SESSION ABSTRACTS

Session 1: EOR monitoring perspective

Session co-chairs: Ali Meshari and Mohammed Badri

EOR monitoring and surveillance are critical to assess the performance of any EOR method. They contribute to de-risking the project and provide valuable information in understanding the processes related to fluid movement in the reservoir. Each EOR method whether gas injection, thermal or chemical will require different strategy on the technologies to be used in the monitoring and with the required sensitivity to specific reservoir fluids and behavior.

The frequency of EOR reservoir monitoring will depend on the EOR method used, the type of reservoirs whether carbonate or sandstone and on the reservoir fluid type ranging from heavy oil to medium to light oil. The results of the monitoring are used in calibrating reservoir models both static and dynamic. Continuous monitoring of reservoir fluids and rock can be achieved through surface seismic monitoring methods using buried sources and receivers. Instrumented monitoring wells with various sensing capabilities provide extremely valuable information on reservoir pressure, temperature, fluid movement and geomechanical integrity of the reservoir flow units.

Session 2: Challenges in EOR monitoring – Engineering

Session co-chairs: Smeer Al Kilani & Talal Al-Aulaqi

Reservoir monitoring provides the insight into what we are doing in the reservoir. Various reservoir monitoring tools are often required to understand if the reservoir development option is the optimum for the reservoir. When properly designed and implemented, they provide valuable information required for timely decisions and actions. In EOR business, the quantification of residual oil saturation determine the success of EOR during the different phases from piloting to full scale implementation. Several challenges do exist in any project. There are challenges in monitoring the de-saturation in thermal EOR projects due to extreme high temperature. Furthermore, the complexity of monitoring the heavy oil rim using thermally assisted gravity drainage process in naturally fractured reservoir. However, new monitoring techniques can bring up additional challenges such as deployment constraints, ambiguous interpretation, high costs, etc. The participants are encouraged to share their experience, challenges and success stories in reservoir monitoring of EOR projects for the various methods such as miscible gas injection, chemical and thermal EOR projects.

Session 3: Challenges in EOR monitoring – Geophysics

Session co-chairs: Maitham Ebrahim & Hiroshi Hagiwara

Following the “Session 2: Challenges in EOR monitoring – Engineering”, we will shed another lights on the same subject from geophysics perspective. Participants are encouraged to exchange their
experience, challenges and case histories especially focusing on 1) Well-based monitoring, 2) Surface based monitoring and 3) Non-seismic methods.

**Session 4: Case studies**

**Session co-chairs: Theresia Kuswardhany**

The case study is a qualitative approach to emphasize designing the study to optimize understanding of the case rather than to generalize beyond it. The case study is a nature of qualitative research in collecting qualitative data from experience, observations, and documents and evaluation. The step is to deal with the analyzing data collected, manage the concerns of reliability, validity data, evaluating, and writing the case report and ended with the recommendation.

In the oil and gas industry, the performance based strategies is the framework to conduct the common practice to validate the influencing factors and their attributes come up with the approach model and how to develop the model to get the optimum development of the production. And the risk and incident command skills are a level of management skills that are not a feature of based on the field experiences in petroleum industry activities that have been leading to several environmental impacts. Through the case studies the minimum risk and incident can be minimize and avoid.

**Session 5: Role of rock and fluid analysis in EOR monitoring**

**Session co-chairs: Ahmed Eidan & Ali Sumaiti**

Most of the EOR methods rely on the injectant either altering the rock wettability, reducing the interfacial tension (IFT reduction) or changing the oil viscosity. Therefore, successful EOR monitoring is established on diligent and continuous analyses of changes in the rock, rock-fluid interphase, and fluid properties. Capturing the rock and fluid properties before, during and after EOR operations is very important for assessing the efficacy of any EOR project.

**Session 6: Understanding the sensitivity of different EOR monitoring technologies for multi-scale reservoir characterization**

**Session co-chairs: Hiroshi Hagiwara & Bertrand Six**

There is a variety of monitoring technologies existing in the market, where each technology has different level of spatially and vertically resolutions. In the same way, EOR requires different monitoring sensitivity and detectability depending on our individual EOR strategy. Hence understanding different scale of resolutions for each monitoring method are crucial for us to plan, select and optimises our monitoring programmes and meet our expectation without jeopardizing our investment.

This session will shed light on the sensitivity of various monitoring technologies for reservoir monitoring. This will includes but is not limited to, discussion on sensitivities for surface-based and well-based monitoring for fluid characterization and reservoir integrity. The surface-based monitoring case will highlight on the change in reservoir fluids whether gas, chemical, or thermal flooding change in reservoirs can be detectable by surface seismic technology. The well-based monitoring case will also focus on the same but by well-based method where we will discuss on how much change in reservoir saturation which could be detectable by logging tools or using permanent completion such as pressure gauges, resistivity array or microseismic instrumented in the well. On the reservoir integrity side, we will focus on the
discussion of sensitivities such as how much changes are needed to happen to be detected by various monitoring methods.

**Session 7: Emerging technologies and future outlook**

**Session co-chairs: Ali Meshari and Mohammed Badri**

Permanent and efficient fluid front monitoring is a desired technology in key instrumental wells in a reservoir undergoing EOR process. EOR monitoring are either well-based or surface based. The well-based monitoring technology is limited to shallow depth of investigation in the scale of few inches away from the wellbore while surface-based monitoring technology is reservoir scale however it lacks the required resolution and it faces the challenges of accuracy especially when dealing with mapping fluid movement in the reservoir.

The technology gap between well-based and surface-based has been addressed by the cross-well technology of seismic and EM however they are limited to 2D map leaving large uncertainty in the surrounding rock volume in 3D space. Emerging technologies such as surface to borehole EM, borehole to surface EM, smart tracers, complex nano-mappers, in-situ sensing agents, intelligent completion and surface multi-phase flow monitoring with gas analyzer provide advanced technological capabilities needed in de-risking EOR projects and adding new oil reserves.

This session will look at emerging new technologies and provide an outlook for future technology requirements.