Saudi Aramco’s CO$_2$-EOR Demonstration Project

AMMAR J. ALSHEHRI
SAUDI ARAMCO
Saudi Aramco Environmental Stewardship

- Energy efficiency
- Reduce gas flaring
- Zero discharge mandate
- Renewables
- Carbon management
At a Glance

- The 1st in the Kingdom
- One of the largest in the middle east
- 10 dedicated wells for this project
- Captures ~800,000 tonnes of CO2 per year
Milestones

- Inception/Roadmap: 2006
- Lab Studies: 2007
- Pilot Design: 2009
- Baseline Testing: 2012
- CO₂ injection started: 2015
- Screening Studies: 2008
- Simulation Studies: 2010
- Drilling of Wells: 2013
- M&S in Full Swing: 2016
- Demonstration Project Evaluation: 2017
Our unique approach
Monitoring & Surveillance

- Seismic monitoring
- Electromagnetic surveys
- Borehole and surface gravity
- Inter-well tracer tests
Monitoring & Surveillance

Monitoring Parameters:

- Sequestered CO$_2$
- Plume evolution
- CO$_2$ Migration
- Oil saturation monitoring
Monitoring & Surveillance

• Seismic sensors

1\textsuperscript{st} continuous seismic monitoring

1000 seismic sensors

Tracks plume propagation
Monitoring & Surveillance

- Seismic sensors
- Cross-well Electromagnetic

CO₂ plume between two wells
Monitoring & Surveillance

- Seismic sensors
- Cross-well Electromagnetic
- Borehole and surface gravity

track CO$_2$ plume in the reservoir

detect inadvertent CO$_2$ leakage into shallow aquifers
Monitoring & Surveillance

- Seismic sensors
- Cross-well Electromagnetic
- Borehole and surface gravity
- Tracers

$\text{CO}_2$ flow path and breakthrough speed
Monitoring & Surveillance

- Seismic sensors
- Cross-well Electromagnetic
- Borehole and surface gravity
- Tracers
- Geochemical surveillance
- Fiber Optic DAS/DTS

Detect inadvertent CO2 leakage into shallow aquifers

Monitor integrity of entire well length
Saudi Aramco: Public

24/7 Real-Time Monitoring by highly qualified Experts

Wells are Intelligent Field compliant

Data routed to GOSP

Monitor and Control Intelligent Field Center
Awards and Recognition

- EOR Project of the Year: 2014
- Oil & Gas HSE Project: 2015, 2016
- Best Digital Transformation Project: 2017
- HSE Initiative of the Year: 2018
- Environmental Award: 2013
- Hart’s E&P HSE Meritorious Award: 2019
Innovation and Publication

- 4 Granted Patents
- 29 Patent Disclosures
- 82 Conference Papers
- 35 Journal Papers
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