Monday, October 28, 2019

HGS North American Dinner Meeting

Norris Conference Centers • 816 Town and Country Blvd #210
Social Hour 5:30–6:30 p.m.
Dinner 6:30–7:30 p.m.

Cost: $40 Preregistered members; $45 non-members/walk-ups

To guarantee a seat, pre-register on the HGS website & pre-pay by credit card.
Pre-registration without payment will not be accepted.
Walk-ups may pay at the door if extra seats are available.

If you are an Active or Associate Member who is unemployed and would like to attend this meeting, please call the HGS office for a discounted registration cost. We are also seeking members to volunteer at the registration desk for this and other events.

Abstract 1

Stratigraphic Controls on the Connectivity and Flow Performance of Deep-water Lobe-dominated Reservoirs

Fabien J. Laugier *and* ***Morgan D. Sullivan***
Chevron Energy Technology Company Clastic Stratigraphy Team
Michael Pyrcz
Department of Petroleum Engineering,
The University of Texas, Austin
Laura Murray
Chevron Gulf of Mexico Appraisal

Sand-prone deepwater lobes are conventionally modeled at reservoir scale as laterally extensive and homogeneous; however, recent work shows that in deep-water lobe systems stratigraphic architecture is spatially variable and complex, with facies and reservoir quality varying across multiple hierarchical orders (bed, element, complex, complex set). Here we consider the impact that these hierarchical variations have on reservoir connectivity and performance forecasts for high-net deep-water lobe reservoirs. We investigate the degree and style of heterogeneities observed in outcrop and subsurface systems, focusing on variability in: (1) distribution of facies and reservoir quality; (2) presence and nature of shale drapes; and (3) dimensions and stacking patterns.

We present results from >3000 process-mimicking (PM) reservoir models that capture realistic lobe geometries, stacking patterns, and internal heterogeneities. Using statistical analyses of flow simulation results we quantitatively identify the key stratigraphic features and hierarchies impacting reservoir connectivity, sweep efficiency, and flow performance, and critically, highlight the predictability of their impact in deep-water lobe reservoirs. Intra-element flow is limited by bed-to-element scale facies and amalgamation trends, while reservoir-scale flow is limited by spatial connectivity of amalgamated high-quality facies across element-to-complex-set stacking patterns. Results indicate fine-scale features, those least captured via common geostatistical techniques, are a primary control on connectivity; element-scale spatial trends of NTG, facies amalgamation and reservoir quality can reduce sweep efficiency by 22% due to transitional compartmentalization, while accurate modeling of 3D shale-drape geometry rather than modeling flat permeability barriers, can reduce sweep efficiency 20%. In contrast to the conventional assumption that fine-scale heterogeneities have limited impact in high-net lobe reservoirs, we show that these heterogeneities compound over hierarchical orders to result in a non-linear decrease in connectivity; even a low proportion of shale drapes in certain element-scale stacking patterns can form composite, complex-wide barriers. We conclude that fine-scale heterogeneities need to be rigorously characterized and captured in reservoir models at their appropriate scales for robust well optimization and production forecasting in deep-water lobe reservoirs such as the those in the Paleogene Wilcox Formation. ■

Abstract 2

Stratigraphic Surface-based Modeling of Deep-water Reservoirs: Application to an Ultra-deep Gulf of Mexico Wilcox Asset

Laura Murray
Chevron Gulf of Mexico Appraisal
Fabien J. Laugier *and* ***Jesse Thompson***
Chevron Energy Technology Company Clastic Stratigraphy Team
Rhonika Kaplan
Chevron Energy Technology Company Reservoir Modeling Team

Stratigraphic heterogeneity in clastic reservoirs is mainly driven by the process-evolution of depositional systems, the collective stratigraphy being the result of deposition and erosion over time. While deep-water reservoirs are often high-net, recent studies have indicated that fine-scale heterogeneities such as hierarchical