AAPG International Conference: October 24-27, 2004; Cancun, Mexico

3D Modelling of Structurally and Stratigraphically Compartmentalized Permian Gas Reservoir Using Seismic Attributes and Inversion: Kommerzijl, Netherlands

***Martin Grecula**, Jos Terken, Hans Dankbaar, Herve Le Guen, and Robert Meij. Nederlandse Aardolie Maatschapij, PO Box 28000, Assen, 9400 HH, Netherlands, phone: +31 592 363 952, Martin.Grecula@shell.com*

Rotliegend gas reservoirs in the northeastern Netherlands show strong vertical and lateral variability caused by intercalation of aeolian, fluvial and lacustrine facies. Development of the fields is locally hindered by normal and strike-slip faults which can be sealing due to pervasive cataclasis and cementation. Kommerzijl field, as a typical example, is penetrated by a well with high initial flow rates followed by rapid decline. Well test and production data indicated small compartments with limited connectivity. The realistic modelling of the geometry and location of transmissibility barriers is therefore crucial for unlocking of the remaining reserves.

The seismic-based workflow focused on two areas: a) Reservoir characterization using high-resolution probabilistic seismic inversion calibrated to well data, b) Fault mapping utilizing a combination of volume-based automated 3D fault picking and manual interpretation aided by surface-based attribute maps (edge enhancement, curvature, amplitude). Several deterministic scenarios of derived reservoir quality distribution and fault structure were incorporated into a 3D PETREL™ reservoir model and subsequently exported and upscaled for dynamic simulation. Sensitivity analysis indicated that the presence of small faults in the reservoir is the main control on the observed well performance. A production history match of the dynamic model was achieved by linking lateral transmissibility to seismic attribute maps indicating fault damage zones.

The detailed 3D model provided a realistic production forecast and identified scope for further infill drilling in the field. Seismic-based reservoir characterization also allowed well design optimization. The developed workflow could be successfully used in other compartmentalized gas reservoirs in analogue settings.