Screening and simulation of offshore CO2-EOR and storage: A case study for the HZ21-1 oilfield in the Pearl River Mouth Basin, Northern South China Sea

GCCC Publication Series #2019-28

P. Li
L. Yi
X. Liu
G. Hu
J. Lu
D. Zhou
S. Hovorka
X. Liang

Keywords: storage, reservoir, CO2-EOR

Cited as:
Li, Pengchun, Linzi Yi, Xueyan Liu, Gang Hu, Jiemin Lu, Di Zhou, Susan Hovorka, and Xi Liang, 2019, Screening and simulation of offshore CO2-EOR and storage: A case study for the HZ21-1 oilfield in the Pearl River Mouth Basin, Northern South China Sea, GCCC Publication Series #2019-28, originally published in *International Journal of Greenhouse Gas Control, 86, 66-81.*

Abstract

CO_2-enhanced oil recovery (CO_2-EOR) and storage is currently the most effective and economic technology for reducing CO_2 emissions from burning fossil fuels in large scale. This paper is the first effort of proposing a modelling assessment of CO_2-EOR and storage in the HZ2-1 oilfield in the Pearl River Mouth Basin in northern South China Sea offshore Guangdong Province. We attempt to couple the multi-parameter dimensionless quick screening model and reservoir compositional simulation for optimization of site screen and injection simulation. Through the quick screening, the reservoirs are ranked by EOR dimensionless recovery RD, and by CO2 storage in pore volume SCO_2. Our results indicate that SCO_2 is highly pressure dependent and not directly related to RD. Of these reservoirs, CO_2-EOR and storage potential of the M10 was estimated through a compositional simulation as a case study based on a 3D geological model. Nine scenarios of CO_2 injection operations have been simulated for 20 years with different well patterns and injection pressures. The simulation results represent an obvious improvement in oil production by CO_2 flooding over No−CO_2 production. The best operation for M10 is miscible CO_2 flooding, which led to the higher recovery factors of 52%˜58% and CO_2 stored masses of 8.1×106˜10.8×106t. The optimum operation for CO_2 injection should be set well pattern in region of injector I1 and high injection pressure for miscible flooding. In a whole, the HZ21-1 field can be used as a candidate geological site for GDCCUS project. We are fully aware of the limitation in the primary modelling including reservoir and fluid properties and production history matching, and regard this study as a general and hypothetic proposal.