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Reservoir Performance Versus Reservoir Geometry and Architecture in Deepwater Turbiditic Environments: Where Details Really Count (a Field Case)

Optimising reservoir performance and middle to long term hydrocarbon production is the main goal of every company involved in today's oil business, especially in deep marine settings. As a result, in the past few years more and more integrated reservoir studies have focused their attention on the impact of sedimentary architecture on production and fluid flow behaviour. Better understanding turbiditic reservoirs, which account for some of the largest oil discoveries in the past five years and yet show the highest level of heterogeneity, constitute the focal point of TotalFinaElf research program on the subject.

In the chosen example (a producing oil field located offshore West Africa), oil and gas are contained in a mixed stratigraphic and faulted structural trap. The dynamic behaviour through time of three different depositional environments (channel axis, internal channel margins, external channel margins) was studied using RFT, DST and permanent downhole gauges. Comparing high resolution seismic images with pressure responses recorded over a range of five to thousands of hours, has brought complementary and sometimes contradictory information to the investigated volume, shape and flow pathways. The smallest scale of investigation, i.e. the elementary channel scale, is seldom seen during depletion. On the contrary, pressure data at the DST scale most often characterises the next hierarchical level, i.e. the channel belt itself. However, the match of six months production requires adding more "reservoir", thus highlighting lateral dynamic connection through time. If these interpretations produce clear and useful indications on flow behaviour during the depletion phase, we will demonstrate that it is much more complex to anticipate the results of the injecting phase which brings into play heterogeneities at another scale.