Does the Quaint Oil of Mann-665 Cast Light on the Regional Geology?

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ABSTRACT

The Mann field is the third in size of the onshore producing oil fields of Myanmar. The field is located in the Salin Basin, the most productive of the Central Myanmar Basins ("CMB"). State enterprise MOGE discovered the field in 1970, and put it in production in 1972. The field has produced a total of some 120 MMbbls and 123 Bscf gas, with a maximum output of 24,700 bopd in 1979. MPRL E&P has been the contractor for MOGE to enhance the oil recovery of the field since 1999 and is rewarded with a share of the incremental production. The field now produces some 1,320 bopd including some 970 bopd of incremental production due to MPRL E&P's and MOGE's efforts, with an average decline rate of only 4% compared to more than 12% before 1997.

Incremental petroleum has been produced by a combination of infill drilling, deepening, additional perforations and some innovative technologies pioneered by MPRL E&P and MOGE in the Myanmar onshore oil scene, such as hydro-fracturing and the use of enzymes and other paraffin scavengers. MPRL E&P and MOGE have also introduced international practices of HSE and CSR in the field long before they were enforceable by law in the country, including a mechanism of resolution of operational grievances praised by international watchdogs and nearly 90% of all formation and waste water reinjected in the formation.

The Mann structure is a 30-km long asymmetrical anticline with a northwards dipping axis, increasingly tight flanks southwards and a major westwards dipping reverse fault complex bounding the anticline to the East, where the flank is steeper than to the West. The Mann anticline is one of about a dozen similar structures described by U Ko Ko 2016 as belonging to a late Pleistocene N-S strike-slip deformation belt nearly parallel to the axis of the basins along the Ayeyarwaddy River, from the Leipando oil field in the North of the Salin Basin to the Shwepyithar wet gas field in the Pyay Embayment in the South. This deformation belt is characterised by en-échelon asymmetrical anticlines, partly filled with shallow oil and/or gas, with wet gas in deeper tighter reservoirs as proven in a few structures (such as Mann and Pyay fields).

The Mann field, located just north of the well-known Minbu mud volcanoes, is very compartmentalized, with three main fault blocks separated by late cross-field normal faults, each with their different exploitation challenges in terms of depth, stratigraphy, compartmentalization and pressure regime of reservoirs. The field produces a variety of oils spanning from 24° to 47° API from 22 Oligo-Miocene stacked reservoirs in 59 pools.

One of the means of enhancing production has been infill drilling. MPRL E&P has drilled about 21 deep infill wells, six of which exceeding 6,000 ft, most of them commercially quite successful. Mann-665 was drilled in the southernmost much compartmentalised DS fault block and
has been producing since November 2009 some 5-6 bpd of the lightest oil in Mann practically without decline. The oil density measures some 47° API with very low paraffinic content by contrast with all other oils of the field. This peculiar oil probably migrated through a deep-seated network of faults intersecting the well bore near the main bounding fault to the East. The result of M-665 has been one of the incentives to drill in 2011-2012 the deep exploratory well of Mann Deep East-1, which discovered a wet gas play in the Lowermost Oligocene Shwezetaw sandstones. This challenging well could not be tested because of excessive tectonically induced formation pressures needing a drilling mud of up to 21 ppg (sg 2.5) to be contained. MPRL E&P has attempted to integrate the basic oil analyses of M-665 with other oil analyses in the field, as well as with stratigraphical, sedimentological and structural aspects to sketch some conclusions on exploration-appraisal prospectivity of the Mann field.