**Innovation Features**

Gaslift remains one of the most common artificial lift methods currently used for oil producing wells. Conventional gaslift well systems have been used worldwide for decades. However, the depth-limit bottleneck for such wells also remains, meaning that the deepest gaslift injection point must be located above the packer, whereas normally it is set just above the top perforation. Above packer placement must be maintained for gaslift well design and integrity reasons. A new gaslift well design, “DeepLift”, has proved suitable for use in many types of wells, particularly those containing long true vertical perforation intervals. This completion design was de-bottlenecked by deepening the gaslift injection point, which resulted in well deliverability improvement and reserve recovery.

Designing a production system cannot be separated into inflow and outflow performance independently; the entire production system must be analyzed as a unit. However, well deliverability may often be drastically constrained by the performance of only a single component in the system. By isolating each component, performance can be optimized in the most cost-effective way. The crucial part of well performance is governed by two major curves: Inflow Performance Relationship (IPR) and Tubing Performance Relationship (TPR). Improving inflow performance is more complicated and expensive e.g. costs for well stimulation and maintaining or increasing Reservoir Pressure (P_r) by waterflooding. Deepening the gaslift injection point system helps improve TPR by increasing drawdown pressure or decreasing the hydrostatic column. This new design was granted a patent by the U.S. Patent and Trademark Office, Patent No. 7,770,637 B2, on August 10th, 2010 (filed on October 12th, 2007, Patent Application No. 11/871,746). The Continuation-In-Part (CIP) design, Patent No. 8,191,624, June 05th, 2012 (filed on August 11th, 2009, Patent Application No. 12/539,050), was also granted to strengthen the patent for this new approach. This single completion design uses the same tubing for producing hydrocarbons and delivering gaslift. A system for gas lifting fluids from a wellbore, therein defining an upper portion and a lower portion of the gaslift injection, comprises the primary string, a secondary string as gaslift bypass tube, and a linkage between those two strings in a closed system to allow placement of the gaslift bypass packer in close proximity to the perforation. The top section of the tubing is used for production while the bottom section of the tubing is used for delivery of the gaslift to the wellbore. The gaslift flows first through the perforated tube above secondary port of the dual packer and then to the bypass packer downward via a gaslift bypass tube, which is connected to the lower tubing section. The gaslift is injected out of a bottom side pocket mandrel via a reverse gaslift valve to the wellbore approximately at the bottommost perforation intervals to improve the outflow of the well. This design provides full well intervention from the surface down to the tailpipe and wellbore while also maintaining well integrity standards. Operational flexibility is thus fulfilled for reservoir
management purposes, e.g. changeability of gaslift valve for gaslift rate optimization, replaceability of downhole gauge for pressure and temperature monitoring.

**Thai E&P Industry Impact and Value**

The S1 concession continues to serve as Thailand’s largest onshore oilfield, covering approximately 90 percent of the onshore wells in the country. The most common method of artificial lift in S1 is gaslift. At present, about 60% of the producing wells use the gaslift technique while only 20% use the downhole pumping technique; the remaining 20% are not yet equipped with artificial lift systems for some reasons. The discussed innovative DeepLift design has been implemented successfully for the first time at the S1 Field, Thailand.

Gaslift enhances production rate by lowering the wellbore flowing pressure. Injection of gaslift into the production tubing aerates the flowing fluid, thus decreasing the hydrostatic pressure and reducing backpressure at the wellbore. The production rate is increased by decreasing bottomhole flowing pressure. Generally speaking, the deeper the operating gaslift injection point is, the better the lifting efficiency and production of the well is expected to be. Still, it must be noted that the deepest gaslift injection point of a Conventional Gaslift Well is limited by the packer setting depth, which must be at just above the top perforation intervals. In order to deepen the gaslift injection point limited by shallow production packer setting depths, the gaslift bypass packer is inevitably determined. DeepLift – The Innovative Gaslift Bypass Packer Technique is proposed to de-bottleneck this constraint. It is suitable for use in many types of wells, particularly those containing long true vertical perforation intervals. Two wells that contained 500 – 600 mTVD, which is a significantly long distance between the top and the bottom perforation depth, were selected for a field trial. The relationship between gaslift injection depth and well production rate (with constant gaslift supply) are presented graphically in a well performance nodal analysis model. An enormous increased percentage of production was gained in Well No.2 compared to Well No.1 due to 1) much lower water cut, reduction from 80% to 20%, resulting in much less hydrostatic pressure, and 2) genuine higher drawdown pressure, improvement from 150 to 300 psi. The production rates were satisfactory and overall well results turned out as good as expected when compared to the forecast from the Prosper Simulation Model. Results showed well deliverability improvement and reserve recovery gain of several hundred barrels of oil per day.

<table>
<thead>
<tr>
<th>Well No.</th>
<th>Conventional Mode</th>
<th>DeepLift Mode</th>
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<tbody>
<tr>
<td></td>
<td>Gross (bpd)</td>
<td>Net (bpd)</td>
</tr>
<tr>
<td>1</td>
<td>317</td>
<td>59</td>
</tr>
<tr>
<td>2</td>
<td>66</td>
<td>53</td>
</tr>
</tbody>
</table>

Well No.1

Well No. 2
The DeepLift – Innovation Gaslift Bypass Packer Technique, has proven to be suitable for use in several types of wells, particularly those containing long true vertical perforation intervals (500 – 600 mTVD) resulting in value-add not only for Thai E&P industry but also for the industry worldwide in that it unlocks the potential for long true vertical perforation intervals.

**Why this project should win the award?**

Producing more oil, but demanding less input power consumption while doing so challenges all E&P companies as they pursue sustainable energy resources. The innovative DeepLift technique makes the odds for surmounting this challenge greater. An enormous percentage of the production gain stems from the genuine higher drawdown pressure improvement from 150 psi to 300 psi. Using DeepLift has resulted in a significant production improvement and is a new completion gaslift well design innovated successfully by the Thai Well Engineering and Production Technology Team. This achievement does not only utilizes our domestic natural resources worthily, but also encourages people industry-wide to innovate technology to sustain world’s energy resources more effectively.

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