

# Evolution of the Reservoir Stress Path During Depletion and Re-inflation and Its Implications

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Dr. Puneet Seth is a Senior Petrophysicist at Oxy in the GOM Asset Development team. He will speak on Thursday, November 14, 2024. The topic is “Evolution of the Reservoir Stress Path During Depletion and Re-inflation and Its Implications.”

## **Abstract**

Several researchers have studied the impact of reservoir depletion on rock mechanical behavior and associated changes in in-situ stresses and reservoir depletion stress path. However, the evolution of the reservoir stress path (ratio of change in minimum horizontal stress with reservoir pressure change) due to re-inflation of the reservoir during injection operations such as waterflooding is less understood. In this work, a more fundamental approach to the evolution of the reservoir stress path under both depletion and re-inflation is studied through core plug uniaxial-strain experiments and field-scale numerical modeling which includes the impact of plastic deformation. Both unconsolidated and consolidated sandstones are considered. Results from the uniaxial-strain compaction experiments agree with findings from 3-D field scale numerical modeling that the injection stress path coefficient  $\gamma_{h,i} = \Delta\sigma_H/\Delta P_{inj}$  is either similar or greater than the depletion stress path coefficient  $\gamma_{h,d} = \Delta\sigma_H/\Delta P_{dep}$ . The findings in this study have significant implications for waterflooding operations, infill drilling window estimation for re-inflated reservoirs, and CO<sub>2</sub> capture and storage operations (CCS). The assumptions on  $\gamma_{h,i}$  directly impact the allowable injection pressure, injection rate, and storage capacity for CCS projects. Hence a more thorough understanding could prevent overly conservative designs and promote a more accurate screening of potential waterflooding, infill drilling, and CCS projects.

## **Biography**

Puneet recently joined Oxy as a Senior Petrophysicist in the GOM Asset Development team. Previously, he worked as a Petrophysicist & Geomechanics Specialist at Shell supporting Deepwater GOM Operations and Studies. Puneet graduated from The University of Texas at Austin with a PhD in Petroleum Engineering. His research at UT Austin was focused on understanding pressure interference between horizontal wells in unconventional reservoirs during stimulation and production. He has experience developing 3D field-scale fracturing-reservoir-geomechanics simulators and is passionate about leveraging digital technologies like Machine Learning and Artificial Intelligence to develop novel tools. He has published his research in several conferences and journals.

Google Scholar:

<https://scholar.google.com/citations?user=qZsiHUsAAAAJ&hl=en>