SPE 110357 Gas Well Liquid Loading from the Power Perspective

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Many studies have been carried out to maximise the economic recovery of wells which no longer produce due to the depleted reservoir pressure or fluid velocity. The objective of the study described in this paper was to understand the economic limit of depletion-drive gas wells burdened by liquids accumulation. The study was split into 2 sections:

1. Understand the natural ability of the reservoir energy to lift the fluid to surface and then observe the decreasing production as a function of the increasing liquid production.
2. Sensitivities were carried out on the well's natural energy and compared against sensitivities where energy was added to the well. A proxy for well operating costs in the form of 'theoretical power' was applied to calculate the economic limit.

The results showed that the ultimate recovery could be improved with the addition of a pump (as opposed to gaslift) as its use resulted in a lower bottomhole pressure and required less power. From the studies which were carried out, the main costs were found to be due to the deliquification and had to be accounted for when determining the 'theoretical power.' The energy required to carry out the deliquification process was determined by; estimating the power needed to remove the liquids as well as the power expended by the gas in the formation and wellbore.

IPM was used to model the integrated system from reservoir to surface network while observing the following assumptions:

- The reservoir in question is a depletion drive.
- The well experiences a constant WGR throughout its life.
- A simple methane-water system is in use.
- VLPs are calculated using the Gray correlation.
- Water is produced through the perforations along with the gas.
- Constant bottomhole pressure and surface separator pressure.
- Vertical wellbore
- Constant surface pressure

CONCLUSIONS:

The ultimate recovery of the gas from depletion drive gas wells depends on how low the reservoir pressure can be economically drawn down. For a given surface pressure, the primary variable is the cost of removing the liquids.

From a power perspective, quantitative analyses could be carried out for long term production engineering decisions as well as economic limit criteria for recoverable reserves estimation.

The highest ultimate recovery was achieved by pumping the liquids out.