CHAPTER VI

CONCLUSIONS AND RECOMMENDATIONS

This chapter presents the conclusions of the effect of reservoir fluid compositions on gas recycling in gas-condensate reservoirs to evaluate the feasibility of gas recycling in gas-condensate reservoirs having different compositions and condensate yields. The simulation results and economic analysis for the two sets of production strategy and the recommendation for future works are outlined.

A simple reservoirs model and quarter five spot flooding pattern were used in this study. After the model was constructed and required inputs were defined, two sets of scenario were simulated: (1) producing the gas-condensate reservoirs with natural depletion by one producer and (2) producing the gas-condensate reservoirs with gas cycling for reservoir pressure maintenance. Ten sets of fluid composition are used as variable input for both sets. Results from simulation runs such as cumulative production of oil and gas, production rate of oil and gas, injection rates, and the well bottomhole pressure were analyzed. The scenario details for the simulation are described as follows:

1. Natural depletion

   One production well located at the center of reservoirs is opened for production by natural depletion. The production rate during the plateau period is 5,000 MSCF/D. The production stops when the production rate reaches the economic limit, i.e., oil production rate less than 5 STB/D and gas production rate less than 100 MSCF/D. Each profile was economically evaluated using economic decision tools: NPV, IRR, and payback period.

2. Production with gas cycling

   One production well and one injection well located at opposite corners of a quarter five-spot flooding pattern. Gas cycling is started at the beginning of the production. All of the produced gas is re-injected back into the reservoirs. The production/injection rate is fixed at 5,000 MSCF/D. When the oil production rate reaches the economic limit, 5 STB/D, the injection well is switched to production well in order to produce gas. From this point, the production continues from two producers till abandonment at gas production

rate less than 100 MSCF/D. Each profile was economically evaluated using economic decision tools: NPV, IRR and payback period.

6.1 Conclusions

Based on simulation results and economic analysis, the optimal production and injection strategy for gas-condensate reservoirs being studied can be concluded as follows:

6.1.1 Theoretical Point of View

a) Gas re-injection or gas cycling does effectively maintain the reservoir pressure above the dew point pressure, preventing condensate dropout within the reservoirs.
b) Gas cycling enhances the production of condensate from gas-condensate reservoirs, significantly improving the oil recovery when compared to production by natural depletion.
c) The higher the mole percentage of C_{5+} and C_{7+} and molecular weight of the compositions, the higher the production of condensate and gas can be obtained from gas-condensate reservoirs.

6.1.2 Quantitative Point of View

a) Production by natural depletion yields more equivalent volume of cumulative gas production compared to the result from production with gas cycling.
b) Production with gas cycling gives about 89-247% increase in cumulative oil production compared to production by natural depletion.
c) The total of oil production produced from gas cycling process increases when the mole percentage of C_{5+} and C_{7+} and molecular weight of the compositions increases.

6.1.3 Economic Point of View

a) In this study, almost all of the cases which have the mole percentage of C_{7+} greater than 6%, production with reservoir pressure maintenance: gas cycling has better economic criterion (NPV) compared to production by natural depletion for the case which
b) For all scenarios, the fluid composition with greater of mole percentage of C_{5+} and C_{7+} and molecular weight of the compositions tends to get results in higher NPV and shorter payback period.
c) Well cost is another major factor which can cause negative internal rate of return (IRR).

6.2 Recommendations

The following points are recommended for future study:

a) Since the oil price usually fluctuates, the change of the price will definitely affect the economic analysis. So the decision of economics analysis will be reconsidered at that period of time.
b) From the economic analysis, only the sets of hydrocarbon component which has the value of molecular weight greater than 30 give better NPV when gas cycling is implemented. So if gas cycling is consider as an option to enhance the condensate recovery, it would be better to know the composition of the reservoir fluid.