A New Approach to Stratigraphic Analysis in the Pre-Upper Cretaceous of the Sirt Basin, Libya

Woolam, Ron [2]; Pearce, Timothy [1] (1) Unit 1 Ravenscroft Court, Chemostrat Ltd, Welshpool, United Kingdom. (2) Geological Operations, Core Laboratories, Redhill, United Kingdom.

The development of stratigraphic schemes in Pre-Upper Cretaceous (PUK) successions within the Sirt Basin is problematic due largely to the prevalence of extensive, quartz-rich, coarse clastic sequences. The sedimentological character makes lithostratigraphic interpretation problematical and detailed biostratigraphic correlation is not possible due to highly variable preservation potential for fossil material. Where fossil assemblages have been recovered, a lack of critical assessment of reworking effects has resulted in erroneous age-assessments.

Study of forty wells across the Sirt Basin, encompassing 75000ft of section with over 3000ft of core has allowed a new stratigraphic framework to be developed for the PUK successions. This has been achieved through a multi-disciplinary stratigraphic approach, integrated with detailed sedimentological interpretation. Chemostratigraphy underpins the correlation framework and has allowed characterisation of four sequences (S1 to S4) that are subdivided into a total of seventeen packages (S1-P1 to S4-P6). Cyclostratigraphic analysis of climate-driven cycles, supports the chemostratigraphic scheme and offers potential for reservoir scale correlations.

Palynological analyses provides age-calibration of the chemostratigraphic sequences. Rich and diverse Ordovician, Silurian and Devonian assemblages have been recovered from Paleozoic successions in the western part of the study area (sequences S1 and S2). Paleozoic assemblages with much reduced recovery are also recorded in the central and eastern area, but their association with rare Triassic palynomorphs results in the suggestion that extensive reworking of Paleozoic material into younger Triassic successions with sparse indigenous palynoflora took place (sequences S3 and S4). A number of sections have produced rich and diverse Triassic palynofloras, providing additional support for the presence of Triassic-age sediments within the correlation framework. While Jurassic assemblages were not recovered in any of the samples analysed, a few samples yielded Early Cretaceous assemblages (Package S4-P6).

The stratigraphic results from this integrated study indicate equivalence of Qarqaf, Amal and Nubian/Sarir successions. Importantly from an economic standpoint, this study provides new information on the timing of initial rifting in the Sirt Basin, which will require petroleum exploration opportunities to be re-evaluated.