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Reservoir Overpressure Modelling in North Malay Basin.

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Abstract

The study was performed to further evaluate the factors contributing to reservoir overpressure in North Malay Basin. The model will be used in assisting the well planning for the future exploration campaign in the area. The study area is located in the 'S' Field, North Malay Basin. In general, the 'S' Field is a four way deep closure with an East West trending anticline. Four wells (SBD-1, SBD-2, SD-1, and SD-2) were drilled in this area. The pressure in the shale was evaluated using well log data (sonic, resistivity, density, and gamma ray) by applying the Eaton Method. The pore pressure model was calibrated using MDT across the sand intervals. The estimated reservoir pressure linked to 3D geological model with wells exists in similar geological settings. It was used to identify the potential of disequilibrium compaction and the effect of drainage capability those contributed to overpressure. The shale pressure (Psh) and reservoir pressure (Pres) were compared to identify any equilibrium variation for each wells. Five reservoirs (B100, D35, D60, E48, and H) were selected for each wells. The B100 and D35 reservoir pressures in SBD-1 well is higher as compared to SBD-2 and SD-2 wells. The seismic shows both reservoirs in SBD-1 well are up dip relative to SBD-2 and SD-2. The absence of a fault suggesting those reservoirs are connected. The water expelled in deeper part from SBD-2 and SD-2 wells may pressurized both reservoirs in SBD-1. Consequently, instantaneous re-equilibrium occurred throughout, and the buoyancy effect of the gas within both reservoirs put an additional overpressure within the pressure system. The NCT derived from shale was equilibrium to D60 and E48 reservoirs pressures in SBD-1 and SBD-2. It suggesting a constant shale pressure at the same burial depth. The water expelled from the adjacent shale during compaction pressurized the isolated reservoirs, consequently equalized the pressure. The H reservoir in SD-2 is shallower relative to SD-1. However, H reservoir pressure is higher in SD-2. The lateral overpressure transfer from SD-1 contributes to overpressure in H reservoir in SD-2. Moreover, the gas column within H reservoir contributed to an additional buoyancy pressure which lead to overpressure in SD-2. In conclusion, the pressure variation in B100, D35, and H reservoirs across different wells are a closed system with lateral overpressure transfer. The D60 and E48 pressure are a close system with Psh adjacent to the reservoir is constant throughout.