Fracture network modelling for shale rocks – a case study from the Baltic Basin

Gabriel Ząbek, Michał Michna

AGH University of Science and Technology, Faculty of Geology, Geophysics and Environmental Protection, Department of Fossil Fuels; al. Mickiewicza 30, 30-059 Krakow, Poland; e-mail: zabek@agh.edu.pl

© 2015 Authors. This is an open access publication, which can be used, distributed and reproduced in any medium according to the Creative Commons CC-BY 4.0 License requiring that the original work has been properly cited.

The discrete fracture network (DFN) approach offers many key advantages over conventional dual porosity approaches when the geometry and properties of discrete fractures play a significant role in geomechanics, and resource assessment (Dershowitz & Doe 1988). A comparison of the simulated data to real fractures observed on core samples increases confidence in the DFN approach.

A DFN model typically combines deterministic and stochastic discrete fractures. The deterministic fractures are those directly imaged through seismic or intersected by wells. Other, usually smaller-scale fractures may not have been detected through seismic, yet may be very important for reservoir performance. These fractures are generated stochastically (Parney et al. 2000).

The aim of this study is prediction of fracture properties for the Lower Palaeozoic shale rocks. The input data included seismic survey data, and well logs with FMI interpretation that were calibrated with measurements and observations on the cores to ensure accuracy in the estimates of fractures properties. This study was performed using Petrel software from Schlumberger. Typical workflows for modelling of oil and gas reservoirs were applied (e.g. Zakrevsky 2011). The result was a 3D fracture distribution model consisting of four zones. In each zone two generations of fractures were modelled based on well log data. Several seismic attributes were additionally considered as fracture density drivers for the spatial modelling. Finally, the ant tracking structural attribute was chosen as the best indicator of faults and fractures in a seismic cube. To improve the quality of the DFN model, should define the local stress distributions.

The Faculty of Geology, Geophysics and Environment Protection, AGH University of Science and Technology, is deeply indebted to Schlumberger for the possibility of using Petrel software that was made available for the authors within the framework of the University Grant Program – Agreement no CTT-tt-4/2012 for Software Donation.

The research was financed by the AGH University of Science and Technology grant no. 15.11.140.640.

REFERENCES

