

# ENHANCED AND IMPROVED OIL RECOVERY METHODS - A LIFE LINE FOR AN OLD AND "TIRED" RESERVOIR?

BY

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## COURSE OUTLINE

This short course offers an overview of EOR and IOR processes with particular emphasis on issues relevant to field applications. Few case histories and exercises are also presented.

- EOR/IOR - What are they?
- Size of the PRIZE: why must we consider it?
- Screening for EOR -- Timing: When is the right time for implementation? What options do we have? What tools do we need? Can we do it all?
- Basic fluid flow concepts relevant to EOR/IOR: What are key parameters and R&D needs?
- Waterflooding, including variations of waterflooding --polymer, alkaline and surfactant
- Gas flooding (HC, CO<sub>2</sub>, Air and N<sub>2</sub>)
- Role of Asphaltenes in Gas-based EOR Processes
- Thermal methods (steamflood, cyclic steam stimulation, *in situ* combustion, SAGD and VAPEX)
- EOR in Naturally-Fractured Reservoirs
- Horizontal Wells for EOR/IOR
- IOR through sweep improvement & profile modifications (gels, foams, near well-bore strategies)
- Introduction to enhanced coal-bed methane recovery
- Tracers for monitoring, surveillance and residual oil saturation estimation.
- Brief overview of Safety, Health and Environmental Issues
- Critical Review and Identification of broader issues and Summary

## WHO SHOULD ATTEND

The course is intended for reservoir engineers, production engineers, geoscientists and management personnel who are involving in the screening and planning for EOR/IOR applications in the near future. New recruits should also benefit from this course. As well, it may also interest experienced professionals as a refresher course.

# Reservoir Engineering Fundamentals

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## COURSE OUTLINE

The course offers a general overview of reservoir engineering principles, including fundamentals and its multi-disciplinary aspects.

- **Introduction:** What is reservoir engineering, Role of Reservoir Engineer, Multidisciplinary Aspects, Types of Reservoirs and Reservoir Processes
- **Size of the PRIZE: How much oil is there and does it have the energy to produce it by itself?** Rock & Fluid Properties, PVT and phase behavior, Role of laboratory studies, Calculation of Hydrocarbon Volumes and Fluid Pressure Regimes, Reservoir heterogeneities ...
- **Will it flow through the reservoir formation (rock):** Darcy's Law and Applications, Permeability, Relative permeability, Capillary pressure, Wettability
- **How to estimate what's produced, what's remaining and how much we can produce?** Material Balance Equations for Different Types of Reservoirs and Drives, Aquifer Behavior and Water Influx (van Everdingen-Hurst and Fetkovich methods)
- **When the reservoir needs help to produce the oil, who does it call?** Introduction to Enhanced/Improved Oil & Gas Recovery Processes -- Immiscible Displacement, Buckley-Leverett theory, Gravity-Stable Displacement, Water and Gas Injection, Coning and Cusping, Asphaltene and High WOR and GOR Problems
- **Fundamental gas reservoir engineering principles**
- **Monitoring, surveillance, Decline Curve Analysis and making future production projection**
- **Multi-disciplinary Aspects and Field Development Issues**

## WHO SHOULD ATTEND

The material presented is intended for non-reservoir engineers who work closely with reservoir engineers and use reservoir engineering data to make decisions. New recruits should also benefit from this course. As well, it may also interest experienced professionals as a refresher course.

## *Also Offered Courses on ...*

- ***Characterization, Evaluation and Enhanced Oil Recovery in Naturally Fractured Reservoirs*** (A 3-day course)
- ***Gas Processes: Principles and Field Applications*** (A 3-day course)
- ***Fundamentals of Gas Miscible Flooding*** (1-day course)
- ***An Introduction to Improved Oil Recovery*** (1-day Course)
- ***Sweep Improvement and Profile Modification*** (A 3-day course)
- ***Horizontal Well Technology: A New Hope for EOR?*** (A 3-day course)
- ***Role of Asphaltenes in Gas Injection Processes*** (A 3-day course)

## THE PRESENTER



**Professor Hemanta Sarma** is the Chairman of the Petroleum Engineering Program at the Petroleum Institute, Abu Dhabi. More recently he was a Professor and holder of the Reg Sprigg Chair in Petroleum Engineering in the Australian School of Petroleum (ASP), University of Adelaide. He is also the founding Director of the Centre for Improved Petroleum Recovery (CIPR) in the ASP and was a Research Project Leader (2003-2006) for CO<sub>2</sub> sequestration through enhanced petroleum recovery and enhanced coal-bed methane recovery in the CO<sub>2</sub>CRC, a major Australian *Cooperative Research Centre for Greenhouse Gas Technologies*. In addition, he has been a consultant to a number of Australian petroleum companies in the areas of reservoir engineering and EOR.

Previously he was a Senior Staff Reservoir Engineer with the Alberta Research Council, Canada, and an Invited Research Advisor at the Technology Research Center of Japan National Oil Corporation where he participated in domestic and international R&D projects and field pilots. He has published extensively and offered several specialized courses on EOR and reservoir engineering.

Dr. Sarma holds a B.Tech. Honours in petroleum engineering from Indian School of Mines, an M.Sc. in chemical engineering (specialization in reservoir engineering) from University of Calgary and a Ph.D. in petroleum engineering from University of Alberta. An active SPE member, he has served on several technical program committees, including SPE South Australian Executive Committee leading its Continuing Education Program. He is a member of SPE's *Distinguished Achievement Award for Petroleum Engineering Faculty Award Committee* since 2006 and its 2008-09 Chair. In addition, he is an Associate Editor of *SPE Reservoir Evaluation and Engineering Journal*, and led an SPE-wide academic taskforce looking at improving the quality of the Journal. Earlier, he served in the Editorial Review Board of *Journal of Canadian Petroleum Technology*.

Prof. Sarma is a 2008-recipient of *The Australian Learning and Teaching Council Citation for Outstanding Contribution to Student Learning* awarded by the Hon. Julia Gillard, Australian Deputy Prime Minister and Education Minister for “*initiating students into the profession of Petroleum Engineering while interacting with them to secure their welfare as individuals and success as scholars*”. Earlier, he also received a *2006 Excellence in Teaching Prize* of the Faculty of Engineering, Computer and Mathematical Sciences of the University of Adelaide.