RECOGNITION OF SHALLOW STRUCTURE OF OROGENIC AREA WITH APPLICATION OF AMT AND CSAMT SURVEY

MAREK WOJDYLA 1, Elzbieta Maj 1, Mariusz Slys 2, Michal Stefaniuk 1,3

1. PBG Geophysical Exploration Company Ltd., m.wojdyla@pbg.com.pl
2. Polish Oil and Gas Company
3. AGH University of Science and Technology

Hydrocarbon deposits in the Carpathians occur at rather shallow depths, but under highly complicated structural and lithological conditions. It is therefore much difficult to detect and recognize such deposits with the use of surface geophysical methods. In 2008, research work commissioned by the Polish Oil and Gas Company and the project 'Development of new methods for detecting hydrocarbon deposits and recognition of their structure and variability during exploitation with the use of deep- and medium-penetration electromagnetic surveys' sponsored by the Minister of Science and Higher Education led to investigations of the Grabownica deposit with the use of two electromagnetic methods: Audio Magnetotellurics (AMT) and Controlled Source Audio-Frequency Magnetotellurics (CSAMT). The objective of the investigations was to evaluate the usefulness of electromagnetic methods in recognition of structural and tectonic conditions of deposits, and particularly to determine hydrocarbon-saturated zones.

The Grabownica deposit occurs within a long steep fault that is cut by a number of tectonic zones both running conformably and transversely to the fault strike. The deposit series are formed of rather thin and steep sandstone layers sealed by shales. Due to the direct contact of steep layers with the ground surface, the seal seems to be somewhat problematic in some part of the deposit. Because the structure is fairly good examined by numerous exploitation boreholes, this makes favorable conditions for test investigations. Also, the recognition of zones with no hydrocarbon saturation and deposit zones with different exploitation degree are propitious factors. All this information helps to evaluate how the deposit is reflected in interpreted resistivity distribution along test profiles.

A significant impediment to electromagnetic data interpretation is the complex structure of the deposit. It is often difficult in the interpreted resistivity cross-sections to distinguish between anomalies generated by a 'structural factor' and anomalies due to varied lithology and/or hydrocarbon saturation.

magnetotellurics, oil-gas deposits,

Marek Wojdyla, PBG Geophysical Exploration Company Ltd. 76 jagiellonska Str. O3-301 Warsaw, Poland, e-mail: m.wojdyla@pbg.com.pl