

Flow assurance in the ultradeep/deep water regime

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Flow assurance is the scientific discipline that ensures successful flow of hydrocarbons from reservoir to the point of sale. It is the confluence of science and engineering that is integral to develop and engineer solutions for various production challenges such as hydrates, paraffin deposition, asphaltenes and scale problems likely to be encountered during operation. Flow assurance studies commence during exploration activities, project into asset development and follow throughout the entire life cycle of the hydrocarbon exploitation. An accurate prediction of the unique properties of reservoir fluids is mandatory for the efficient production and utilization of petroleum reserves. Decisions regarding the commercial development, economics and marketability of a prospect hinge to a great extent on a petroleum reservoir's unique fluid characteristics. Flow assurance is thus vital to develop strategies and methodology to address solids control and management and ensure reliable, efficient and profitable exploitation of petroleum resources.

Crude oil production in deepwater and ultradeepwater (DW/UDW) is an extremely capital intensive process in what is typically an immensely challenging environment. Ensuring smooth oil production from DW/UDW reservoirs is critical due to the long distances, high pressures and low temperatures applicable in such regimes. Transforming ultra-deepwater discoveries into producing fields necessitates employing enhancing and enabling technologies for lift and separation. It is expected that sub-sea separation; ESP and sea floor pumps as well as cold flow will be technologies that will be exploited. Subsea processing is highlighted

as a key enabler for the viability of many future deepwater projects; however, there is also an acceptance of the difficulties involved in the application of new technology. With sub-sea separation, problems with emulsions, foaming and gas carry-under can be expected. There is a pressing need to enhance basic scientific understanding of the anticipated UDW challenges in order to develop improved predictive tools to help industry better define and ultimately manage the risks associated with field development. Flow assurance thus takes on a whole new form driven by the combination of a hostile environment, challenging fluid properties and system reliability targets found in DW/UDW oil and gas production systems.

The majority of current flow assurance laboratory tests is based on analyses performed on dead oil samples and fail to capture true reservoir conditions. Recently, new techniques have been developed that regenerate live oil and simulate production conditions in the lab. However, to drive further progress in the flow assurance science of the future, it is imperative to correlate field flow assurance data with laboratory screening tests. Collaboration between the industry, academia and field are critical to ensure innovation and improved understanding. This talk will present both previous and ongoing work in the area of asphaltene and wax. Data supported with internal research and cross-collaborations will be presented. A joint case study on Wyoming crude oil and asphaltenes will be discussed. Laboratory techniques to test for paraffin and treating chemicals will be reviewed.