THE IMMORTELLE HORIZONTAL OIL WELL PROGRAM: USING NEW TECHNOLOGIES TO OPTIMIZE RESULTS

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ABSTRACT

With the planning, drilling and completion in 1994 of Trinidad's first ever horizontal well, the stage was set for cost effective development of a 12 m (40') oil leg in the Immortelle field. Gas, oil and water are present in a 103 to 121 m (340 to 400') thick, Pleistocene-age, fluvial-deltaic sand known as the 16 Sand.

Hydrocarbons are trapped in three narrow, NW-SE trending fault blocks just to the east of the Immortelle Platform location and at average depths of about 2150 to 2180 m (7100 to 7200') SSTVD. Concerns regarding gas break-through, water coning, lateral variability of reservoir quality, production rates and oil recoveries prompted the Immortelle development team to assess the viability of horizontal technology for depletion of these oil reserves. This multi-discipline team consists of resource management (geologist, geophysicist and reservoir engineer) and operations (drilling engineers, wellsite geologist and production engineer) personnel.

The westernmost and structurally highest fault block was tested by the Immortelle 8 well, which encountered a 42 m (140') thick gas cap and targeted the middle of the oil leg. A 750 m (2477') long horizontal section was drilled and 606 m (2000') of that was completed. Initial rates from this well were in excess of 2000 BOPD, no water, with a GOR of 700 SCF/B. Information gained from the MWD tool and the production logging tool was tied back to the 3D seismic dataset and other well control by using interpretive software on a UNIX workstation, resulting in the recommendation of a 4 well horizontal program for this year. Internal reflection characteristics from the 3D seismic (tied to current well control) are being used to predict the location of the highest net to gross sand reservoirs in each fault block and where the internal dip rates are the least.

During the drilling phase, the team will further optimize placement of the wellbores by using workstation technology and resource management personnel expertise on-site at the drilling rig. Interpretive software (geologic, seismic and mapping), the 3D seismic and well datasets are loaded to a Unix Sparc20 workstation which will be placed offshore on the rig. A geosteering team consisting of the resource management geologist and geophysicist, the MWD engineer and the wellsite geologist will be on-site to geosteer the wells. The workstation graphics capabilities will improve communications among team members by allowing rig personnel to visualize changes necessary during drilling. At the same time, "real time" MWD data will be used to refine the target boxes for the next wells.