PS Deep Clastic Reservoir Quality in Ciputat Low, Onshore North West Java Basin*

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Abstract

A regional porosity vs depth model for sandstone has been developed for onshore North West Java Basin using ambient porosity from routine core analysis data and sonic porosity. The area from west to east covers Ciputat, Kepuh, Cipunegara, Cemara, Waled, Jatibarang, and Babadan Low. By assuming there is no significant erosion at the surface as indicated from vitrinite reflectance, seismic, and sonic value, the porosity curve follows exponential trend with surface porosity 58% and slope coefficient $-6.3*10^{-4}$ as the best fit model. The model also tells us that below depth 3000 mTVDss the porosity will be less than 10%, with permeability <0.2 mD. The low estimate model predicts porosity 5% higher in average and the high estimate model predicts porosity 6% lower in average than the best fit model. Attempt has been made to characterize the low and high estimate porosity model using petrography classification and led into bias conclusion due to limited data. We found an appropriate technique to characterize the porosity model using GR log pattern scale 1:200: cylindrical, funnel, bell, symmetrical, and serrated. Cylindrical log pattern follows low estimate model better and may reflect high energy play.

The basin wide porosity model then tested in Ciputat Low following company strategy to drill deep wells (more than 3000 meters) in the area. Our last two wells in the area targeted sandstone of Equivalent Jatibarang Formation as primary objective and found both reservoir and hydrocarbon but failed to flow hydrocarbon in significant quantity due to reservoir quality problem. The porosity model within Ciputat Low agrees with the basin wide porosity model. Fortunately, large petrography data are available within this Ciputat area and eased us to characterize the porosity model. The scheme used for the analysis is the combination between Folk (1974) classification and Dott (1964) classification. Best estimate model deals with arkosic

sandstone, while high estimate model deals with wacke sandstone and low estimate model deals with arenite group sandstone (arenite, sublitharenite and litharenite sandstone). The arkosic sandstone and wacke sandstone are found in relative deep area and interpreted as sand bars deposited in estuary setting as indicated from core, log, and seismic attribute. Arenite group sandstone mostly found in high area: Rancajawa, Pondok Tengah and reflects channel deposition as also indicated from core, log, and seismic attribute.

The comprehensive analysis of compaction for different rock clusters suggests that the main factor for porosity reduction in the study area is grain composition. Wacke sandstone undergo a larger degree of compaction than other groups due to the presence of more clay minerals. Diagenetic plays a minor role in porosity reduction for arenite group sandstone as indicated from petrography with quartz overgrowths only counts as a maximum 5%. As generally accepted, diagenetic plays an important role in decreasing permeability for sandstone, especially by the presence of some authigenic clay minerals (Athy, 1930). We identified these kinds of minerals from thin section such as: kaolinite, illite, and chlorite, but no clear relationship observed between permeability and clay content due to very limited XRD data. We believe that the very low permeability value for arkosic sandstone and wacke sandstone is caused by very low porosity.

References Cited

Athy, L.F., 1930, Density, Porosity and Compaction of Sedimentary Rocks: American Association of Petroleum Geologists Bulletin, v. 14, p. 1-24.

Dott, R.H., Jr., 1964, Wacke, Graywacke and Matrix – What Approach to Immature Sandstone Classification?: Journal of Sedimentary Petrology, v .34, p. 625-632.

