ABSTRACT

Pertamina EP East Java Gas Development Project (PPGJ) faced a challenge when drilling into the relatively low-pressure carbonate reservoir in Kedungtuban field. One of the major difficulties during the well construction was pinpointing the casing point at the boundary between the relatively high pore pressure overburden shale and the low pore pressure carbonate reservoir. The early Miocene Kujung reef carbonates are difficult to drill because of its pinnacle shape and the difficulty to predict the top of the reservoir. The depth uncertainty and difference of pore pressure between the overburden and the reservoir lead to circulations loss, kicks, and blowouts. The Kujung carbonate is especially hazardous because it contains toxic gas such as H2S and CO2. Therefore, the precise placement of the casing must be started from the planning phase. Geological condition and its interpretation should be taken into account when estimating formation pressures and fractures gradients.

The actual top of reservoir can be 20-100m different than the top of reservoir obtained from correlation or seismic data. Thin carbonate stringers can be misleading and be interpreted as the top of reservoir and fractured shale can be a passageway for the drilling fluid into the reservoirs. Either too deep or too low drilling can be very expensive, harmful and bring unwanted consequences. Urging to manage the risks and lowering the possibility of any unwanted event brings PT. Pertamina EP to look into new technical applications, the real-time Logging While Drilling (LWD) Geostopping.

Geostopping is a planned interactive stopping of a well bore using geological offset data in comparison with real-time acquired LWD data. There are various techniques and tools in the LWD arena to do this, such as at-the-bit resistivity or look-ahead from seismic while drilling.

The stopping criteria while drilling favor a technique from the classic well placement method, using bit resistivity and real-time images, to compare and then to update the existing geological model.

The process of geostopping starts by collecting offset data followed by creating formation models and performing a risk assessment to determine the possibility of identifying the top of reservoir and stop drilling. This risk assessment might result in choosing a new down hole location at the time the risk level exceeds. This offset model with the expected at-the-bit resistivity response provides the required confidence to detect the top carbonate on the spot and therefore mitigate the risk.

LWD geoVISION (Mark of Schlumberger) resistivity (GVR (Mark of Schlumberger)) service was chosen because it provides the most sophisticated solution and maximizes the real-time information acquisition, from azimuthal GR and resistivity images to resistivity at-the-bit. This data is not only used for formation evaluation such as geological structure interpretation or fracture and fault identification but also for drilling purposes such as hole conditions, breakouts or drilling induced fractures.

INTRODUCTION

Kedungtuban field is a gas field located in Desa Pulo, Kecamatan Kedungtuban, Kabupaten Blora, Central Java, 29 km southwest Cepu. On the regional geology setting, Kedungtuban is located in the Eastern Cepu High, in the North East Java Basin.