



SEAPEX Exploration Conference 2007
Orchard Hotel, Singapore
24th – 26th April 2007

Day: Wednesday 25th April
Session: Malaysia - Vietnam Session
Time: 1130 – 1200 hrs

The Petroleum Systems of the North Malay Basin, Offshore SW Vietnam

Greg Solomon, Chevron Vietnam
Rui Lin, Chevron Thailand Exploration and Production
Jim Turner, Chevron Thailand Exploration and Production

More than fifty exploration wells have been drilled in the North Malay Basin since 1993 on various vintages of seismic data including approximately 9000 km² of 3D surveys with a success rate of over 80%. Significant gas-condensate discoveries have been made in multiple stacked sandstone reservoirs over approximately two thousand metres of stratigraphic section, predominantly in three-way structural traps. The regional structural framework is characterized by normal faulting propagating upsection from metasedimentary and sedimentary basement terrains interpreted to be of Palaeozoic and Mesozoic ages. Large vertical fault displacement is present on the prominent Kim Long Horst within a hinged Oligocene age half-graben that abuts the Vietnam shelf. Miocene to Recent sediments are interpreted to be sag basin-fill, with a notable unconformity at approximately 10.5 million years ago. The horst and adjacent intra-basin regional highs have acted as focal points for the entrapment of migrating hydrocarbons discovered to date. Two distinct petroleum systems have been recognized - a Miocene coaly source paired with Miocene reservoirs, and an Oligocene lacustrine source paired with both Miocene and possible Oligocene reservoirs. This paper will focus on these known petroleum systems within the northernmost Malay Basin, predominantly in Vietnam territorial waters in the Gulf of Thailand.

Depositional environments range from Oligocene lacustrine-fluvial systems to Miocene and younger age fluvial to marine settings. Biostratigraphic and seismic studies suggest rapid changes in sea-level controlled large scale basin fill across the northern area of the basin. Reservoir quality is generally good to excellent and influenced by the relative abundance of ductile materials and quartz content,

as well as grain size. Oligocene shaly source rocks are characterized by algal and land plant input with TOC's of 1 to over 25% and HI's of 250 to 800 (mg HC/g TOC). The Miocene coaly source has much higher TOC's (>50%) with lower HI's (150-300). The amount of liquid hydrocarbons with the gas is controlled by both source rock type and thermal maturity. Geothermal gradients of 5-7 degrees Celsius/100m are observed in the area locally. Normal pressure gradients operate in the flank regions of the basin with increasing pressure basinward in the lower Miocene section, switching back to normal pressures in the lowermost sandstone unit. Significant volumes of carbon dioxide are also present with hydrocarbons in the Miocene: Miocene system and are thought to have a predominantly inorganic origin.