Unlocking Future Well Productivity: Insights from Historical Data-Driven Analysis of an Intelligent Surface-Controlled Gas Lift Technology

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Abstract:

This abstract compares the performance of a surface-controlled gas lift system with conventional gas lift technologies. The remote-control system provides operators with the capability to precisely calculate the necessary quantity of injected gas to achieve a specific oil production target. This control level permits the fine-tuning of the production rate in accordance with the prevailing conditions in the facility, ultimately optimizing the overall efficiency of production. In our study, we compiled a dataset from two nearby pads comprising six wells equipped with our surface-controlled gas lift technologies in Pad#1, alongside six wells utilizing conventional gas lift technologies in Pad#2, located in New Mexico.

The wells are drilled in Wolfcamp formation in Delaware Basin with an average porosity of 6%, but with a notably low average permeability of 10 millidarcies, necessitating the implementation of multistage hydraulic fracturing. A comprehensive analysis is conducted to compare the pads production and perform a decline curve analysis to find out the performance of different gas lift technologies. This assessment proves the effectiveness of the surface-controlled gas lift systems in sustaining and potentially enhancing production levels in the assessed wells.

Regarding cumulative production over a 19-month production, Pad#1, utilizing the surface-controlled gas lift technology, outperformed Pad#2 utilizing conventional gas lift technologies by yielding 1,799,388 m3 more cumulative liquid production (370,410 m3 more oil), marking a 31% increase (46% for oil). During the crucial initial five-month production phase, where return of investment rate is pivotal, Pad#1 yielded an additional

239,700 m3 of oil, marking a 63% increase in oil production compared to Pad#2. Regarding gas production, over the entire 19-month period, Pad#1 produced 336,223 MCF more gas, constituting a 4% increase compared to Pad#2 with conventional gas lift technologies.

Regarding profit enhancement, considering the West Texas Intermediate oil price at the 19-months of the analysis, Pad#1 with the surface-controlled gas lift technology generated a superior profit of over $36 Million for 19 months of production compared to Pad#2 utilizing conventional gas lift technologies. Furthermore, during the initial five months, Pad#1 accrued over $25 Million more in profit than Pad#2.

Regarding monthly production rate, on average, wells equipped with the surface-controlled gas lift systems in Pad#1 exhibited a liquid production enhancement of 94,705 m3/month (19,495 m3/month for oil), representing a 29% improvement (a 41% for oil). Regarding gas production, an average increase of 17,696 MCF/month was observed for Pad#1, resulting in a 1% rise. Additionally, the average water cut for Pad#1 stands at 83%, while for Pad#2, it is 88%.

Regarding decline curve analysis by applying an exponential curve fitting technique to the production data and comparing the coefficients representing the curvature and initial production volume of the curves, it was observed that wells utilizing the surface-controlled gas lift systems in Pad#1 exhibited lower decline by 25% and 14% in oil and liquid production curves compared to wells employing conventional gas lift technologies in Pad#2, respectively. However, wells in Pad#2 experienced a 3% lower decline in gas production compared to Pad#1.

Regarding normalized cumulative production, calculated by dividing the production value by the lateral length of the wells, over the 19-month production period, Pad#1 exhibited 37% increase in liquid production (51% for oil) compared to Pad#2. Furthermore, Pad#1 demonstrated a significant 68% increase in normalized oil production compared to Pad#2 during the initial five months.

Drawing upon real data sourced from New Mexico, this inquiry scrutinized the impact of the innovative and remotely operated automatic gas lift technology on increasing well productivity. The insights derived from analyzing real data in this study could inform the strategic shaping of future energy unlocking endeavors within mature reservoirs.