# Importance of Seismic Petrophysics for Seismic Data Inversion – Comparision with Reservoir/Conventional Petrophysics

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**Summary**

Well logs are essential for post-stack, simultaneous AVO (pre-stack) and geostatistical seismic inversion. In the inversion project well logs are used for; i) wavelet estimation; ii) seismic to synthetic tie; iii) Low Frequency Earth Model (LFM); iv) input geostatistics and; v) offset to angle conversion of seismic data. Accurate and geologically reasonable P-Sonic, Density and S-Sonic are required for inversion. Unfortunately this is not always possible due to bad borehole conditions i.e., washouts, shape/change of boreholes; miss-calibration of the measurement tool amongst wells and invasion. Additionally measured S-sonic is not always available because of the high cost of measurement and it needs to be synthesized.

General conditioning, normalization, calculation of mineral volume, water saturation, total porosity, synthesis of missing logs including S-sonic and fluid-substitution are usually done for inversion projects. All these fall under the title 'Seismic Petrophysics'. Seismic Petrophysics is different from Conventional Reservoir Petrophysics because; i) it is analysed for the whole geological interval running over several hundreds of metres, whereas Conventional Reservoir Petrophysics concentrates on the reservoir interval and does not cover zones above or below reservoir; ii) Seismic Petrophysics calculates volume of different insitu minerals (multi-mineral) which is usually input to Rock Physics Modeling (RPM), whereas Conventional Petrophysics just calculates reservoir vs non-reservoir (eg. sands or shales); iii) Conventional Petrophysics corrects values of logs for smaller intervals (for few depth samples), whereas Seismic Petrophysics corrects for the whole bed and also incorporates boundaries between non-reservoir to reservoir (shale to sand interface or vice versa - which is usually important for AVO analysis); iv) synthesis of S-Sonic – wells with S-sonic can only be used in AVO projects. The S-sonic log is synthesized using two different approaches; 1) rock physics modeling and ii) from seismic petrophysical analysis.

This paper presents the differences in Conventional Petrophysical and Seismic Petrophysical analysis and the importance of the latter to the inversion project.