Reservoir Monitoring Consortium (RMC)

Semi-Annual Project Review Meeting

A Novel Approach to Tracer Analysis: Dynamic 3D Geomodeling of Tracer Blobs in EOR Operations

Noha Najem, Kuwait Oil Company

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Statement of Problem

\[ Np = N \times E_a \times EV \times Ed \]
Objective

Dynamic Mapping of Ea and Ev
Solutions

- 4D seismic
- Pressure Transient
- Performance Data
✓ Tracers
About Tracers

• Conventional Thinking
  – Water Soluble Tracers
  – Gas Tracers
  ✓ Monitoring
Tracer Response in A Field

- 417 days (1000 m)
- 106 days (700 m)
- 162 days (750 m)
- 892 days (~900 m)
- 885 days (~800 m)
- 316 days (~800 m)
Problems with Conventional Thinking

• Expensive
• Cost of Sampling
• Time of Sampling
• Adsorption
• Detection Sensitivity
• Modeling
Smart Tracer Technology

- Chemical Based
- Sensor Based
Smart Tracer Technology
Smart Tracer Technology

Detect water by measuring capacitance or dielectric properties
Smart Tracer Technology
Field Scale
Smart Tracer Technology
Data Response & Interpretation

Parameter

Time
Smart Tracer Technology
Data Response & Interpretation
Blob- EOR/IOR 3D Geomodel from Tracer Technology

Developing a method to generate the 3D image of a tracer blob
assumptions:
Complex heterogeneous reservoir
Method

**Tracer Test Design/ Candidate Selection:**

- A commonly used environmentally safe tracer candidate can be used that is detectable by downhole sensors.
- Definition of Interwell tracer objectives and aim of tracer testing.
- Definition of relevant tracer properties and select tracer candidate based on these.
- Definition and design of tracer test strategy (location, duration etc).
Dynamic Tracer Simulation:

- Model The novel approach will utilize downhole sensors to sense the tracers.

- A dynamic simulation model will be generated based on the real-time information attained at the well.

- The information will allow an iterative model for inverse modeling and history matching to obtain optimal results based on various modelling scenarios.
Conclusions

• Kuwait Oil Company is looking into implementing EOR in its mature fields

• Past implementation of Interwell tracers has shown much success, however approaches were traditional and did not address all challenges

• A novel approach using downhole sensing and dynamic simulation is now being developed to address these challenges and aid in the identification of pathways, improve sweep efficiency and indicate Sor.