

Shale gas: How it can be targeted?

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In the past, the oil and gas industry considered gas locked in tight, impermeable shale uneconomical to produce. However, advances in directional well drilling and reservoir stimulation have dramatically increased gas production from unconventional shale. Over the past decades extensive natural gas development has taken place in “Shale” formations in North America. Although North America is producing shale gas at an economic level, producers are so eager to increase shale gas recovery. The decline in conventional resources and the demands for natural gas encouraged different countries throughout the world (e.g. Germany, Poland, Romania, Algeria, Saudi Arabia, China and others) to follow North American experience and produce the gas from shale.

Unconventional gas shales are fine grained, organic rich, sedimentary rocks. The shales are both the source of and the reservoir for natural gas, unlike conventional petroleum reservoirs. In the shales, gas occupies pore spaces, and organic matter adsorbs gas on its surface. The Society of Petroleum Engineers describes “unconventional resources” as petroleum accumulations that are pervasive throughout a large area and that are not significantly affected by hydrodynamic influences (they are also called “continuous-type deposits”). The reservoir systems have a gas-bearing strata that are not densely stratified, do not have a gas/water contact, and persist over a very large geographic area. The term “shale” has been used to describe these formations due to the high argillaceous content in the rocks, as well as the relatively high gamma ray response compared to traditional conventional reservoirs. These formations, while appearing very argillaceous, also commonly contain high volumes of silt and other non-clay material such as quartz, calcite and kerogen. These lithologic variations make understanding of these highly complex reservoir rocks challenging, but essential, to achieving successful results in shale gas development.

Though the shales may be as porous as other sedimentary reservoir rocks, their extremely small pore sizes make them relatively impermeable to gas flow, unless natural or artificial fractures occur. Directional drilling and “hydraulic fracturing” are instrumental in exploiting this resource; their application has opened up significant new resources in these rocks and added significant volumes to the natural gas supply in North America.

It is very important for gas producers to follow a well-defined screening procedure that helps them to decide whether to go after shale gas reservoirs exploitation. Shale gas development history, reserves, similarities and differences, economics, regional prospective, screening, shale core analysis and shale gas in place estimates will be presented. The presented screening plan is essential and of great help to oil and gas operators to make a go/no-go decision on shale gas projects.

Biography:

Abdelaziz Khlaifat is the Head of Petroleum Engineering Department at Abu Dhabi Polytechnic and AD Poly SPE Students Chapter Advisor. Prior to joining AD Poly, Abdelaziz worked as a Research and Development Manager of Dhahran Research Center at Weatherford International (Geoscience Development). Earlier, he worked as a Senior Reservoir Engineer, specialized in unconventional resources (tight and shale gas) at Weatherford Saudi Arabia. Before joining Saudi Arabia office, he worked as a senior reservoir engineer (modeling and simulation) in the reservoir engineering group of the Weatherford Well Engineering Center of Excellence in Dubai. He obtained his B.Sc degree in Petroleum Engineering (1990) from Moscow Institute of Oil and Gas, Moscow-Russia, Master of Chemical Engineering and PhD in Chemical/Reservoir Engineering from Illinois Institute of Technology, Chicago-USA in 1994 and 1998, respectively. Before joining Weatherford, he had held different positions in the academia. In 2009 he was promoted to a full professor of chemical engineering at Mutah University, Jordan.

Abdelaziz is actively involved in scientific research and development of novel methodologies and techniques in tight and shale gas reservoirs, shale gas resource development workflow and tight gas staged field experiments. He has authored/coauthored over 80 publications, including journal articles, book chapters and specialized conference proceedings in the areas of flow through porous media, hydrocarbon reservoir engineering, unconventional tight and shale gas, managed pressure drilling, non-aqueous phase Liquid transport, photocatalysis, two phase flow modeling and simulation, and Dead Sea related-research. He is an active member of the SPE, AIChE, GA, JES, JEA, AHWA and SFERA.