BASAL DAKOTA SANDSTONE POTENTIAL IN SW SAN JUAN BASIN

Introduction

The basis for this study is a relatively untested lower Dakota sandstone found exposed in a large number of area one wellbores. Although this interval has been tested in 15 to 20 wells in the study area, it is thought that the completions were inefficient due to high treating pressure, and in most cases the target zone was stimulated with upper, more porous intervals.

It should be made clear that the team feels that any attempt to produce this interval is extremely risky, as many previous attempts ended in failure due to water production from lower, water-bearing intervals. However, if mechanical obstacles can be overcome, a large number of existing Dakota wells could be recompleted in this interval, hence its' merit as a priority project. This study focuses on a three township grid in the greater Huerfanito area. Mapping work done subsequent to this study indicates similar potential in at least two additional townships.

Geologic Characterization

The basal Dakota sandstone is a clean,tight fluvial channel fill deposit with a pebbly conglomerate at its' base. It ranges in thickness from 4 to over 30 feet in the 3 township area mapped. Average porosity is about 9%, and ranges from 5% to 12%. Neutron logs typically show gas effect, and there are often indications of permeability from SP, caliper mudcake, and microlog response.

The basal Dakota lies unconformably on the Burro Canyon, which is much more porous (16%) and is water saturated. The Burro Canyon is also a fluvial / alluvial deposit with wide (4 to 80 feet) thickness variation in the study area, and is the likely culprit for past failed attempts to produce the basal Dakota. The real challenge then, is to avoid communication with the Burro Canyon.

Priority Project Potential

The basal Dakota isopach map shown in figure one was used to in part to define recompletion potential based on interval thickness of 15 feet or more. The geometry of the thick trends combined with higher average porosity suggests that these are point bars in a meandering floodplain. Figure 2 is a porosity isopach showing average porosities of 8 to 14 % in the thicker trends, while the surrounding areas are 4 to 8%. At least 40 wells with exposed basal Dakota are located in four thick trends. Apparent relative water saturation was also mapped in an effort to define areas that the basal Dakota is most likely to be gas saturated. The lower saturation trends shown in figure 3 coincide with the thick isopach trends.

Recommendation

The team plans to test the basal Dakota in three separate wells with different geologic, mechanical, and political conditions as follows:

1) Jernigan #3 (NE 24-27N-9W) (Subject Well of This Paper)

This BLM demand Dakota well is proposed as a priority project horizontal sidetrack to test the basal Dakota while avoiding a thick underlying Burro Canyon interval. The basal zone is 16 feet thick (gross) with an 8 foot /11% porosity target in the middle of the interval (figure 4). It should be noted that the 2.5BCF that the well has produced is from two upper Dakota intervals whose average porosity is somewhat lower than the basal zone. The Jernigan #3 was not drilled below the basal Dakota, so the existence of a wet Burro Canyon directly below is inferred from nearby control.

Azimuth

The proposed azimuth of the sidetrack is south, which will accomplish several objectives:

1) Drill in the direction that the basal Dakota thickens, increasing chances of staying in zone and draining more of local 'thick' trend (figure 1)

2) Drill *approximately* parallel to anticipated strike of best developed fractures. The objective of this test is to produce matrix gas from the basal Dakota, and to lower the chances of intersecting fractures that could communicate it with the Burro Canyon. The most likely orientation for open fractures is north- northeast (figure 5).

3) Drill towards the undrilled (for Dakota) Se/4 of section 24, *away* from the Huerfanito #97, increasing chances of draining upper and middle Dakota sands during build portion from kickoff point. These sands could potentially salvage the project in the event of mechanical or geologic failure in the target zone.

4) Significantly larger drilling window of approximately 2500' to the south as opposed to 1200' to the north.

2) Huerfanito #81 (NE 11 26N-9W)

1994 priority project conventional stimulation of 18 foot basal Dakota with thin, 4 foot Burro Canyon sandstone separating it from Morrison shale. This project is discussed in more detail in a separate recommendaton.

3) Huerfanito #90 (NE 1 26N-9W)

1995 Discretionary project conventional stimulation of 26 foot / 14% porosity basal Dakota with thick underlying Burro Canyon interval. This zone will be opened and tested at the same time uphole Mesa Verde intervals are added.

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