

Preparing future development plan for a mature and complex offshore carbonate field under difficult economic constraints: a monitoring challenge

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ABSTRACT

A large Middle Eastern oil field, located in Arabian Gulf, is producing a 28° API oil from heterogeneous Upper Mishrif Cenomanian carbonates. The mature field is experiencing high water cuts arising (up to 85-90%) from a complex combination of different water production mechanisms.

The field has been developed with ESP activated horizontal wells in several consecutive major development phases before a strategy of continuous infill wells drilling was decided. This strategy was initially successful but, once the surface facilities were saturated, have progressively shown its limits and was successfully revised to optimize the profitability of the field. In parallel to those immediately applicable solutions the next development phase is being prepared. One of the main objectives of the reservoir monitoring on the field is to provide data to reduce the risks on the stakes associated to these projects. The classical tools available usually imply important extra cost or production shortfalls:

The zonal production tests, during which production will be limited to only one zone, or one layer using Flow Control Valves. The Pressure build up, in particular on limited perforation interval in mono layer provide valuable information regarding the permeability, the reservoir heterogeneities and the pressure, but require the well to be shut. The wells cased hole data acquisition on existing wells, such as PLT or RST inform on the characteristics of the reservoir, including the impact of reservoir features such as fractures or presence of double medium on the production. Open hole acquisition while drilling new drains to tune the geological and dynamical model.

Thus the reservoir engineers face the challenge of bringing valuable data at the lowest possible cost, with the lowest possible impact on the production during the data acquisition process. This article develops some of the methods and good practices used on the field to meet this challenge, through concrete examples, from the well daily follow-up to the integrated monitoring data management.

The main ideas to reduce the economical impact of such data acquisition lay in using the constraints on the field (Maintenance platform or field shut-down, rig move, Work-over...) as opportunities, on the communication between the reservoir monitoring, and the entities in charge of the production, and in charge of the project development.