

Comparison of Hydraulic Stimulation Methods of Coals and Carbonaceous Shales in the Cherokee Basin, Mid-Continent, Kansas USA

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Abstract

The Cherokee Basin produces gas from the Desmoinesian and Atoka age Cherokee Formation coals and carbonaceous mudstones at less than 2,000 feet. From 1990 to 2009, the basin underwent an active exploitation of these unconventional reservoirs peaking at over 1,000 wells per year. Exploitation ceased with the collapse of gas prices in 2008 to 2009. The coals and carbonaceous shales tend to be less than two and four feet thick respectively. The basin is under-pressured and water production is significantly less than other CBM producing areas in North America. Three types of hydraulic fracture methods were used as well as stimulation designs that stimulated each zone individually or in groups. The unconventional reservoirs did not require a de-watering phase suggesting that either they may be oversaturated with gas or production is draining a larger rock area that includes several adjacent lithologies. The majority of the wells have over ten years of production and this allows analysis of the effectiveness of each stimulation methods, individual versus multiple seam completions and by operator. Results indicate that cross-link gel was as effective or better than slick water, stimulating individual zones was significantly more effective than stimulating groups of zones. Production from wells where two or more zones were stimulated simultaneously experienced very steep decline rates. Wells where each coal or carbonaceous mudstone were individually fractured stimulated the results were significantly more productive. Several other trends were also identified that will be discussed. While gas prices remain low, this analysis allows a re-evaluation of where potential opportunities still exist within the basin.