6. Sensitivity Analysis

The performance of the Miscible CO2 flood was analyzed under various reservoir conditions. The analysis was conducted under the following parameters; Dykstra Parson's Coefficient, Reservoir Pressure and Oil Viscosity.

6.1 Dykstra Parson's Coefficient

A sensitivity analysis was performed in order to show the effect of Dykstra Parson's coefficient of reservoir heterogeneity on cumulative oil production using profile results. The CO2 flood test was run with four different values for Dykstra Parson's coefficient (0.5, 0.6, 0.7 and 0.8), and cumulative production vs. time was plotted in Figure 9.0. Results show that oil production decreases with increasing Dykstra Parson's coefficient

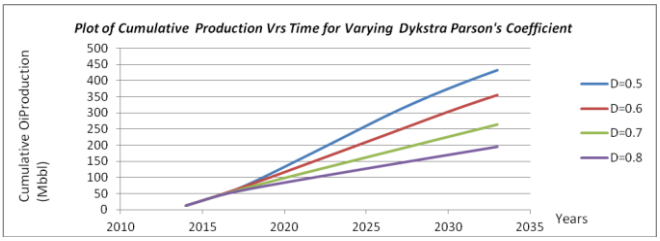

Figure 9.0: Sensitivity to Dykstra Parson's coefficient

6.2 Reservoir Pressure

A sensitivity analysis was performed to analyze the effects of reservoir pressure on oil produced under the 40-acre, 5-spot pattern case. The model was run using average reservoir pressures of 500, 1000, 1500, 2000 psi. Immiscible floods occur at 500 and 1000 since they are less than the MMP, while the remaining two runs are miscible. The plot of cumulative production vs. time in figure 10.0 shows that the highest production occurs at an average reservoir pressure of 2000 psi.

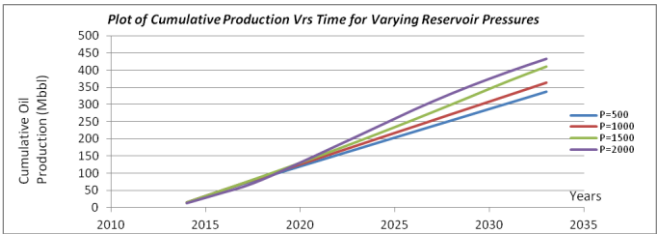

Figure 10.0: Sensitivity to Reservoir Pressure

6.3 Oil Viscosity

A sensitivity analysis on the effects of oil viscosity on oil production was performed using the CO_2 flood test. The model was run with values of 2, 1, 10 and 50cp. Figure 11.0 shows that, increasing viscosity results in low oil production

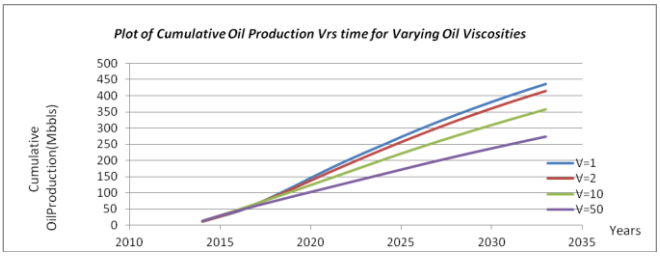

Figure 11.0: Sensitivity to oil viscosity

7. Conclusion

Oil recovery was efficiently improved using miscible CO_2 flooding resulting in a recovery factor of 16.67%. The incremental oil recovery amounts to 420667.56 Mbbl of oil which requires a total of 3,199MMScf of CO_2. The incremental oil recovery resulted in a subsequent increase in the cumulative cash flow of the project justifying its economic feasibility. From the derived results from this study, it can be concluded that the miscible CO_2 flooding project is a very good and economically viable one for that matter. The sensitivity analysis was carried out to determine critical parameters on which oil production would be dependent. Results of the sensitivity analysis predicts that a steady decline in production beyond the 20-year period could result and be attributed to increasing heterogeneity or increasing oil viscosity since the reservoir could undergo significant formation changes over the years. This in a way predicts what profit margin and earnings to be expected as the project progresses.

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