

Pore pressure prediction and well bore stability analysis in Lower Paleozoic shale formation, N Poland

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Pore pressure and wellbore stability sometimes pose a serious challenge while drilling, especially through rock formations of reduced strength or through intervals where abnormally high pore pressure was formed. Lack of prediction of pore pressure and lack of wellbore stability analysis introduce an element of uncertainty in selection of drilling fluid density. Too low density of drilling fluid can lead to uncontrolled flow of the reservoir fluid to the wellbore (kicks), washouts and occurrence of cavern like structures called breakouts. On the other hand too high density can lead to formation fracturing and further fluid loss. Therefore wellbore stability loss frequently prolongs the operating time, rising the costs of the drilling and in severe cases may end up well abandons loss.

The above mentioned complications can be avoided or greatly reduced by reliable analysis of drilling conditions with the aspects to geomechanical characteristics of drilled rock formations.

This study presents the results of analysis of pore pressure performed with the use of commonly used in oil industry methods. The analysis of pore pressure was carried out in almost entire profile of four boreholes drilled through lower Paleozoic shales, deposited in the southern part of the Baltic Basin.

In addition wellbore stability analysis was performed in the well with most complete geomechanical input data base.

Obtained results helped identifying intervals with elevated pore pressure could pose a risk during drilling operation. Elaborated 1D geomechanical model provides safe mud weight window helping to reduce the instabilities risk and constitute a great tool for geomechanical model validation.