

# CO<sub>2</sub> sequestration-EOR in Wuqi oil reservoir – Yanchang Field, China: Estimation of CO<sub>2</sub> storage capacity using a two-stage well test

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Depleted hydrocarbon reservoirs, deep saline aquifers, deep coal seams and shales are considered as potential CO<sub>2</sub> geological storage sites. However, depleted (mature) oil fields are often considered as first targets for geo-sequestration where the cost can be offset by enhancing oil recovery as well as utilising the existing infrastructure and facilities. However, evaluation of CO<sub>2</sub> injectivity/dynamic storage capacity and ultimate CO<sub>2</sub> enhanced oil recovery (EOR) are key elements for site selection and a successful CO<sub>2</sub> storage – EOR project.

The Yanchang Petroleum Company's Yanchang oil field is located at Ordos Basin in north western China and it is the second largest low permeability oil field in China with a very short and inefficient primary oil depletion and secondary water-flooding recovery. Thus, CO<sub>2</sub> EOR was considered an appropriate tertiary oil recovery approach. In this work, the Wuqi reservoir in the Yanchang field was selected to study the feasibility of full-field CO<sub>2</sub> sequestration – EOR. The Wuqi reservoir has been in production for over a decade using both primary and secondary oil recovery methods and has historical data that can be history matched to reduce the uncertainty for a CO<sub>2</sub>-EOR field development plan. To acquire essential dynamic data to evaluate CO<sub>2</sub> injectivity/dynamic storage capacity, a specific two-stage well testing design is proposed to inject both water and CO<sub>2</sub>. It provides accurate effective permeability estimates for the water (test phase 1) and CO<sub>2</sub> (test phase 2) at the injecting well and estimates of the water and CO<sub>2</sub> fronts in the reservoir. Using two monitoring wells significantly increase the radius of investigation (ROI) and also describes the reservoir heterogeneity.