Building A Simple Velocity Model By Utilizing Pseudo-average Velocity Kriged With Different Methods

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Abstract

Objectives/Scope: Defining a container for a 3D model is a vital step in calculating volumetrics. Sonic and density logs and checkshots availability can be challenges in creating a robust velocity model. A velocity model can be created from surface picks. The objective is to create a simple velocity model that utilizes pseudo-average velocity and kriged by secondary seismic properties and compare it with average velocity model to find the most accurate method.

Methods, Procedures, Process: To create a pseudo-average velocity model, picks from wells give depth information, while time interpretation values at the well location give time information. Dividing them gives a pseudo-average velocity. The seismic stacking velocity is approximating the RMS velocity. For comparison, extracted RMS seismic velocity was used as a guide to kriging interval velocity points once by cokriging and another time by kriging with external drift. Finally, three interval velocity models were generated and used to depth three surfaces using pseudo-average velocity, interval velocity from cokriging with RMS velocity, and interval velocity from kriging with external drift trended by RMS velocity.

Results, Observations, Conclusions: Three blind wells were used to test the three velocity models. All three models gave excellent results that are comparable to a fully detailed velocity model that utilizes well logs and checkshot data. For the target reservoir, the error percentage ranged from 0% to 1.29% for all models. The interval velocity from cokriging model has the lowest error percentage in all the blind wells, and therefore, is considered to be the preferred model. The result of the velocity model is not only reflected in the accuracy between the model results and actual drilling results but also volumetrics assessment as well. Additional rock volume by 2.25% is achieved by the interval velocity from the cokriging model.

Novel/Additive Information: This procedure showed that it is possible to obtain excellent depth conversion results utilizing only well picks or seismic velocity data without the need of sonic and density logs for time-depth relations and/or checkshot data. Since most wells will have surface picks, they can be utilized as an alternative, quick method for depth conversion. Testing and comparing between velocity methods should be done to find the best solution to each individual case.