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Eagle Ford: Introducing the Big Bad Wolf

Scott Malo, Nick Volkmer, Jimmy McNamara, Ehsan Amirian

RS Energy Group

Summary

Historically, enhanced oil recovery (EOR) through the injection of a miscible gas into the subsurface has only successfully been applied to conventional reservoirs as a tertiary recovery mechanism to extend the lifetime of an oil field. This study analyzes the application of this recovery method to increase production and value in the Eagle Ford. Several companies are incorporating a “huff-n-puff” EOR technique that injects natural gas into the reservoir to increase oil recovery factors from the low permeability interval. This technique has boosted estimated ultimate recoveries (EUR) and net present values (NPV) in multiple pilots, generating interest among operators and investors in the play. This study will evaluate the viability of EOR across the Eagle Ford and discuss which areas have the highest chance of success.

Theory / Method / Workflow

By identifying leases that have the appropriate data to assess EOR performance, a model was developed to determine the lease-level oil recovery assuming an EOR program and a primary recovery. This model was then used to compare the economic impact of converting wells to EOR.

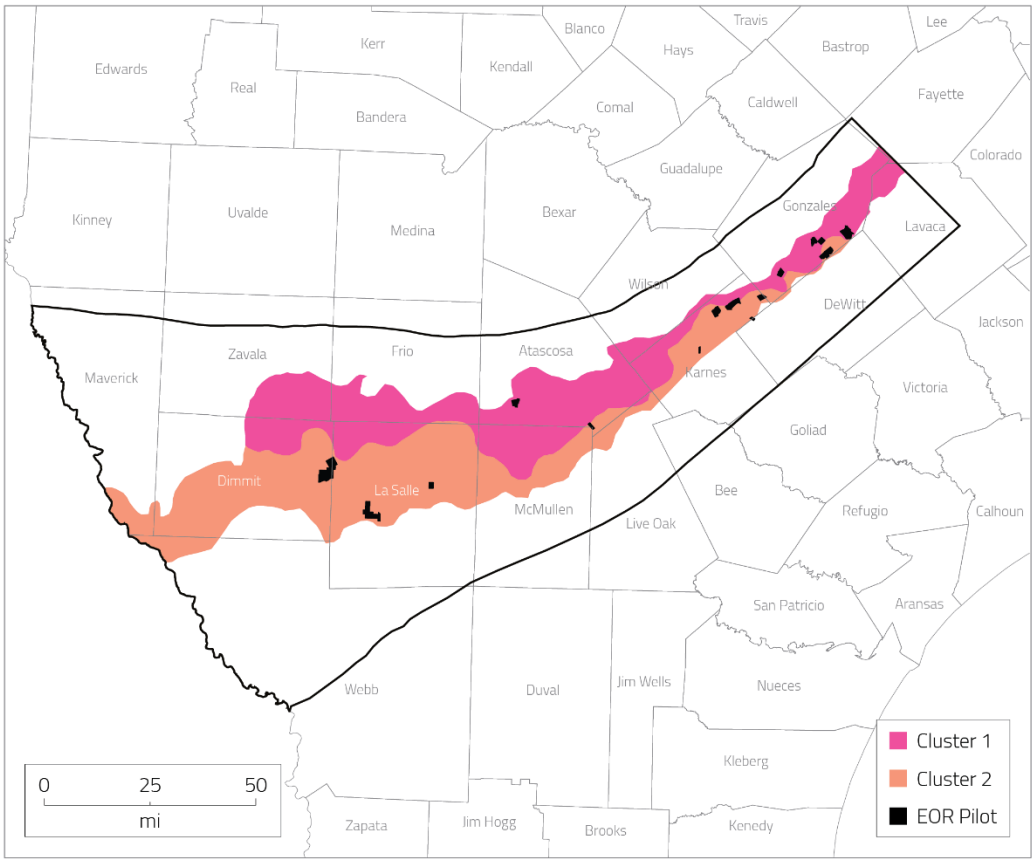
Wells with comparable completion styles and reservoir characteristics to existing EOR locations are the most favorable for conversion. This research integrates a principal component analysis (PCA) followed by clustering techniques to identify areas where we expect future EOR development. Wells within the derived clusters completed similarly to existing EOR pilots have the most potential to observe similar uplift.

Results, Observations and Conclusions

Pilot tests showed an average oil EUR uplift of 30% and an average incremental NPV increase of $0.3 million per well, base case, and $1.0 million per well assuming 50% of capital is sunk. Three principal components were derived from the PCA analysis and used in the cluster analysis to identify similar reservoir types. The first two components explained 75% of the variance of the dataset and were dominated by oil-in-place and reservoir conditions. The three components together explained 90% of the variance. Current EOR development is located within two clusters; therefore, we expect future EOR development within these clusters as they are defined by similar reservoir characteristics.

Novel, Additive Information

With inventory becoming a concern in mature unconventional plays such as the Eagle Ford, EOR methods, along with well spacing and completion optimization, provide operators with attractive options to attain additional value. The described workflow could provide a valuable EOR screening and evaluation methodology for Eagle Ford operators and investors. The workflow can also be a valuable tool to determine similar reservoir within a basin or between several basins.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