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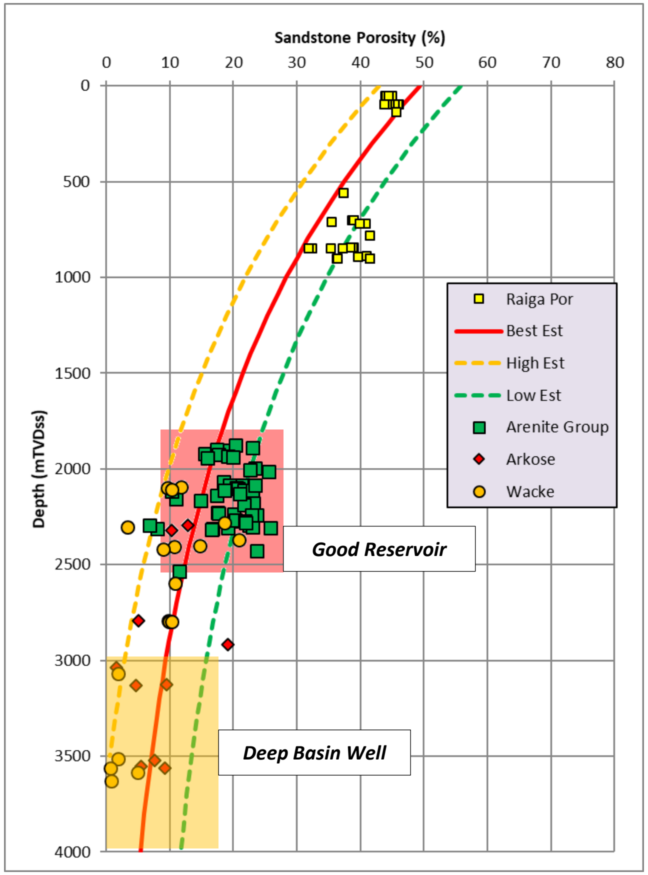
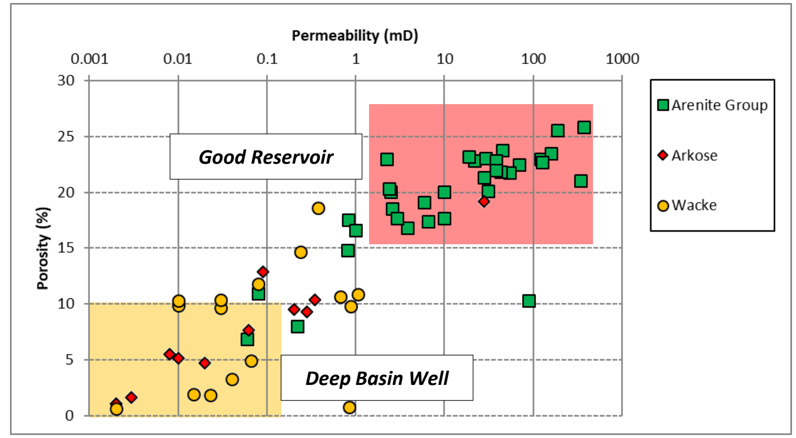




- Best estimate model : surface porosity 58%, slope coefficient $-63*10^{-4}$
- Below depth 3000 mTVDss, porosity <10%, permeability <0.2 mD
- Low estimate model reflects high energy play

Figure 1 – Left - porosity vs depth for each sandstone type in Ciputat-Pondok Tengah Area
Right - porosity vs permeability for each sandstone type in Ciputat-Pondok Tengah Area

