Angsi Field – World’s Largest Platform Based Fracturing Operations

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The Angsi field is the largest integrated oil and gas development in the region and the first tight gas development in Malaysia. It is located 165km off the East Coast of Peninsular Malaysia in a water depth of 70m. Angsi Project is a joint venture between PETRONAS Carigali Sdn Bhd (PCSB) and ExxonMobil Exploration and Production Malaysia Inc. (EMEPMI), operated by PCSB. A dedicated project management team consists of technical personnel from PCSB and EMEPMI was formed to oversee the timely and prudent development of the field.

Angsi field consists of both oil and gas reservoirs at depths of 1500m to 3000m TVD. The deeper retrograde gas-condensate K-sands require fracture simulation to improve well productivity and mitigate the detrimental effects of condensate dropout. The Angsi fracturing campaign is the largest platform based fracturing operation to date. Fracturing equipment, materials and personnel were mobilized worldwide to the drilling riser platform. The frac spread is a semi-permanent installation for a 2-year campaign. Development drilling commenced in November 2000 with a total of 47 wells to be drilled, of which, 21 wells would require fracture simulation.

S-shaped wells are drilled (up to 6000m MD and 75 degree inclination) with vertical completions in the K-sand reservoirs to minimize fracture complexity, such as multiple fracture and tortuosity.

The target K-sand reservoirs are moderately permeable (0.1 – 3.0 mD), slightly over-pressured (0.49 psi/ft), with reservoir temperature of 320 deg. F. The group K reservoir consists of three to four primary gas sands with numerous secondary gas members. Angsi K-sands are retrograde gas condensate reservoirs, with a total yield of 25 – 100 bbl/MMCF.

The objective of the completion is to achieve optimal fracture length and conductivity, while maximizing hydraulic coverage of both the primary and secondary gas sands. Initial designs called for three to four fracture treatment stages to achieve the simulation objectives, with stage isolation using sand plugs being the most efficient and economical alternatives.