DRILLING OF DEEP-SEATED RESERVOIR IN HIGH PRESSURE REGIME IN THE NORTH OF MALAY BASIN

Hamdan Mohamad, Nurazlina Jaini and M. Redzuan Tajuddin

Petroleum Management Unit (PMU), PETRONAS,
Level 22, PETRONAS Twin Tower 2, KLCC
50088 Kuala Lumpur

PMU PETRONAS has taken initiative drilling wells in high exploration risk areas such as deep-seated high pressure and high temperature (HPHT) reservoirs, since 1996. PMU drilling campaign in the deep-seated and high pressures wells has resulted a few field discoveries, such as Bergading Deep, Sepat Deep and Guling Deep-1 wells.

The challenges of drilling deep-seated and high pressure wells gives us a significant experiences in predicting the abnormal pressures and handling the well operations especially while drilling through the critical zones within the leak-off pressure limits. (figure 1). In drilling high-pressure wells in Malay basin, we had an experiences of having severe losses of the mud, well kicks and operational difficulties such as stuck pipes, hole stability and hole caving while drilling of the well. Of course, surrounding well information such as formation pressures, velocity, well logs will help geologist and drilling engineer in designing the well, determined mud recipes, bit types and prediction of pore pressure. All these preparations are very important, prior to drill and while drilling the well to ensure the success of drilling and safety of the personnel onboard.

In the drilling of deep reservoir well, pressure prediction is very important to be carried out. The data from nearby wells has to analyze in predicting abnormal pressure such as seismic velocity, formation pressures from RFT/ MDT, mud weight were used from nearby wells, porosity, density and well log curves. The good data would predict the presence of abnormal pressure based on the deviation on porosity trend, density and reversal of velocity data with the increase of depth.

The understanding of the mechanisms of overpressure is very crucial in predicting the overpressure pressures. The mechanisms of abnormal pressure in Malay basin were observed mainly due to the following reasons;

i) Under compaction or overburden – at the center of the basin
ii) Uplift – tectonic compression and structural inversion
iii) Inflation or late over pressuring – at the basin flank
Figure 1: Regional Pressure Profile In North Malay Basin