Gas Lift Optimization Strategies for Enhanced Productivity in Ageing Brown Fields

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Abstract:

The introduction and optimization of gas lift systems in oil wells is a crucial process that aims to enhance the recovery of hydrocarbons and extend the life of a well. When brown fields and assets in late life are considered within the context of Wells Reservoir and Facility Management (WRFM), the utility of gas lift systems has been proven to be beyond marginal. Achieving and sustaining enhanced recovery from aged wells via gas lifting is influenced by key design elements which include injection pressure, depths, rates, valve types & sizing etc.

In the Niger Delta, it is not uncommon to find development/producer wells situated in brown fields assets that have produced for more than forty (40) years. Over the extensive production life of these wells, the propensity for vertical lift issues associated with higher watercut and/or reservoir pressure depletion increases, and ultimately results in well productivity decline.

In a number of these wells the introduction of gas lift has helped to stem the productivity decline. The scalability of gas lift technologies, ranging from manually operated gas lift facilities to fully automated configurations offering real time monitoring and autonomous gas metering inherently facilitates the optimization of cost benefits on a well-by-well basis.

Field X, an onshore oil producing asset situated in the Niger Delta was discovered in the 1960's. Oil production commenced in the early 1970's. Producing reservoirs typically have strong aquifer support with permeability ranging from 200-2000 millidarcies. Routine well tests indicated a batch of eight (8) wells were producing below potential; production from 5 of these wells is gas lift enabled while 3 of these wells produce on natural flow. In the gas lifted wells, it was observed that injected gas was being wholly recycled because the depth of injection was shallower than the fluid level in the tubing. Conversely, In the 3 natural flowing wells a significant increase in watercut was observed and this presented a quick win opportunity to improve well productivity by introducing gas lift.

Nodal inflow/outflow performance analysis using commercially available Nodal Analysis software was used to carryout gas lift design and establish valve sizes, gas injection rates and depths for optimally gas lifting these wells. To complete the total Gas Lift System "loop", surface gas lift line repair / replacement was also identified for some the wells to realize this opportunity value.

The intended gas lift valve changeout/orifice deepening, nova valve installation to eliminate gas sharing issues was executed for all 8 wells using wireline. However, well testing has only been completed for 4 wells. Of the 4 wells tested, the productivity gain was about 1100 bopd, resulting in a free cash flow of about $13m/n.

This paper aims to increase awareness on the valve of simple gas lift optimization in arresting the productivity decline in brown fields.