

## Applicability of Full Waveform Inversion in Sonic Logging

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Sonic logging has been widely used for many years to acquire physical properties of hydrocarbon reservoirs. Velocity analysis had been initially performed by the detection of first break, that was later replaced by slowness time coherence (STC) method using full waveform acquisition, since the estimation of velocity is important for the identification of fluid contacts such as OWC (Oil-Water Contact), GOC (Gas-Oil Contact), etc. The resolution of existing methods is restricted to 6 inch defined by neighboring receiver distance of logging tool. However, there is significant needs to gain the resolution higher than the current detection of fluid contact locations.

We, therefore, tried to introduce the method of full-waveform inversion (FWI) as an innovative technique to acquire high resolution velocity structure in the subsurface, since the method has been proven as a technique that provides higher resolution than the conventional seismic reflection methods. Since the applicability of FWI to the sonic logging has not been revealed yet, we first examined the applicability of FWI using numerical experiments.

Our results show that both GOC and OWC can be detected with the resolution higher than the conventional sonic methods whose resolution is 6 inches. We conclude that FWI would be applicable to sonic logging as a high resolution technology.

Keywords: FWI, OWC, GOC