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Low Pressure System for Gas Wells: Do We Need It? How Low Should We Go? A Compression Strategy for Tight Gas Wells in South Texas

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Abstract

In a large field with thousands of wells of different ages and qualities, determining the optimum operating pressure is a challenging task. This study looks at the Lobo Field in South Texas which has approximately 1800 tight gas wells currently in production to determine the effect of pressures on recovery and the benefits vs. costs of compression. Wells were divided into 3 groups that share similar characteristics and modeled using the integrated production modeling tools to evaluate recovery vs. line pressure. Results show that the better wells can produce longer in a high pressure system before loading up and needing lower pressure, therefore, cost of compression per unit volume is lower. Wells with lower reserves do not stay in the intermediate pressure gathering system long before needing low pressure, thus for these wells the fuel savings from having an intermediate pressure system does not offset the cost. Well head compression is only attractive for the better wells.

1. Introduction

ConocoPhillips currently produces roughly 1800 wells in the Lobo Field and maintains an active drilling program adding 40-50 wells per year. Initial field development began in the late 1970's. As the field matures, reservoir pressure declines, and as a result, so does production. Optimizing production requires optimizing surface pressures. The continuous drilling program, while adding to potential recovery, exacerbates the optimization challenge because the mixture of older and newer wells has a large range of pressure needs. The long lead time of compression projects combined with the flow and load-up characteristics of numerous wells can result in significant range of uncertainty for design volumes. Timing, location, horsepower, capacity, throughput and compressor configuration are some of the numerous variables that need to be determined with constantly changing needs. Addressing questions on this issue presented a unique opportunity for a multifunctional team of reservoir, production, facility and operation disciplines to work out a compression strategy. It was necessary for the team to work together to align goals and production philosophy and to manage a balance between top priority projects in the short term and longer term projects. A strategy that balances the cost and benefits of compression for the different types of wells was developed. This paper only focuses on the methodology used to determine the benefits and estimated cost of reduction in wellhead pressure, including timing of compression. Other compressor related issues such as cost/benefit of acquisition method, installation design, maintenance philosophy, instrumentation level and fuel usage optimization, which are all part of the overall cost of compression were included in the strategy, but will not be discussed here.

Compression project economics are driven by acquisition costs, installation costs, operating expenses and the production profile resulting from lower system pressure that compression provided. How will the wells respond to lower pressure? What is the lowest pressure that added rate and recovery can justify the cost of compression? First, the wells' responses must be modeled. It is very time-consuming to model all 1800 wells at the same time thus a short-cut methodology is preferred. It was determined that despite the age differences, Lobo wells share many similar characteristics and the wells can be divided in three groups. Group 1 has an average estimated ultimate recovery (EUR) of approximately 1 bcf. Group 2 has an average EUR in the 3 bcf range and Group 3 has an average EUR exceeding 6 bcf. It is sufficient to model one well from each group and use their responses to determine representative compression economics.