



Denver Basin

Oil and Gas Geology, Past Production, and Future Development

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Basin geology

The Denver Basin has typical foreland basin-style geometry with a north-south trending basin axis. The strata on the western side of the basin dip steeply toward the east, while the strata in the eastern Denver Basin gently slope to the west. The basin is more than 3,962 m (13,000 feet) deep, as defined by the 1.6 billion year-old Precambrian basement. The bulk of the strata preserved in the Denver Basin were deposited during and after Laramide deformation, and are thus Cretaceous age and younger. Surface outcrops in the Denver Basin are generally Tertiary in age.

The Silo field, discovered in 1981 (Sonnenberg, 2011), is the largest field in the basin and is also the largest horizontally-drilled field in Wyoming.

Production in the Silo field is primarily from the Cretaceous Niobrara Formation, which is predominantly fractured chalk (reservoir) encased in tight shales and mudstones (seal). This unconventional reservoir is conducive to horizontal drilling and hydraulic fracturing that significantly enhance production.



Tertiary White River and Arikaree formations on the Goshen Hole rim. Photo by J. Stafford.

Past production

Oil and gas was first discovered in the Denver Basin in 1901, and it now includes approximately 1,500 hydrocarbon fields spanning several states (Higley and Cox, 2007). The Denver Basin of Wyoming has 31 named oil and gas fields, 16 of which are not currently producing oil or gas (Toner and others, 2016). Production has fluctuated through the years, with an increase of more than an order of magnitude from 2009 through 2016 (WOGCC, 2017).

Future development

Although production efforts in the Denver Basin have historically focused on the Niobrara Formation, operators are beginning to explore other unconventional plays in the basin. Horizontal drilling and hydraulic fracturing have increased recent production from the tight sand formations of the Upper Cretaceous Muddy “J” Sandstone and the Codell Sandstone Member of the Carlile Shale.

As drilling techniques and reservoir characterization in the Denver Basin are refined and improved, increased production from unconventional reservoirs is expected to continue.

References

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