ChE SEMINAR

Fundamentals of Petrophysics and its Application to Reservoir Modeling and Simulation

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ABSTRACT

Petrophysics is an interdisciplinary subject which bridges the geosciences and engineering disciplines. It deals with interpreting the electrical, nuclear and sonic response of rock and porous media filled with fluids. The goal is to predict producibility. In the process of studying rocks and fluid properties there are some differences in approach applied by geologists, geophysicists, petrophysicts and reservoir engineers. The geologists describe the rocks, mineral contents and texture at an outcrop (megascopic) to hand specimen (microscopic) scale analyzing a physical sample of the rock. The geophysicists “measure” a seismic or electromagnetic signature of the rock bodies on a large scale (megascopic level) with in-direct sensors and the petrophysicists often study borehole electro logs and core data which measure electrical properties, natural gamma radiations and neutron bombardment generated gamma rays at a wellbore or mesoscopic level to evaluate matrix densities, porosity in rocks and fluid saturations. In modern day the high resolution image and nuclear magnetic resonance logs can be run on wireline or recorded while drilling with sensors placed on the bottom hole assembly of drill strings. The purpose of these data is reservoir characterization, fluid typing, porosity, geomechanics and predicting producibility of hydrocarbons. The petroleum engineers study well testing and often take part in production operations. The reservoir engineers plan and manage wells and fields .In the industry today all these sciences and

engineering practices are integrated to build predictive earth models which are used to effectively produce hydrocarbon from the reservoir under current and future economic scenarios. Water flooding operations, steam flooding and any type of well stimulation should be designed after adequate data analysis and integration of all these discipline to improve safety and reliability in production performance. The current talk focuses on basics of well logging, data quality control and basic petrophysical analysis to quantify presence or absence of hydrocarbons in rocks. It also give an introduction to the integrated workflow for 3D geocellular modeling of reservoir properties, up scaling / downscaling for reservoir simulation and well planning. Some generic examples will be discussed.

ABOUT THE SPEAKER

Satyaki Ray is Senior Petrophysical Advisor for Occidental Oil and Gas Corporation (OXY) based in Houston, Texas, USA. He works in Oxy's Worldwide Subsurface Engineering Department as Project Lead for various domestic and international petrophysical studies for Oxy in California, South Texas, New Mexico (Permian), Oman and Qatar. He has more than 24 years of global industry experience in India, Canada, Middle East and USA working in conventional and unconventional resources such as Heavy oil, CBM, Tight Oil and Carbonates. He has worked in technical, operations management and leadership roles for ONGC India, Schlumberger, ConocoPhillips Canada, Marathon Oil Corporation and currently Oxy.He likes to mentor and teach courses on geology and petrophysics and is a user of several software such as IP, Petrel, Geographix and Landmark Openworks.He holds a M.Sc Degree and University Gold Medal in Applied Geology from University of Roorkee (now IIT Roorkee) and M.Tech degree in Geoexploration from IIT Mumbai. Satyaki is a Registered Professional Geoscientist in the Province of Alberta, Canada. He is a member of CSPG and SPWLA and currently works and lives in Texas, USA.

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