

Time-lapse (4D) reservoir characterization for feasible CO₂-enhanced oil recovery at Ankleshwar, Cambay Basin - A rock physics diagnostic and modeling approach

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1. CO₂-enhanced oil recovery (EOR) is forthcoming research in India, which helps to attenuate the upsurge in CO₂ emissions in the atmosphere by injecting it into the reservoir for the improvement of oil production followed by CO₂ storage.
2. We discuss the possibility of rejuvenating oil production from an Indian mature oil field, Ankleshwar at Cambay basin (Western India) through CO₂ injection.
3. We developed a rock physics model for the Ankleshwar reservoir and demonstrate its effectiveness to disentangle the sands with significant residual/by-passed oil saturation since these are potential target for CO₂-EOR. Moreover, we found injected CO₂ changes the P-wave velocity and acoustic impedance dramatically.
4. 4D seismic signal will be visible in seismic data even in the case of patchy saturation. Our analysis can be a reliable input while deciding future 4D seismic monitor surveys in Ankleshwar oil field to minimize the uncertainty and risk.

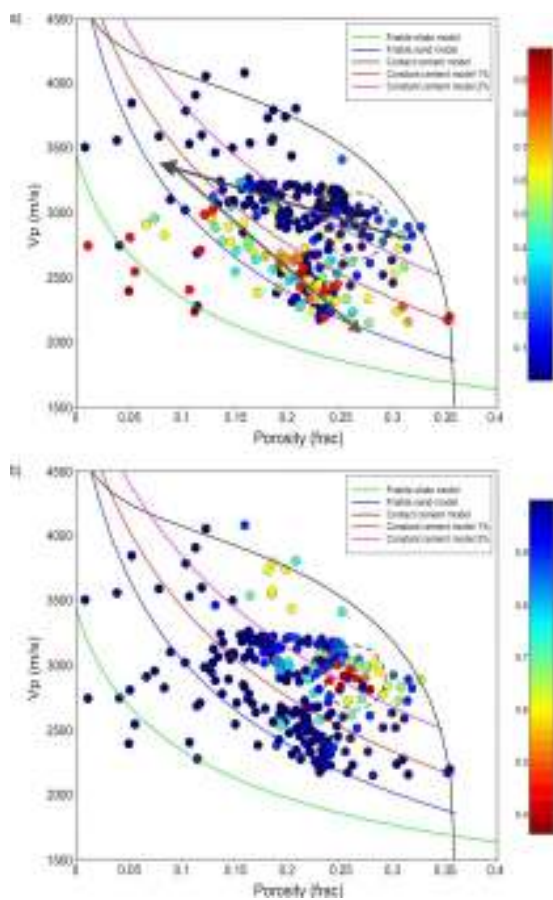


Figure 1: P-wave velocity versus porosity for the pay zones of Ankleshwar oil field with various rock physics model curves superimposed: (a) as a function of shale volume (b) as a function of water saturation. Dark brown dashed circle encloses clean sands with significant residual oil saturation.

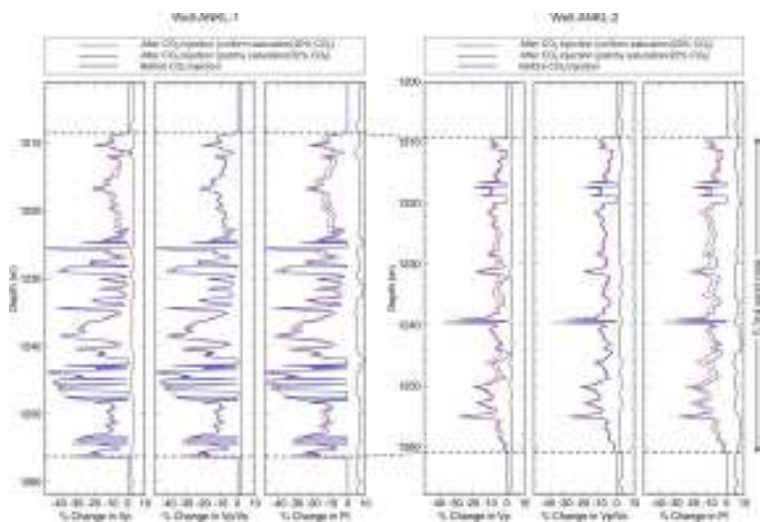


Figure 2: Feasible 4D/time-lapse variation of elastic parameters such as P-wave velocity, Vp/Vs ratio, and P-Impedance. Note that patchy-saturation model at 20% CO₂ saturation provides very efficient thin layer saturation information, which is not attempted by the uniform saturation model.

For Further Details:

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