Final Year Project Showcase Batch-2017
Year 2021

Department: Petroleum Engineering Programme: Petroleum Engineering		
1	**Project Idea**	**Evaluation of foam lift techniques on gas well A and B to counter the water loading problem and to increase the production rate.**
2	**Process**	The process includes the modelling of well data of well A and B on PROSPER software. Then estimate the minimum and current reservoir pressures from it. The next step is to perform the decline curve analysis and estimating the ultimate recovery of wells before they go completely water loaded. The next step is to determine the surface tension and foam density of liquid at foam concentrations of 0.1%, 0.2%, 10%, 20%, 30%, 40%, 50%, 60% and 70%. The values of surface tension are used in PROSPER modelling and new minimum reservoir pressures and gas rate are obtained. The last step is to repeat the decline curve analysis by using new gas rates and minimum reservoir pressures and estimate the incremental recovery by foam lift.
3	**Outcome**	The end results is as follows: The production rate of well A is increased from 0.831 MMSCFD at 0% concentration to to 1.37 MMSCFD. The incremental recovery has increased from 245.57 MMSCF to 1071.24 MMSCF at around 10%. After 10% the surface tension of foam does not decrease sufficiently. So, production does not increase much. The production rate of well A is increased from 0.97 MMSCFD at 0% concentration to to 5.92 MMSCFD. The incremental recovery has increased from 3469.28 MMSCF to 1071.24 MMSCF at around 10%. After 10% the surface tension of foam does not decrease sufficiently. So, production does not increase much.
4	**Evidence (Theoretical Basis)**	In Central North Sea gas condensate field, FAL was applied for 5 years and it was found to be economical lift method as it reduced the condensate loading in mature wells more effectively as compared to other conventional lift methods and thus this technology proved to be profitable for gas well deliquification [1]. Several phases of pilot tests were carried out to describe the best selection method and good FAL candidates as the one with good offload response, condensate and liquid ratio less than 60% and wellbore shut-in pressure less than 1000 psi. Wells were selected based on this new criterion and consequently enhanced production

		was observed in 10 wells [2]. The step-down tests were conducted in five PDO (Petroleum Development Oman) liquid loading gas wells with and without the continuous injection of five different foamers selected after the screening based on laboratory experiments to find the minimum stable gas rate. The application of FAL reduced the minimum stable gas rate by 40% irrespective of the magnitude of water production [3]. For wells with liquid loading problem, low reservoir pressure and deep Side Pocket Mandrels, Foam Assisted Lift & Gas Lift (FAGL) proved to be a better and economical method of de-liquefaction instead of using standalone FAL or Gas Lift because of its lower OPEX [4]. In Gulf of Thailand, an operator experienced good results on five wells in the offshore field with high temperature by using high temperature Foam assisted lift (FAL) with batch treatments. After treatment, three wells which were not flowing to the surface and two wells which were flowing but at a very lower rate started to flow with higher rate [5]
5	**Competitive Advantage or Unique Selling Proposition** (Cost Reduction, Process improvement, Attainment of any SDG (Sustainable Development Goal), increase of market share or capturing new market or having superior performance over a competitor. In summary, any striking aspect of the project that compels the industry to invest in FYP or purchase it. Some detailed description is required in terms of how, why when what. You can select one or more from the following dropdown and delete the rest of them). Please keep relevant options, delete the rest of them, and correct the sequence	
a	**Cost Reduction of Existing Product**	If any other artificial lift methods such as plunger lift, Electrical Submersible Pumpsetc. are usedon the given field then a huge investment will be required to enhance gas production whereas FAL does this work at considerably low cost. In this way, the investment per ft3 of incremental gas production is reduced.
b	**Process Improvement which Leads to Superior Product or Cost Reduction, Efficiency Improvement of the Whole Process** (e.g. What is the issue is current process and what improvement you suggests)	The optimum concentration selection has been done on the basis of surface tension. However, if this selection is done after economic analysis then optimum concentration can be reported with more surety.
c	**Attainment of any SDG** (e.g. How it is achieved and why it is necessary for the region)	If FAL is applied in Pakistan's gas fields after looking at its efficacy proposed by the simulation study, then it will help to achieve: **SDG#12 Responsible Consumption & Production**. E&P companies will be able to take more advantage from the proven resources as FAL will help to produce those hydrocarbons which would be left useless if this method would not have applied.

d	**Capture New Market** (e.g. Niche market or unaddressed segment)	FAL has been applied in several fields globally but it has not gained much popularity in Pakistan by now. On the basis of successful results that have been attained during the project, if this method is applied in oil and gas fields in Pakistan then it will open a new market for FAL.
e	**Any Environmental Aspect** (e.g. carbon reduction, energy-efficient, etc.)	If FAL is started to be applied in oil and gas fields in Pakistan after looking at its effectiveness proposed by the simulative study, then it will impose good effect on environment because FAL has little to no carbon footprint and it is energy efficient as well as it requires relatively low energy to tackle with water loading issue.
f	**Economic Aspect**	The increased gas production has been calculated in the simulation study. If this incremental production is multiplied by the price of unit amount of gas, then the incremental revenue will be determined. After estimating the investment required for the application of FAL on this field, if this investment is subtracted from the increased revenue then the total profit from the process of FAL can be calculated. In this way, this project may also give a good cost analysis for the practical application of FAL in some gas field in Pakistan.
6	**Team Members** (Names & Roll No.)	Abdullah Zameer Usmani PE-17032 Muhammad Taha PE-17026 Abdul Rafey PE-17023 Hamza Ahmed PE-17024 Muhammad Muzammil PE-17025
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9	**Pictures (If any)**	

REFERENCES

[1] S. H. Peyton and S.L.N.a.S.C.K., "Investigation of Batch Foamer Efficacy and Optimisation in North Sea Gas Condensate Wells," *Society of Petroleum Engineers,* 2013.

[2] R. Sianturi, J.A.A., M. N. Jamal and C. E. Jatmiko, "foam Assisted Lift Technology to Improve Recovery Factor from Sensitive Wells," *lesson learned from Total E&P Indonesie,* 2017.

[3] al. and K.V.e., "Evaluating Performance of Foam-Assisted Lift in Sultanate of Oman by Dedicated Field Testing," *Society of Petroleum Engineers,* 2017.

[4] I. Tayyab, M.F.M.U., Q. I. Ahmed, M. Ibad-ur-Rehman and Q. S. M. azam, "Combination of Foam Assisted Lift & Gas Lift (FAGL) to De-liquefy Gas Wells," *Society of Petroleum Engineers,* 2016.

[5] al. and S.S.e., "A Success Story for a High-Temperature Foam-Assisted Lift Application in a Mature Field Gulf of Thailand," *Society of Petroleum Engineers,* 2016.