

## Hydrocarbon Prospectivity Definition, the Kra Basin, Northern Gulf of Thailand

Tianpan Ampaiwan<sup>1</sup>, Minarwan Minarwan<sup>1</sup>, Paul Swire<sup>1</sup>, and Paolo Tognini<sup>1</sup>

<sup>1</sup>Mubadala Petroleum, Bangkok, Thailand ([paul.swire@mubadalapetroleum.com](mailto:paul.swire@mubadalapetroleum.com))

### Abstract

The Kra is a Tertiary aged, rifted, mainly lacustrine basin. Commercial hydrocarbons discovered in 2009 led to the Manora Field development in 2014. A successful exploration well in 2013 (Malida-1) located towards the axis, critically re-defined prospectivity in this high potential basin. World-class source rocks, multiple good quality sandstone reservoirs and trap types with proven seals will be discussed with their associated petroleum system. The VIM Stratigraphical nomenclature is one that was developed by using an integrated multidisciplinary sequence biostratigraphic approach and tied to lithologies and seismic which has been used by Mubadala Petroleum across South East Asia for all regional correlations. The recent addition of T is for Gulf of Thailand sequences. Biostratigraphy (palynology/foraminifera), sedimentology and geochemical analyses undertaken by external laboratories on cuttings, cores and fluid data collected from the Malida wells (Malida-1 plus two sidetrack wells) were used in the post drill analysis and were integrated with prior knowledge of the basin. Biostratigraphy was used for regional and local correlations and for palaeoenvironmental interpretations. Malida wells provided evidence for high potential source rocks younger than the Oligocene shales with measured TOC up to 5 - 7 wt%. The Hydrogen Index can be up to 750 mg HC/gr TOC, indicating rich oil-prone kerogen. The TOC vs. Depth plot shows that organic-rich shales occur consistently from ~7000 ft to ~10,000 ft MD in the central part of the basin. These shales were deposited during the synrift phase and were initially believed to be purely lacustrine. GCMS of some Malida samples and oils from Manora and Malida actually show that the claystones were most likely deposited in an estuarine or shallow lacustrine setting with some terrestrial input. Oil and source rock GC fingerprints, stable carbon analysis and biomarker-based oil to source rock correlation indicate that Malida and possibly Manora oils are sourced from the Early Miocene and are early mature. Organofacies types of source rocks in the Kra Basin are most likely a mixture between Organofacies C (lacustrine algae) and Organofacies D/E (terrigenous, higher plant input). This organofacies mixture is consistent with interpreted depositional settings from new biostratigraphy and sedimentology data.