The CO_2 Enhanced Bakken Research Program – Summary, Status, and Future

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Abstract

Total oil-in-place estimates for the Bakken Formation range from 32 billion barrels (Bbbl) to over 400 Bbbl. Most estimates for primary recovery range from 3% to 12% depending on reservoir characteristics. When considering these low primary recovery factors in the context of such a large resource, it is clear that just small improvements in productivity could increase technically recoverable oil in the Bakken by billions of barrels. While the use of CO_2 in conventional reservoirs is a widely applied and well-understood practice, its use for enhanced oil recovery (EOR) in tight oil reservoirs is a relatively new concept. In conventional reservoirs, heterogeneity, wettability, gravity, and relative permeability characteristics can significantly affect an EOR scheme, and a fracture network could be detrimental to EOR operations. In tight oil reservoirs such as the Bakken, which rely on the fracture network for its productivity, the conventional notion of positive and negative attributes may or may not apply. The Energy & Environmental Research Center (EERC) is conducting a research program to determine the viability of using CO_2 for EOR and carbon storage in the Bakken Formation. The key elements of the program include the development and integration of new and existing reservoir characterization and laboratory analytical data (e.g., core analyses, well logs, oil analyses, etc.) and static and dynamic modeling. The technical aspects of the project are divided according to three primary areas of activity, specifically 1) detailed geological characterization of selected Bakken reservoirs, 2) characterization of Bakken oils from the selected reservoirs, and 3) static model development and dynamic simulation of potential CO_2 injection scenarios. This presentation will provide an overview of the EERC's ongoing project, including the status of laboratory- and modeling-based activities and anticipated next steps. Funding for the project is provided by the U.S. Department of Energy, the North Dakota Industrial Commission through the Oil and Gas Research Council, Marathon Oil Company, and TAQA North Ltd.

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James A. Sorensen is a Senior Research Manager at the University of North Dakota's Energy & Environmental Research Center (EERC), where he is a principal investigator and project manager for the EERC's Bakken Research Program. The Bakken Research Program is an ongoing, multi-disciplinary program with a portfolio of projects valued at over $2 million, funded jointly by the U.S. Department of Energy, the North Dakota Oil and Gas Research Council, and industry. Mr. Sorensen's primary areas of expertise are resource assessment and environmental issues associated with the oil and gas industry. In addition to his Bakken-related work, he has also conducted research on the sequestration of carbon dioxide in geologic media, with an emphasis on the value-added use of carbon dioxide for enhanced oil recovery. In 2010 and 2011 he served on the Unconventional Oil Subgroup for the National Petroleum Council's North American Resource Study, to which he provided contributions on tight oil to the NPC report entitled "Prudent Development: Realizing the Potential of North America's Abundant Natural Gas and Oil Resources.