CO₂ EOR Feasibility in SECARB Region Limited by CH₄

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Methane and Cranfield

Cranfield
- 672,472,000 Mstd ft³ Historic Gas Production
- 2 to <10% Methane Fraction

![Average Methane in Recycled gas graph](image)
Problem of Methane Removal

Separate $\text{CO}_2$ and methane

Don't use recycled $\text{CO}_2$

Immiscible Flooding

(Generon, 2018)

Modified from (ICIQ, 2018)

(Science Photo Library, 2016)
Economic Impact

- Snøhvit reinjects CO₂ emissions from three fields
  Gas gets pumped onshore to separate CO₂ and CH₄
- Increases capex and opex costs

Potential Affects On SECARB Area: The Gulf Coast

28.7 billion bbls OOIP − 11.6 billion bbls recovered
= 17.1 billion bbls unrecovered

- Recent interest in shallow water reservoirs for CO₂ EOR
- Change in miscibility could mean changes in economics of CO₂ EOR
Methane as a Limiting Factor in CO₂ EOR

- Model tolerance of CH₄ impurity in comingled production for CO₂ EOR of 3,598 BOEM reservoirs.
- 18 mole percent CH₄ impurity in recycled CO₂ needed to sustain miscibility >70% reservoirs
Rapid Loss of Miscible Fields At Higher Gas

(Ogbuabuo, 2015)
Methane as a Limiting Factor in Shallow Water CO$_2$ EOR

- Tolerance was affected by water depth and sub-seabed depth.
- 67% of shallow water reservoirs miscible at 18 mole percent.

Analysis of total depth and miscibility for 18 mole percent CH$_4$ impurity (Ogbaruobu, 2015)
Applicability of Methane as a Limiting Factor

Scenario 1: Oil and gas are geologically separated by an impermeable layer

Scenario 2: Oil and gas are separated by gravity

Scenario 3: Gas is dissolved in oil
High Island Case Study Area

Gamma Ray, Resistivity, Neutron Porosity and Bulk Density from API 4260630170000
Basic Log Interpretation

Gamma Ray
- Left: Sandstone
- Right: Shale

Resistivity
- Right: Hydrocarbon
- Left: Brine

Gamma Ray Left, Resistivity to the Right, Big Cross Over: Gas

Gamma Ray Left, Resistivity to the Right, Small Cross Over: Oil

Gamma Ray Left, Resistivity to the Left, Small Cross Over: Brine
Log Interpretation

Cumulative Oil: 40,718 Bbl
Cumulative Gas: 12,202,549 MCF
Seismic data owned or controlled by Seismic Exchange, Inc.; interpretation is that of the Bureau of Economic Geology.
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Production Data
Conclusions

• Well design cannot be completed to avoid CH4 coproduction in Case Study
• More areas may be affected by problem and should be studied

Generon, 2019, Carbon Dioxide Separation from Natural Gas Retrieved March 5, 2019, from https://www.generon.com/product/carbon-dioxide-co2-separation/


Ogbuabuo, P.C., 2015, The role of methane in limiting CO₂ EOR: case study of offshore Gulf of Mexico oil reservoirs” master’s thesis: The University of Texas 930029306


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