Final Year Project Showcase for Batch-2016

Department of Petroleum Engineering		
1	**Project Idea**	Application of Foam Assisted Lift (FAL) to enhance the existing gas wells production on XYZ field by mitigating water loading problem in order to meet the market demand without any significant investment.
2	**Process**	The process includes the simulative study carried out on the gas wells present in a brown gas field. Two approaches are being considered to eliminate the water loading effect. The first approach is to model all 37 existing wells of XYZ field on PROSPER and simulate production network model of the field on GAP without FAL and with FAL by using surfactant concentrations of 0.1%, 0.2%, 0.3%, 0.4% and 0.5%.The optimum concentration is selected by observing separator gas rate of the entire field. Second approach is to perform case studies on 3 wells 18,26 and 35in order to check the efficacy of FAL on individual wells also. PIPESIM is used to create model of the wells. The water loading in wells are identified and mitigated on the basis of Insitu velocity and Turner's velocity curves against True Vertical Depth. The mitigation is performed by using surfactant concentrations of 0.1%, 0.3% and 0.5% while optimum concentration is selected on the basis of gas rates.
3	**Outcome**	The end results are presented as follows: The gas production rate at separator of the field is increased with the application of FAL i.e from 223.18 MMSCFD at 0% surfactant concentration to 232.631 MMSCFD at 0.2% surfactant concentration after which gas rate starts to decrease making 0.2% surfactant concentration optimum for the entire XYZ field Well 35is not found to be water loaded at its original reservoir pressure but it suffers from water loading effect at some future reservoir pressure. Water loading is mitigated at 0.1% concentration however 0.3% concentration is selected to be optimum concentration on the basis of gas rate. Well 18is not found to be water loaded at its original reservoir pressure but it suffers from water loading effect at some future reservoir pressure. Water loading is partially reduced at 0.3% concentration but it is completely eliminated at 0.5% concentration. Well 26 is not found to be water loaded at its original reservoir pressure but itsuffers from water loading effect at some future reservoir pressure. Water loading is mitigated at 0.5% concentration in this well.

4	**Evidences (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 competitor. In summary, any striking aspect of the project which compels industry to invest in FYP or purchase it. Some detail description is required in terms of how, why when what.You can select one or more from following dropdown and delete rest of them)	
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 ft^3 of incremental gas production is reduced.
b	**Process Improvement which leads to superior product or cost reduction, efficiency**	The optimum concentration selection has been done on the basis of gas rates. However, if this selection is done after economic analysis then optimum concentration can be reported with more surety.

	improvement of whole process(e.g. What is issue is current process and what improvement you suggests)	
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: RESPONSIBLE CONSUMPTION AND 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.)	Rafiah Syed (PE-16002) Tooba Gul (PE-16005) Ahsan Ahmed (PE-16015) Shahmeer Hasan (PE-16020) Shaikh Sikander Ali (PE-16028) Tehniyat Batool (PE-16047)
7	**Supervisor Name**	Internal Supervisor: Mr. Muhammad Noman Khan (nomankhan@neduet.edu.pk) External Supervisor: Mr. Yunus Jawed (Production Engineer, Kandhkot Gas Field, Pakistan Petroleum Limited)

8	**Pictures**	

REFERENCES

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