**Redefining the STACK Play from Subsurface to Commercialization: Identifying Stacked Pay Sweet Spots in the Northern Anadarko Basin**

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Search and Discovery Article #11104**
Posted July 23, 2018

*Adapted from poster presentation given at 2018 AAPG Annual Convention & Exhibition, Salt Lake City, Utah, May 20-23, 2018.
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Abstract

Independent unconventional specialist companies continue to be drawn to the STACK (Sooner Trend, Anadarko Basin, Canadian and Kingfisher counties) play of northern Oklahoma. Situated in the northern portion of the Anadarko Basin. The STACK play boasts stacked pay potential from at least five major reservoir units, all of which contain varying amounts of oil and gas reserves. To date, just over 2000 horizontal wells have been brought online in the greater STACK area, and estimated break-evens for many of these earlier wells fall below $30 per barrel. The early core of the play covers approximately 3500 square miles in southwestern Kingfisher County, Oklahoma, and nearby areas in Canadian, Blaine, and Dewey Counties. Here, operators have focused on the Mississippian Meramec Formation, with average peak monthly rates approaching 800 boe/d (6:1) in early 2017. Further, estimated ultimate recoverable volumes (EURs) for Meramec horizontals are approaching 1 Mmboe (6:1), making it competitive with the prolific Bone Spring and Wolfcamp Delaware plays, which have estimated EURs around 1 Mmboe (6:1) and 1.2 Mmboe (6:1), respectively. As the STACK play develops, unconventional experts are also succeeding in secondary reservoirs that have historically been developed using conventional vertical well completions, namely the Hunton, Woodford, Osage, and Oswego. Delineation and de-risking of these additional horizontal targets has not advanced as quickly as the Meramec; however, peak monthly rates in these secondary reservoirs have been on par with the Meramec. Multiple horizons in the STACK play allow for stacked horizontal development—similar to what is taking place in the Permian today, where operators enjoy economic advantages from concentrated operations. In addition, operators have extended STACK success into nearby areas and renamed some areas as individual plays. This study serves to detangle the Silurian-Pennsylvanian-aged stacked pays in the Anadarko Basin by standardizing the stratigraphic nomenclature, to identify accurately commercial inventory and localized well productivity by reservoir. Further, integration of geological, economic, production, and completion data from each of the pay zones throughout the greater STACK area aids in identifying production drivers and inhibitors, which enable more accurate prediction of total STACK resource and future production growth potential of the STACK play and surrounding areas.
References Cited

Blakey, R.C., 2017, Paleogeography: Colorado Plateau Geosystems, Phoenix, AZ. For additional information please refer to: https://www2.nau.edu/rcb7/ and https://deeptimemaps.com/.


Acknowledgements

A sincere Thank You to Vyetta Jordan at the OGS for providing IHSM with the necessary core data, and to Joe Landry and Bill Price with PSI for providing IHSM with quality petrophysical logs.
The purpose of this study is to define an area for stacked pay exploration in the Anadarko Basin province, Colorado, Kansas, Oklahoma, and Texas. This study is motivated by the following: (1) understand the basin’s depositional system in which each individual depocenter is oriented roughly southwest parallel to the shelf break. Sedimentary sequences identified in this system in which each individual depocenter is oriented roughly southwest parallel to the shelf break. Sedimentary sequences identified in this system 


calcareous sponge spines (yellow and light blue, associated with phylloid algae (stained red)).

carbonate clasts

Calcrite: micrite (blue or red, associated with calcite cements). No visible porosity.

Siltstone: micrite with low degree of compaction.

Laminated argillaceous siltstone: micrite with high degree of compaction.

Clastic sandstone: micrite cemented with clastic sand, gravel, and minor amounts of clay.

Siltstone: micrite with high degree of compaction, commonly with calcite cements.

Laminated siltstone: micrite with high degree of compaction, commonly with calcite cements.


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Note: Quintiles are calculated by separating all suitable wells, force ranking them by peak boe/d per 1,000 lateral feet (20:1).

To capture technology optimization and target zone delineation, this graph is based on production data from Meramec benches with proppant intensities less than 1,500 lbs./ft. Above 1,500 lbs./ft., Upper Meramec is most productive, followed by the Lower Meramec and then Lower Osage. Upper Osage sediments only exist in the central to eastern part of the play due to erosion related to subaerial exposure in the southeast.

High SOPHIH areas also yield favorable productivities, identifying geologic sweet spots, however, low porosity and SOPHIH trends are relatively poor siltstone facies within the Meramec benches and relatively poor sandstone facies within the Osage. Shell and IHS Markit estimates there are over 1,300 sq. mi. (3,300 sq. km) of high net thickness and SOPHIH are oriented sub-parallel to the paleo-shoreline.

High SOPHIH areas serve as a good proxy for high porosity, and SOPHIH axes are parallel to the paleo-shoreline. The primary stacked pay sweet spot identified herein is situated largely in an overpressured area of the play. The most significant area with stacked pay potential (red circles above) is located in the Osage, 38 miles (61 km) northeast, 28 miles (45 km) south of the stacked pay potential is situated largely in an overpressed area of the play.

Using SOPHIH as a proxy for reservoir quality, 4 areas appear to have stacked-pay potential (red circles above). Most of the stacked-pay potential is situated in the over pressured area of the play.

Net thickness and SOPHIH trends for each bench generally follow gross bench trends and oriented roughly parallel to the paleo-shoreline. Upper Osage benches have overall poor reservoir quality largely due to high amounts of pore-pressure.

The most significant area with stacked-pay potential identified herein is situated largely in an overpressed area (~350 sq. mi.) in SE Blaine and SW Kingfisher counties, herein is confined to a relatively small area (~350 sq. mi.) in SE Blaine and SW Kingfisher counties, herein is confined to a relatively small area (~350 sq. mi.) in SE Blaine and SW Kingfisher counties, herein is confined to a relatively small area (~350 sq. mi.) in SE Blaine and SW Kingfisher counties, herein is confined to a relatively small area (~350 sq. mi.) in SE Blaine and SW Kingfisher counties, herein is confined to a relatively small area (~350 sq. mi.) in SE Blaine and SW Kingfisher counties, herein is confined to a relatively small area (~350 sq. mi.) in SE Blaine and SW Kingfisher counties, herein is confined to a relatively small area (~350 sq. mi.) in SE Blaine and SW Kingfisher counties, herein is confined to a relatively small area (~350 sq. mi.) in SE Blaine and SW Kingfisher counties, herein is confined to a relatively small area (~350 sq. mi.) in SE Blaine and SW Kingfisher counties, herein is confined to a relatively small area (~350 sq. mi.) in SE Blaine and SW Kingfisher counties, herein is confined to a relatively small area (~350 sq. mi.) in SE Blaine and SW Kingfisher counties, herein is confined to a relatively small area (~350 sq. mi.) in SE Blaine and SW Kingfisher counties, herein is confined to a relatively small area (~350 sq. mi.) in SE Blaine and SW Kingfisher counties, herein is confined to a relatively small area (~350 sq. mi.) in SE Blaine and SW Kingfisher counties, herein is confined to a relatively small area (~350 sq. mi.) in SE Blaine and SW Kingfisher counties, herein is confined to a relatively small area (~350 sq. mi.) in SE Blaine and SW Kingfisher counties, herein is confined to a relatively small area (~350 sq. mi.) in SE Blaine and SW Kingfisher counties, herein is confined to a relatively small area (~350 sq. mi.) in SE Blaine and SW Kingfisher counties, herein is confined to a relatively small area (~350 sq. mi.) in SE Blaine and SW Kingfisher counties.