

## Geophysics Paper 21

### TIME-LAPSE SEISMIC MODELLING IN MALAY BASIN

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Time-Lapse seismic has become as an important petroleum reservoir monitoring and management tools since its successful application in 1990s. The fundamental principle underlying the time-lapse seismic is simple, that is, the changes in reservoir parameters or properties are directly related to the differences in seismic response between the monitor and the base surveys. In reality however, the application is not that simple. There are many issues needed to be understood and considered before concluding any differences observed are due to changes in reservoir properties and not due to other factors such as seismic acquisition parameters and seismic processing artifacts.

Feasibility study prior to a full time-lapse seismic project is crucial in providing information that helps guide our expectations. Changes in fluid type and saturation may not necessarily be significant enough to induce a large impedance contrast and consequently detected by seismic signal. The reservoir pore-fluids, rock matrix and frame, and reservoir conditions need to be fully understood to ensure the success of any time-lapse seismic study.

There are many aspects of a time-lapse feasibility study that need to be considered such as seismic acquisition design, processing algorithm and parameters, reservoir production, reservoir fluid properties, reservoir rock properties, reservoir monitoring

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program, geomechanics, seismic modeling, etc. This paper will focus on the fluid properties and seismic modeling aspects of the feasibility which is thought able to give, if even not full, a sufficient understanding on how pore-fluid type and saturations in the reservoir with varying types and thicknesses of cap rock could affect the resultant seismic amplitude, the fundamental element of any time-lapse seismic study.

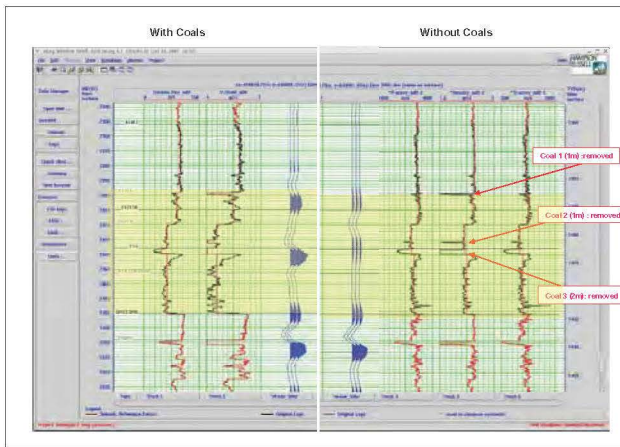


Figure 1: Synthetics traces showing the difference in seismic characters with and without coals on top of reservoirs.

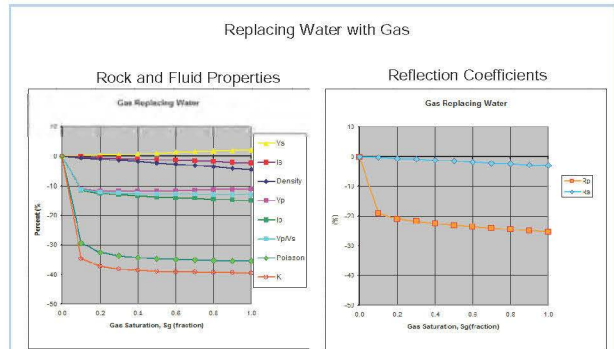


Figure 2: Percentage changes in reservoir seismic properties as reservoir fluid was changed from water to gas.