DRILL 2 FRAC

CASE STUDY

Avoiding Water in the San Andres Formation

Objective

A key to future horizontal success in the San Andres is to avoid fracturing down into the higher water saturation zone of the residual oil zone (ROZ). With only limited data typical in these laterals (i.e. gamma ray and mud logs), it is difficult to consistently avoid run-away fractures that go out of zone and contact high water bearing zones that are lower in the transition zone.

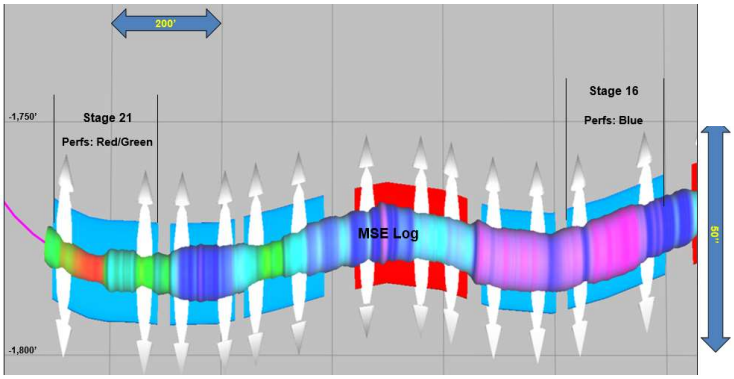
Run-away fractures are commonly caused by large differentials in rock strength within individual stages. In stages with high heterogeneity, a disproportionate amount of fracture energy and proppant will be placed in rock more favorable to fracture initiation.

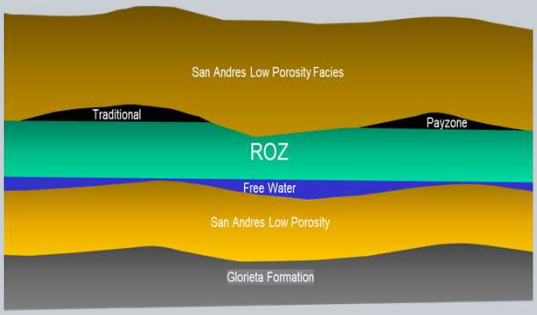
Such was the case of a Houston company operating in the San Andres Formation. They needed a way to position their clusters in like rock to avoid run-away fractures from contacting the lower water zones.

Results

By using Drill2Frac's (D2F) OmniLog™ lateral profile, the operator was able to identify relative rock-strength heterogeneity. Mass spectrometry data performed on the mud gasses identified hydrocarbon rich areas along the lateral.

With PerfAct Perf Placement application, the operator was able to place perf clusters within rocks of similar rock strength while avoiding the high water areas. In so doing, run-away fractures are avoided and there is more consistent distribution of frac energy and proppant along the length of the stage.





The San Andres was first produced in 1920. In the subsequent nine decades, The San Andres has produced over 30 billion barrels of oil. All historical production has been from vertical wells drilled on structural highs with thick columns of oil saturation rock.

The area between these structural highs frequently shows a thick transition zone of oil to water. Recent focus of horizontal drilling has targeted this upper part of the transition zone between the larger structures. By drilling horizontally and fracturing into these laterals, land[ng higher in the section, operators are producing commercial volumes of oil with large amounts of formation water.

OmniLog Trajectory Plot showing stages and clusters that were placed in like rock along the lateral

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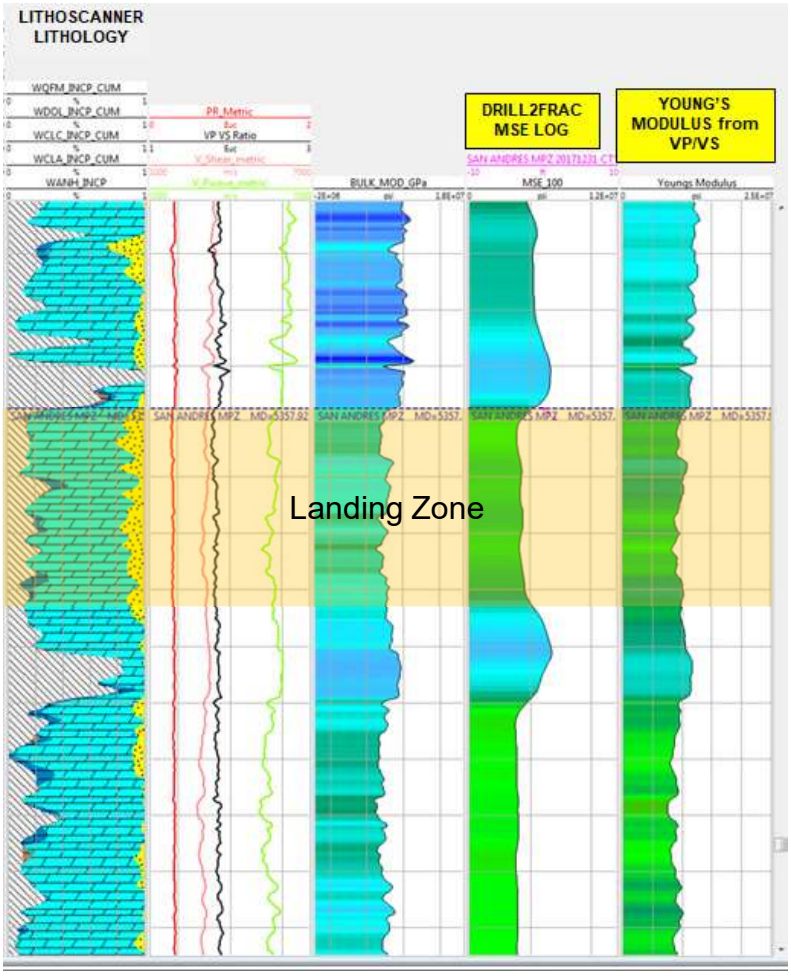
Validation of Results

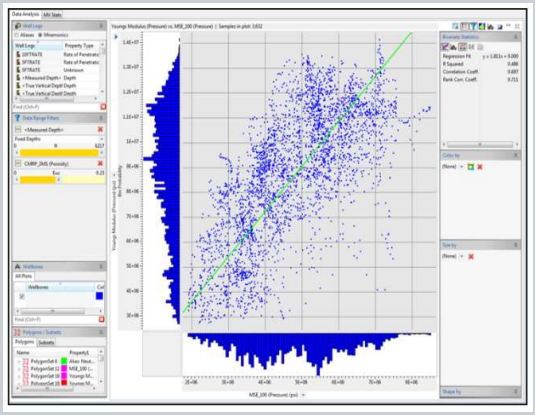
The D2F technique was validated by establishing a correlation between the OmniLog profile and the open-hole logs in the pilot well. The operator observed correlations between Young's Modulus and the vertical OmniLog values.

The operator stated, "The Drill2Frac mechanical properties log exhibits a reasonable correlation to the calculated Young's modulus in the pilot well, verifying that the log is a good proxy for log-derived rock strength calculations."



Cross-sectional view showing comparison of gamma ray, lithology, OmniLog profile, and Young's Modulus calculated from sonic logs

Cross Plot of OmniLog and Young's Modulus



The regression analysis shows a reasonable correlation between OmniLog profile and Young's Modulus.

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