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Assessment of Temporary Gas Storage to Avoid Flaring: A Bakken Case Study

Ala Eddine Aoun[1]

[1]University of North Dakota

Abstract

Environmental performance is a significant driver of energy production today, and providing attractive methods to reduce flaring remains a high priority for oil producers. Oil production from the Bakken and Three Forks formations has significantly increased over the last ten years without commensurate augmentation of gas capture infrastructure. The gas gathering network and treatment facilities work under maximum capacity, which leave the system vulnerable in case of maintenance, or operational emergencies. This study investigates the potential solution to mitigate flaring in case of temporary gas plant shutdown. The project's main objective is to evaluate technically the feasibility of gas re-injection in the Bakken formation as a means to temporary store gas, increase oil recovery, reduce flaring and maintain compliance. A flow simulation model was created to investigate dedicated gas injection of a four-well pad and to identify the best scenario for temporary gas storage, assess the incremental production, analyze the effect on offset wells, evaluate gas recovery and efficiency. Gas reinjection has the added benefit of producing incremental oil that can offset installation and operational costs associated with gas compression and nonproducing time for a well during injection. Results indicate that gas injection rate of 2.8 MMcfd has the highest gas injection efficiency, up to 0.3 bbl of oil equivalent per Mcf of gas injected. In addition, the increase in the gas production rate during injection phase is manageable, less than 0.7MMcfd. High gas injection rates yielded better gas recovery up to 80%, however lower gas injection efficiency and early gas breakthrough are expected. Low gas injection rates could produce incremental oil with moderate impact on offset wells. Communication of gas is likely to occur between wells within 1500 feet and wells positioned heel to heel that are common to the well-pad facility. The most promising injection scheme appeared to be dedicated injection of 2.8 MMcfd. The findings support continued work to further investigate well configurations that can best benefit from the technique and to mature economic case studies.