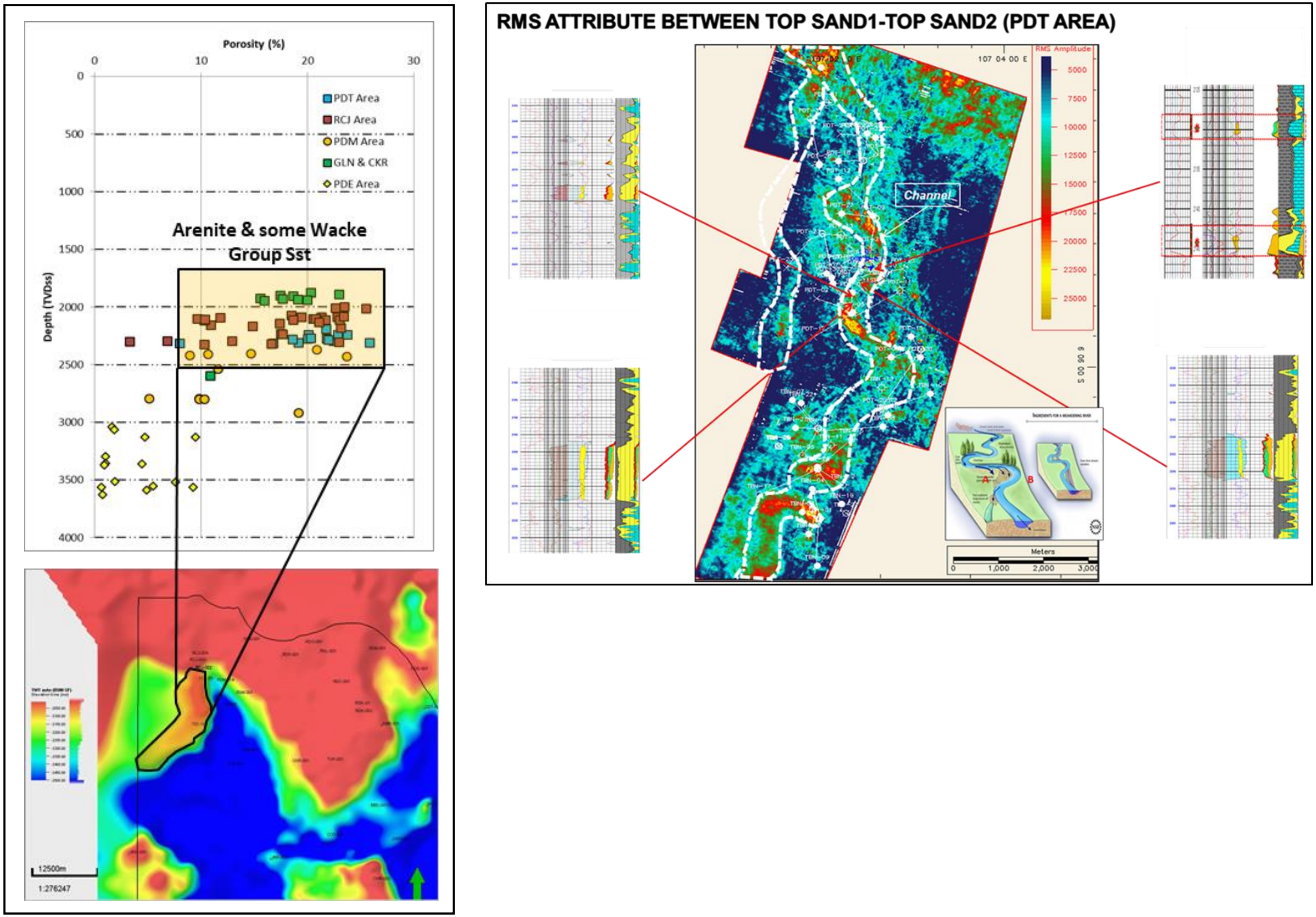


Figure 2 - Left-Porosity Distribution of Pondok Tengah (PDT) high
Right - Seismic Attribute of sandstone reservoir in Pondok Tengah (PDT) high

