

Oil and Gas in the UAE: Present and Future Production

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1. Introduction

UAE's existing oil and gas reservoirs are developed mainly in carbonates rocks within a time period ranging from the late Permian (ca 290 Ma) to middle Miocene (ca 15 Ma). Proven reserves and actual production in the neighboring oil-producing countries (e.g. Oman and Saudi Arabia), however, are also from much older carbonate and clastic reservoir rocks, ranging between Infra Cambrian ca 540 Ma to Silurian ca 420 - Ma. Future petroleum production of the UAE could be increased by exploration of deep basins and by enhanced reservoir recovery with explicit fracture and fracturing networks.

2. Deep exploration and fracture-enhanced oil recovery

Oil and gas provinces of the UAE are part of the general geological setting of the Gulf region, where similarities in both stratigraphy and structural style are dominant (Fig. 1). Specific conditions of pressure and temperature define the formation and maturation of petroleum. The age of source rocks and productive reservoirs in the UAE ranges from 30-290 Ma., with drilled wellbore depth from 1,000 to 5,456 m respectively. The structural style is characterized by wide and open folds with strong imprint of older fault and fracture systems at greater depth. Fracture networks play a vital role for oil migration, communication and sealing. While present UAE reserves are almost entirely in carbonate reservoirs within a depth range of 1-6 km, Fig. 2a, valuable amounts of oil and gas in Oman and Saudi Arabia are produced from both carbonate and clastic reservoirs that are older and much deeper. Future UAE reserves can be increased by exploration of deeper reservoirs of both carbonate and clastic rocks. Detailed study of fracture systems in relation to their geometries, stresses, interconnectivity and conductivity is of great significance for reservoir modeling, which consequently improves oil recovery and reserves, Fig. 2b.

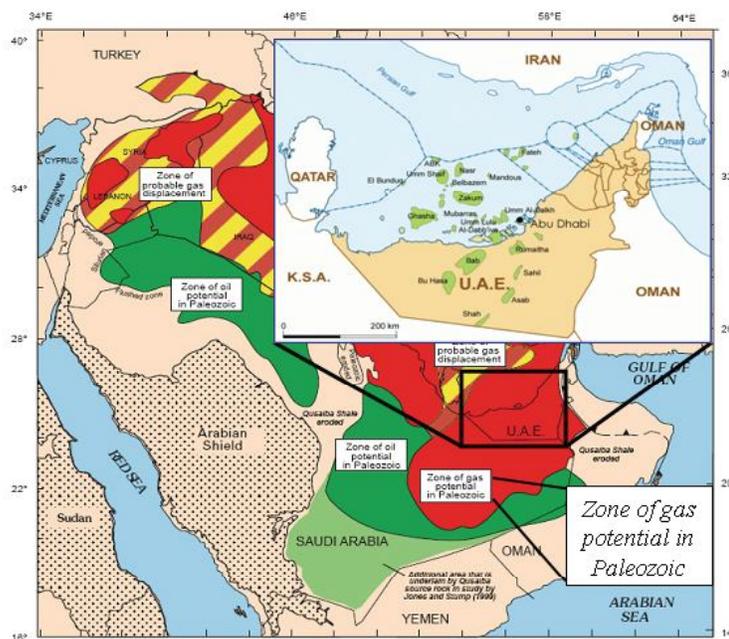


Fig. 1. Oil and gas fields of the UAE and potential occurrence of hydrocarbon in Paleozoic rocks.

3. Conclusions

- 1) The geological development and structural style of the UAE oilfields are related to the geological development of the whole Gulf area.
- 2) Potential reserves are expected at greater depth (> 6 km).
- 3) Both carbonate and clastics reservoirs older than Permian are anticipated due to similarities to other giant oil fields in the Gulf.
- 4) Recovery factors and reserves can be increased by improving reservoir modeling with explicit fracture networks.

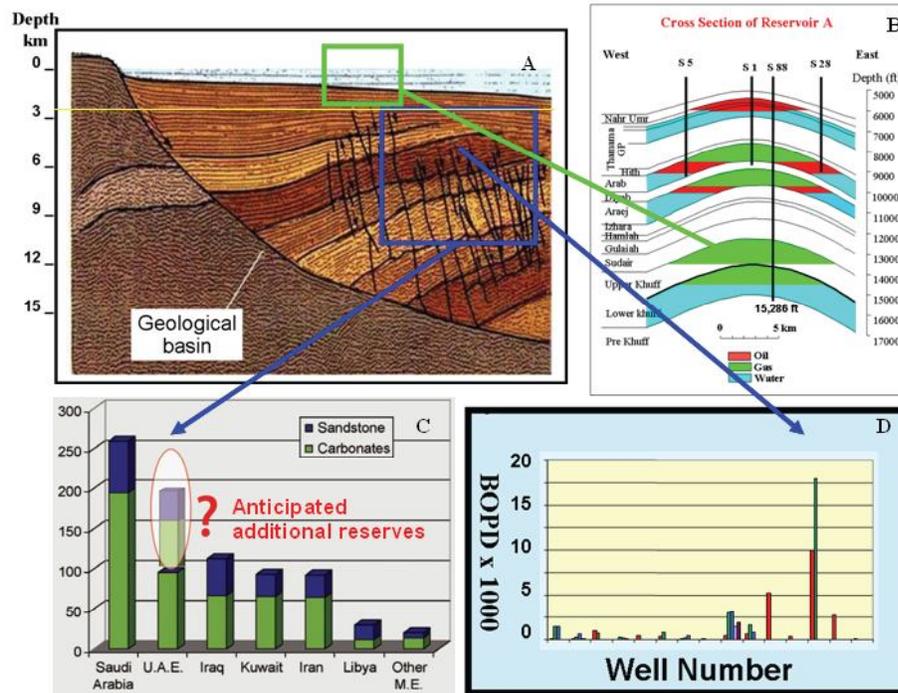


Fig. 2. A) Schematic cross section for a geological basin reaching ~ 15 km of depth, B) Current maximum depth (4586m) reached so far in the UAE, C) Current and anticipated additional oil reserves (MBPD) in the Middle East, D) Fracturing and open fracture networks for enhanced oil recovery.

4. References and Bibliography

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Author Biographies

Dr. Manhal Sirat has more than 15 years experience both in industry and academia. He worked as Engineering Geologist in Iraq (1982-1991). He received a PhD in 1999 from Uppsala University. He worked at several institutions worldwide and is currently presently an Assistant Professor at the Petroleum Institute (PI), Abu Dhabi, UAE. He is the Project Manager of the F&F Project, part of the R&D projects in PI and ADNOC. Dr. Sirat is a member of EAGE, ESG, SPE and IEEE.

Dr. Yue-Feng Sun received a Ph.D. in 1994 from Columbia University. From 1981 to 1987, he worked as a geoscientist in PetroChina. From 1994-2005, he was a Doherty Research Scientist at Columbia University. He is now Associate Professor at the PI. His research areas include carbonate rock physics and poroelasticity, reservoir geology and geophysics. He has published numerous articles and patents. Dr. Sun is a member of AGU, SEG, APS, and AAPG.