

Characterization of Compartmentalized Reservoirs for EOR Pilots within the Illinois Basin

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Within the Illinois Basin, most of the oilfields are mature and have been extensively water-flooded. In order to maximize oil production from these fields, new recovery techniques need to be researched and applied. The Illinois State Geological Survey has been working with the Department of Energy to conduct research on multiple types of Enhanced Oil Recovery (EOR) projects. Two CO₂ injection projects are ongoing, one in at Sugar Creek Field in Kentucky and another in Mumford Hills Field in Indiana. A third EOR project using alkaline surfactant polymer (ASP) has been established in Lawrence Field in Illinois.

Reservoirs within the Illinois basin are frequently characterized as being highly compartmentalized resulting in multiple flow unit configurations. In order to characterize such complex systems, the survey has developed a strategy to utilize a conceptual geologic model to guide the construction of a numerical model of the reservoir architecture to be used later for reservoir simulation. The process combines traditional methods along with geostatistical methods. One of the major challenges encountered in the course of the projects was a lack in quality permeability and porosity data. As a solution, a method to transform spontaneous potential data to permeability and porosity values was developed. The reservoir was then characterized using geostatistics based on the synthetic log data. The statistical results were used to constrain a simulator to produce multiple realizations of the architecture.

In addition to the modeling process, an overview of the geologic characteristics of compartmentalized reservoirs of the three projects will be presented. Initial results of the projects, as they are assessed and become available, will be presented as well.