. High quality reservoir oil and water samples were required for detailed PVT and flow assurance analyses. The mud type used was water-based mud, which posts a great challenge particularly for water sampling since the fluids are easily miscible. A focused sampling technique2 (see Figure 2) was used to accelerate the mud filtrate cleaning process. Different downhole fluid analysis approaches were applied at water and oil sampling station to monitor the reservoir fluid contamination level. At water sampling stations, pH measurement3 (see Figure 3) helped to discriminate the clean reservoir water and water based mud filtrate. While at oil sampling stations, flowing fluid optical density differences4 (see Figure 4) was monitored to ensure clean formation oil sample. The methodology and applications of all the techniques are discussed in detailed in this work and documented with actual field data and PVT laboratory results.

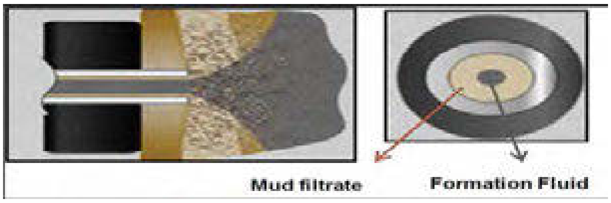

Figure 1: Conventional Sampling Probe was based on single pump and single flowline concept. The amount of filtrate entering the probe is controlled by the formation anisotropic, viscosity differences and invasion profile.

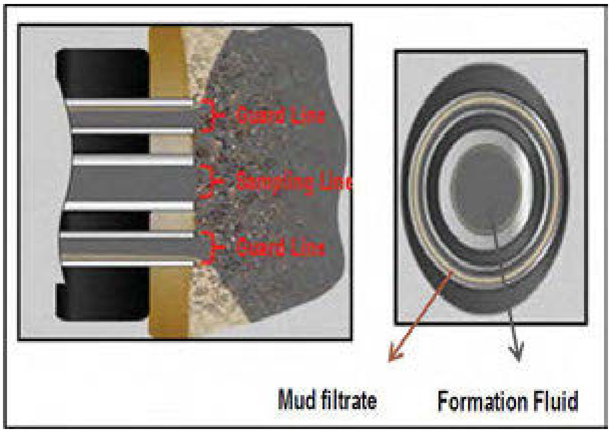

Figure 2: Focused Sampling Probe concept – the filtrate is guarded away using the concentric probe design, only clean fluid is entering the sample line.

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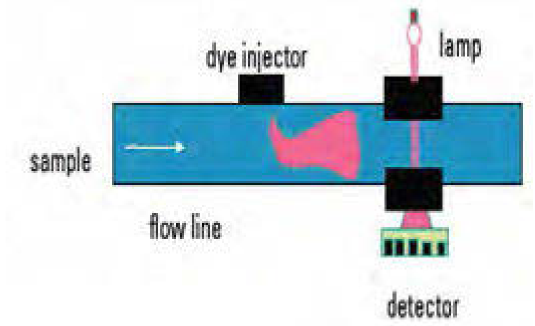

Figure 3: pH sensitive dye is injected into the Wireline Formation Tester (WFT) flowline (only when a pH measurement is made).

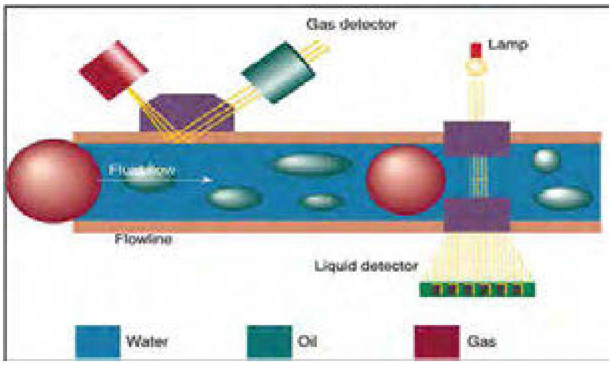

Figure 4: Live Fluid Analyzer (LFA) employs an absorption spectrometer that utilizes visible and near infrared light to differentiate water and oil in WFT flowline.

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