

CHAPTER 2

LITERATURE REVIEW

There have been a lot of studies done on artificial lift performance comparisons one way or the other and it just so happens that electrical submersible pumps and gas lift are the most common forms of artificial lift methods that have been worked upon. There are numerous similarities between these two lift methods and only the most relevant literatures on them is briefly presented.

Naguib and Shaheen² presented the philosophy and the methodology of applying artificial lift systems in the Egyptian oil fields. Depending on the production forecast and the expected well behavior and also the effects of applying the secondary recovery mechanisms either by water flood or gas injection. They also mentioned on the problems encountered on well behavior, the analysis and suggested solutions. Special emphasis was given to the marginal oil fields artificial lifting systems because of the economic limitations. The main concept they presented was to reach the objective of maximum oil recovery including the cost effectiveness of the system. The conclusion made by them was based on the average run life of each artificial lift system mainly being electrical submersible pump and the gas lift as well as other general concepts on the working on each lift system.

Brinkhorst³ mainly presented different ESP/gas separator configurations, along with it the main design criteria applied, compared the performances of the actual pumps installed and discussed various conditions of influence on pump behavior. The main objective was achieving a longer run life for ESPs. However, the concept presented in the paper was confined to the characteristic of the wells and the fields in Oman where these trials were made.

Another paper presented by Naguib and Bayoumi⁴ which had many similarities with the research done but the key differences will be mentioned later in this chapter. They presented yet another paper on artificial lift methods for an Egyptian Field. The objective was to achieve screening criteria on different artificial lift methods and they mainly focused on ESP and gas lift. The main sensitivities were water cut, injection rate and well head pressure and the correlation for vertical lift

used was Hagedorn and Brown. The wells were existing ones and the artificial depths were not varied nor were the effect of gas observed.

The research conducted makes use of the typical fluid properties in the Gulf of Thailand and the appropriate artificial lift method for the environment here. The sensitivities are solution GOR, injection rate, productivity index, artificial lift setting depth and relative permeability. The variation in the depths of both gas lift and injection electrical submersible pumps will enable us to understand the impact of the gas breaking free or the expansion of gas effect on one lift method or the other. Making use of a cross discipline from industrial engineering, the design of experiments is used to set a benchmark to reduce the number of runs and still obtain a viable trend. It will enable us to better visualize the trend in the results when two sensitivities are compared to each other either by surface response or contour map. The conclusions made by using different techniques or correlations to address a scenario may be totally different depending on a number of factors.