Codell Sandstone, DJ Basin, What Sets Brennsee/Fairway Field Apart From Wattenberg Field: Core Characteristics in a Tight Oil and Gas Play

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ABSTRACT

The Codell Sandstone has been producing gas and oil in the Colorado/Wyoming DJ Basin since 1979. Due to relatively good porosity but low permeability Codell production has historically been restricted to the Wattenberg Field where thermal maturity of the Codell is in the gas window. Recent advances in horizontal drilling and multi-stage fracture stimulations have extended the play outside of Wattenberg Field into the northern DJ Basin. Stabilized production rates up to 1300 BOPD are associated with recently completed horizontal Codell wells at Brennsee/Fairway Field. The Brennsee/Fairway Field in Laramie County, Wyoming is distinct from Wattenberg Field and has maturity in the oil window with gas-oil ratios <1000 scf/bbl and wells producing 40-50% water cuts. Wattenberg Field has been pushed from the gas window into a high oil gravity window with gas-oil ratios >1000scf/bbl and little to no water production. The Codell Sandstone was deposited on the eastern side of the Western Interior Seaway by storm events during Late Cretaceous time. The Codell at Brennsee/Fairway Field is a very-fine to fine-grained very poorly sorted sand that produces oil from two facies: bioturbated sandstone and hummocky sandstone. The Codell in Wattenberg is very-fine grained and better sorted than at Brennsee/Fairway Field and produces primarily from bioturbated sandstone. Porosity ranges from 6 to 16% for both areas but perm is lower in Wattenberg. MICP data shows that pore throat size decreases from north to south from Brennsee/Fairway down to Wattenberg. The Codell is a low-resistivity pay zone in both Fields that produces gas/oil from zones with less than 10 ohm-m resistivity. Clay content is approximately 20% with abundant microporosity in feldspars as imaged with epifluorescent microscopy. Codell thins from north to south due to erosional truncation beneath an angular unconformity at the base of the Fort Hayes Limestone Member of the Niobrara Formation. Gross thickness ranges from <5 to 40 feet. Two Codell cores will provide an example of the two depositional facies and rock characteristics of the Brennsee/Fairway and Wattenberg Fields. The Child VO #30-9 core in Laramie County recovered 26 feet of Codell Sandstone, including 22 feet of bioturbated facies and 4 feet of hummocky facies. The Rock Oil Ronald #1 core recovered 12 feet of Codell Sandstone, all bioturbated facies. Both Codell cores lie in productive areas, the Child core is in the heart of the Brennsee Oil Field and the Ronald core is on the edge of the Wattenberg gas/oil window near Wells Ranch area of development.