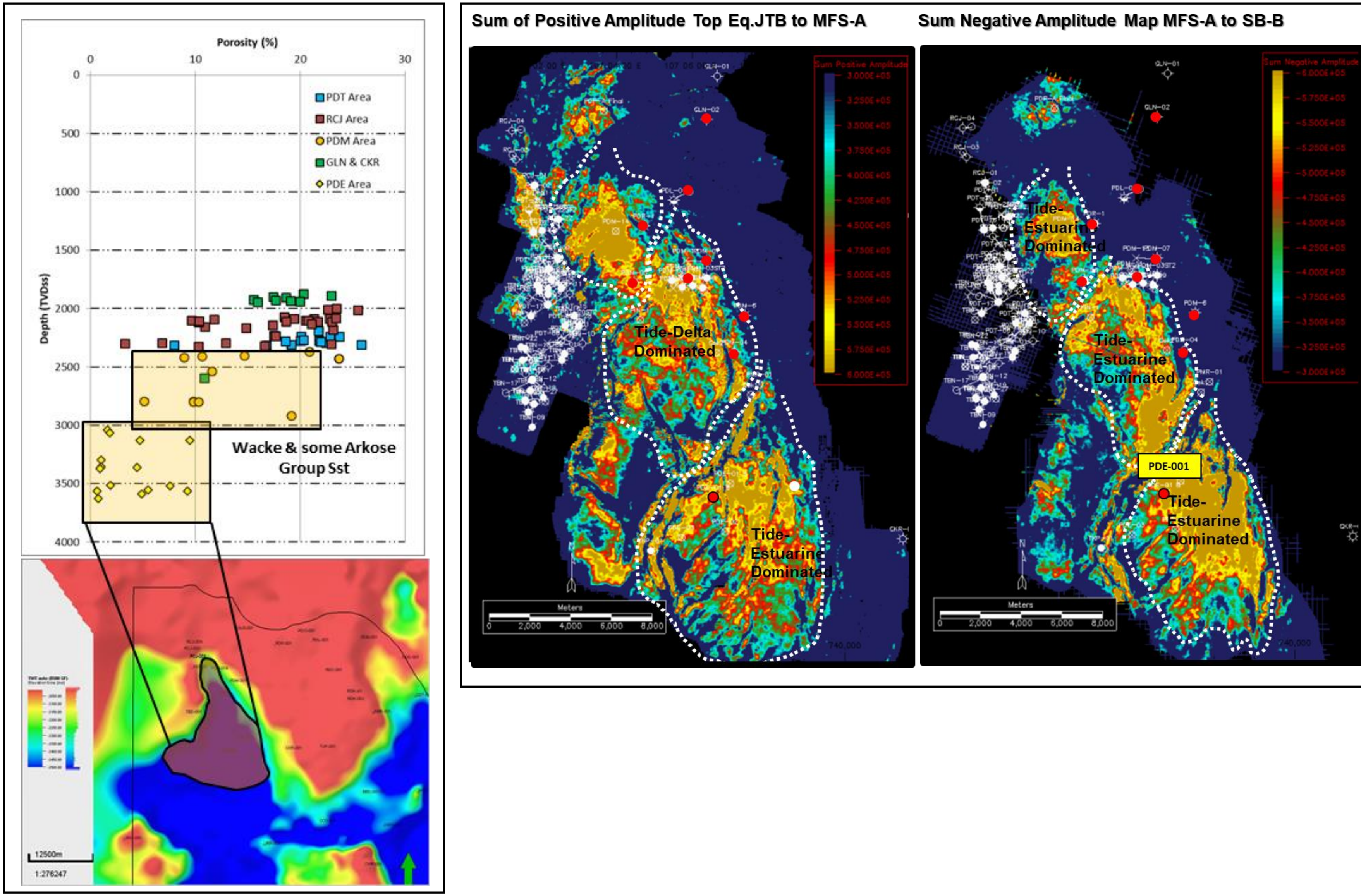


Figure 3 - Left-porosity Distribution of Ciputat Low

Right - Seismic Attribute of sandstone reservoir in Ciputat Low

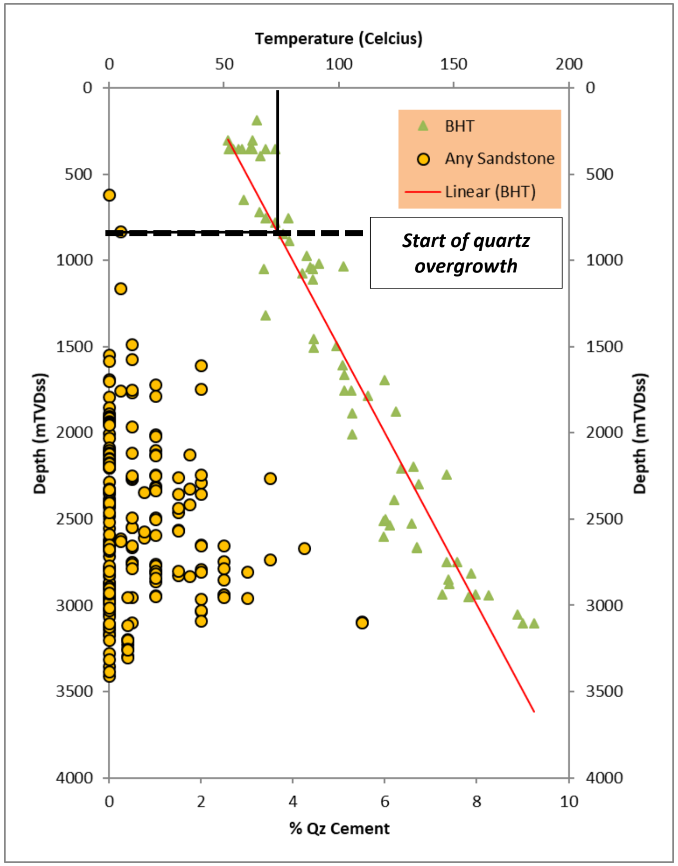
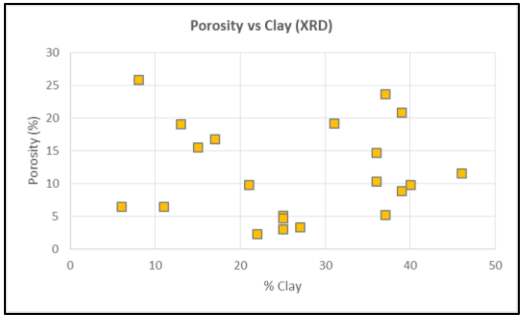


Figure 4 - Temperature vs depth distribution of Ciputat-Pondok Tengah Area

- ❑ Quartz overgrowth only counts max 5% of point counting
- ❑ No clear relationship observed between the presence of authigenic clays with porosity and permeability reduction, due to limited XRD data



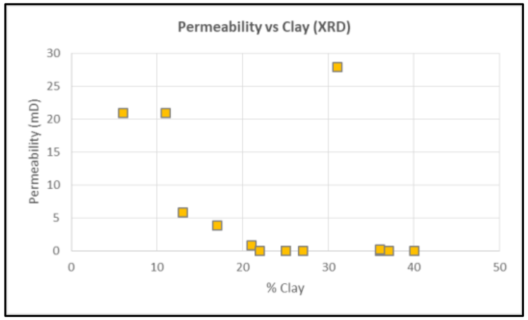


Figure 5 - Left-Porosity vs % clay distribution of Ciputat-Pondok Tengah Area
Right - Permebaility vs %clay distribution of Ciputat-Pondok Tengah Area

References

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