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Sequence Stratigraphy in the Central Sumatra Basin, Indonesia: A Statistical Approach to Enhanced Biostratigraphic Resolution

Environmental constraints in shallow marine and tidal clastic settings of the Central Sumatra Basin exclude most critical age-diagnostic marker species. Traditional chronostratigraphy for the Bekasap, Bangko and Menggala formations of the Central Sumatra Basin places all reservoir sands into a single Early Miocene biozone. With this level of resolution, field-to-field or sub-regional correlations of reservoir units can not be verified.

A statistical approach, which provides a reservoir-scale chronostratigraphic framework, is a viable alternative. In contrast to traditional paleontological analysis for age markers and paleobathymetry, statistical methods readily discern subtle environmental excursions sample-to-sample.

A high-resolution “eco-zonation” is generated using Integrated Paleontological System (IPS), software specifically designed for statistical manipulation of paleontologic data. This approach condenses large biostratigraphic datasets into manageable “eco-groups” based on paleoenvironmental preferences. Juxtaposition of “eco-groups” defines relative deepening and shallowing eustatic cycles at a sub-reservoir scale and provides intra-basinal “eco-stratigraphies”. Thirteen “eco-groups” are defined dependant on group members environmental preferences. Of these, the “planktonic”, “marine”, “shallow”, “r”, and “k” groups provide greatest eustatic control. “Eco-groups” are identified in fifty-one wells across fifteen fields.

Integration of the “eco-zonation” with core facies and wireline motif indicates eustatic trends and the paleoenvironmental evolution of the Bekasap region of the Central Sumatra Basin. Marine floodback surfaces (FS) identified by diverse globigerinid faunas are regionally extensive stratigraphic isochronous units of correlative value. Consistent identification of FS events provide correlation surfaces at a sub-biozone scale for enhanced sequence stratigraphic resolution.