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Petrographic study of core samples from J Reservoirs, southeast Malay Basin, Malaysia

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Abstract: A petrographic study has been carried out on fifty-five (55) core samples from J Reservoirs, southeast Malay Basin. The study involved deriving data from thin-section, scanning electron microscopy and X- Ray diffraction analyses, and these analyses were carried out as one of the work scopes from Hydrocarbon Recovery Technology (HRT) research project. The main objectives of the study were (1) to obtain petrographic properties; (2) to study the diagenetic events and their sequences; (3) to predict reservoir quality and (4) to identify possible production problems of the samples. The samples analysed are from 6 lithofacies i.e S1 Unstratified locally cross-bedded; S2 Unstratified locally cross- bedded with parallel and ripple cross-lamination; S41 Clayey (5-10%), unstratified highly bioturbated, S42 Clayey (5-20%), unstratified highly bioturbated; S43 (15-40%), unstratified highly bioturbated and MI Silty mudstone. The samples represent J20, J25 & J30 reservoir units in southeast Malay Basin. The samples are categorised under sublitharenites, litharenites and subarkoses. Quartz is the major framework grains followed by feldspars, sedimentary rock fragments, glauconite and other accessory grains. Non-expanding clay minerals (kaolinite, chlorite and illite) is predominantly analysed and occurs as the major clay assemblages followed by the expandable clays of mixed layers illite, smectite and smectite. The presence of glauconite suggests deposition in a marine environment. Sandstone Textural Properties observed are fine to medium-grained, poorly to well sorted, and texturally immature to mature. Seven diagenetic events were observed, and they are (1) compaction, (2) pyrite precipitation, (3) siderite cementation, (4) calcite cementation, (5) dissolution of feldspar and unstable grains, (6) quartz overgrowth, and (7) clay authigenesis. Reservoir quality of the sandstones is ranging from very good to very poor. Good quality reservoir sands are from samples S1 and S2, poor quality reservoir sands are samples from S41, S42, S43 and M1 facies. Porosity is poor to good, and it is mainly contributed by primary intergranular pores with a minor contribution from secondary intragranular pores. Main controlling factors for porosity and permeability variations are depositional environment (grain size and sorting) and diagenesis (compaction and cementation). Major factors observed that contribute to porosity and permeability destruction in the sandstones are illitisation (grain-coating and grain bridging illite and/or illite/smectite), kaolinitisation (pore-filling kaolinite booklets) and mechanical compaction. Migration of fine detrital clays and dispersed kaolinite booklets and swelling of expandable clays of smectite component were identified as two potential production problems.x

Keywords: Sand reservoir, thin-section, scanning electron microscopy, X- Ray diffraction analyses

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