

EOR/IOR processes looking ahead : the R&D answers

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1. Introduction

Today on the average only one third of the oil in place worldwide is recovered. In this context, technologies, methodologies and knowledge aiming at improving the recovery of the oil in place take a new importance. Increasing the recovery factor by just one percent for all the world's fields would be equivalent to two extra year's supply at current consumption rates.

2. Key Features

Increasing oil recovery may be obtained through the following process : a) achieve accurate reservoir characterization that leads to a proper description of potential flow paths with reduced uncertainty; b) optimize production schemes to reach and produce oil in place; c) use advanced EOR processes; d) monitor the field for a better reservoir management.

Reservoir characterization : the objective is to build a detailed geological model of the reservoir which will then be converted into a flow simulation model through an upscaling process. As a result a statistical detailed description can be obtained which helps quantifying and reducing uncertainties on flow paths and oil distribution.

Production schemes optimization : this is achieved using advanced well technology. The injectivity/productivity is increased compared to conventional wells, and the sweep efficiency is greatly enhanced. A new step forward consists in "smart wells" that can be remotely controlled on a real time basis to maximize recovery.

EOR processes : there are different EOR technologies to produce incremental oil such as surfactants, polymers, wettability modifiers, gas, etc. Improvements will come from combination of these technologies such as ASP (Alkaline Surfactant Polymer) and from new molecules with specific architectures. Their design could be greatly facilitated through molecular simulation and modeling. For example, supra molecular associations could be obtained that confer smart properties to the sweeping fluid. The simulation of EOR processes is an other essential component : this implies improving the physics together with the reservoir modeling.

Monitoring : integrating production and 4D seismic data helps constraining static and dynamic reservoir modeling. At each step of the workflow, the uncertainties can be calculated in order to perform sensitivity analysis and to optimize production schemes. The monitoring could be further improved through new sensors based on nanotechnologies.

3. Conclusions

EOR and IOR will contribute to the increase of reservoir production. The main issues are : reservoir characterization, production schemes optimization, EOR technologies and reservoir management. R&D is essential in this overall process and major topics include developments in geology, reservoir engineering, physico-chemistry, applied mathematics and numerical simulation, well technology, and data acquisition including smart sensors development.

Speaker's Biography

M. J. Bouteuca : Director Exploration-Production Technology Business Unit. Worked on rock mechanics and well productivity projects. Worked for about 5 years as adviser for the Ministry of industry on Oil&Gas R&D. Maurice holds a PhD in rock mechanics.

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