



SPE 84414

## **Case Study: Merging Modern Reservoir Characterization with Traditional Reservoir Engineering**

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### **ABSTRACT:**

#### **Description of paper:**

Modern reservoir characterization-simulation studies integrate geology, seismic, petrophysics and engineering to build 3D static geologic and dynamic fluid flow models. These models have repeatedly proven their worth through reduced risk and improved reservoir management decisions. Prior to the advent of modern computers and software, traditional reservoir engineering techniques served the industry well through analytic and graphical analysis techniques. It would seem that the modern characterization tools would make these traditional reservoir engineering techniques obsolete; however, this paper shows that these traditional techniques improve the quality of modern 3D models.

This paper describes a field example for the Beaver Lodge Devonian Unit in North Dakota where traditional reservoir engineering techniques from 40 years of waterflooding history were integrated into the modern reservoir characterization-simulation workflow.

#### **Results, observations and conclusions:**

Integrating traditional reservoir engineering techniques such as Hall Plots, water-oil ratio (WOR) plots, injection profiles, etc. into the technical workflow improves the final model and reduces the total project time required.

#### **Applications:**

The techniques described in this paper can be used to improve the quality of a 3D reservoir characterization-simulation model and history match.

#### **Technical contribution:**

This paper extends the technical knowledge base of the petroleum industry by:

1. This paper illustrates how to use water injection profile logs to flow test a 3D geologic/simulation model.
2. This paper demonstrates the relationship between injection well Hall Plots and seismic semblance in the subject field.
3. This paper demonstrates how production well WOR plots, Productivity Index (PI), and produced water salinity can be integrated into a 3D model and history match.