Chapter Five

Conclusion and Future Recommendation

5.1. Conclusion:

- The solar radiation result discussed, point toward FNE oilfield capability in term of solar radiation, as the direct normal irradiation values is quite enough to implement a CSP plant to generate the steam required for injection despite the reduction in DNI value during autumn season.
- FNE field location for DNI was compared with Amal field where the first enclosed trough solar steam generation pilot was applied in terms of Direct Normal Radiation (DNI). FNE shows close results in the monthly average of DNI from January to April, also from November to December, WhileDNI valuesis droppedas a result of seasonal effect for FNE field which was more obvious than that observed at Amaloil field, the studystill show that the solar Energy is very promising for the FNE potential.
- Three operating scenario with variable injection rate have been discussed , the effect of each scenario on the steam flooding pilot performance was comparedwith continues injection rate model using reservoir simulation.
- Simulation results in all three scenarios confirm that all scenarios give equivalents results in terms of cumulative oil produced, cumulative water produced, Cumulative oil steam ratio and the oil recovery factors. There is no observed change in break through time,the oil rate and overall field water cut match the base case after about 21 months from the startingof the steam flooding.
- Two approaches were suggested to study the effect of monthly variation throughout the year on summer – autumn cycle in steam rate, the effect on the steam rate of the proposed scenariosare changed by this assumed approach's.
- The seasonal variation in terms ofsteam injection rate shows insignificant difference in cumulative oil produced, cumulative water produced, cumulative oil steam ratio and the oil recovery factors.
- Environmentally, the replacement of fossil fuel boilers by thermal solar facility could reduce carbon dioxide emissions by(6000 tons) compared with the zero carbon dioxide emissions forsolar facility.

5.2. Recommendation:

- Although there are promising results conducted in this study still additional research is needed before such technology to be implemented in a major scale for Sudanese oil filed, a detailed economic assessment it will a prove the real value of such project, the study indicate that the reservoir simulation alone is not enough to evaluate the whole process, reservoir geomechanic, optical and thermal performance of surface facility most be studied but still the study results are quite promising to recommend the conducting of pilot test.
- For more accurate estimation of solar irradiance parameter more ground measure stations must be installed and add to the grid of ground stations.

- Sudan solar energy potential is very high and still is not contributes in Sudan's economy where CSP technology can be conducted in oil industries such as water treatment, pipeline heating, power plant, hot water injection and steam flooding future projects.

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