

AN INTRODUCTION TO RESERVOIR MONITORING

IAN McMAHON

GEOPHYSICAL SERVICE (MALAYSIA) SDN. BHD.

Reservoir monitoring is a new and emerging technology. It is the application of multiple surveys of reflection seismic integrated with reservoir description and reservoir simulation to track the movement of fluid saturation in a reservoir.

Reservoir monitoring includes both the measurement of the past and current location of the fluids and the prediction of how the fluids will move in the future. This breakthrough in technology is possible through the integration of several disciplines and the focus of each of these disciplines on the reservoir being monitored. Accurate monitoring of the interwell position and movement of fluids in a producing hydrocarbon reservoir can yield major economic benefits through, for example: avoidance of premature breakthrough, optimal placement of infill wells by accurately defining areas of high hydrocarbon saturation, measurement of cone development before coning into a producing well occurs, and other similar improvements in field development.

Seismic response to original fluid contacts has been observed in many fields and reported previously. Recent field experiments, based upon past research, have shown that a differential technique using repeated seismic surveys, reservoir description, and reservoir simulation is capable of discerning moving oil-water fronts in a reservoir.

This paper addresses the concept of reservoir monitoring and how it is performed. Technical issues are introduced that control the success of this technology when applied to the complex reservoirs found in practice as well as the economic justification for applying the technology.

It is concluded that many more reservoirs are potential candidates for reservoir monitoring than previously predicted and there is a substantial economic return. Guidelines are presented for the range of reservoirs which might benefit from reservoir monitoring.