PRESSURE and PRODUCTION ISOLATION:

DEVICE INTEGRATED INTO GAS LIFT EQUIPMENT IN HIGH PRESSURE GAS LIFT APPLICATIONS

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ABSTRACT:

This paper presents a novel design of a gas lift check valve featuring an integrated pressure isolation mechanism, aimed at optimizing gas lift operations in oil wells. Operators utilizing High Pressure Gas Lift, or Single Point Gas Lift systems are often converting to conventional gas lift or other Artificial Lift methods once production has declined. However, this conversion requires a workover and a large capital impact to the operator. This new integrated pressure isolation mechanism offers operators the ability to convert from HPGL to conventional gas lift without the need of intervention.

The proposed gas lift check valve incorporates a unique pressure isolation mechanism within its design to address these challenges. This mechanism allows for controlled pressure release, preventing issues such as valve slamming, gas migration, and excessive backflow. The integration of this isolation feature enhances the valve's reliability and extends its operational lifespan, contributing to improved overall system performance.

The paper discusses the theoretical foundation, design considerations, and simulation results validating the effectiveness of the proposed isolation device.

In conclusion, the integration of a pressure isolation mechanism within the gas lift check valve offers a promising solution to challenges encountered in converting gas lift systems, providing a more reliable and efficient method for optimizing oil well production. The innovative design presented herein has the potential to contribute significantly to the petroleum industry's efforts to enhance oil recovery processes while minimizing operational complexities and costs.

INTRODUCTION

In the realm of oil and gas production, the optimization of extraction techniques remains paramount for maximizing efficiency and output. Gas lift systems stand as a pivotal method employed to enhance productivity in oil wells, particularly in reservoirs where there is an elevated Gas-to-Liquid ration (GLR). Central to the success of gas lift operations is the ability to utilize different gas lift applications depending on well conditions and the ability to transition efficiently and economically, to which the Burstguard™ check valve plays a critical role.

This paper delves into the intricate design, functionality, and performance potential of pressure isolation devices utilized within HPGL applications. As the oil and gas industry

continually seeks to extract hydrocarbons from increasingly challenging environments, the efficacy and efficiency of gas lift operations become ever more crucial.

Ultimately, our endeavor is to contribute to the ongoing discourse surrounding gas lift optimization, innovation, and fostering the development of reliable pressure isolation check valve devices to improve production practices. Through technology aimed at specific applications, we aim to furnish operators with available options to complement their existing gas lift operations strategy.

BACKGROUND

The BurstGuard™ pressure isolation device is designed specifically for HPGL applications converting to conventional gas lift. HPGL applications have emerged as a primary artificial lift method in areas where there is an increased presence of gas compared to overall fluid production. In recent years, HPGL applications have surged in the Permian basin driven by several factors. Firstly, the validation of obtaining similar Flowing Bottom Hole Pressures compared to ESPs resulting in similar overall production output for new wells coming on initial production. Secondly, advancements and availability of compression have facilitated the increased utilization of HPGL implementation. Lastly, operators ROI when comparing ESP run time vs HPGL in areas with high GLRs.

For the wells that implement HPGL and then convert to conventional gas lift as a lift strategy, there is often a need for a workover for the conversion. Attempts have been made to include gas lift equipment during initial HPGL, but the integrity of the check valve has been at issue during conversion often resulting in inefficient operations. Until recently there has not been a way to isolate the gas lift valves and checks during HPGL. As such, a large portion of wells that utilize HPGL will tend to see a workover within the first 48 months as the need to convert due to declining reservoir pressures (barring other needs for remediation).

PARAMETERS:

In working with an operator in the Permian, it was evident a solution must be easily integrated into existing conventional gas lift equipment. Moreover, as many operators use ‘standard’ conventional gas lift equipment (i.e, geometry, and dimensions), the solution could be scalable to other end users. Based on the needs of the gas lift conversion and constraints of equipment, the pressure isolation device was ultimately developed that satisfies the following:

- User defined pressure setting to engage conventional gas lift equipment
- Modular to be easily integrated in conventional gas lift mandrels (Image 1)
- Allows gas passage below check valve without restriction
- Can be integrated into single or double check configurations with existing mandrels

CONCLUSION:

The isolation device™ allows operators to isolate their conventional gas lift checks and valves until at which point the need for a conversion arises without the need for a workover. This pressure isolation device also mitigates the potential failure of a conventional check valve prior to conversion. Barring any other need for remedial work, the avoidance of a workover greatly impacts Net Present Value to the well(s). The pressure isolation is consistent and repeatable as seen in Figure 1 during testing.

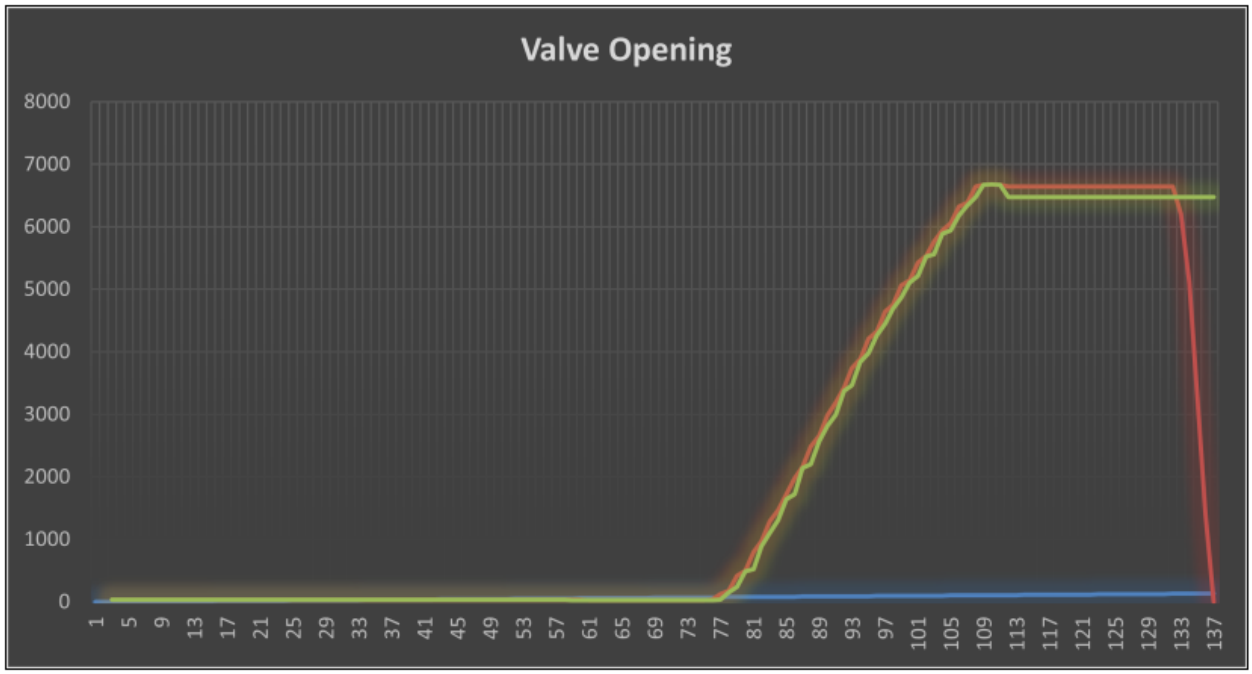

Fig. 1. BurstGuard repeatability and operational testing.

Image 1. Modular design for pressure isolation