INTRODUCTION

In the ever-evolving oil and gas industry, the focus on optimizing well performance and maximizing production recovery has become paramount. As operators strive to enhance profitability and navigate a landscape of capital discipline, the era of expansive capital projects solely driving production growth has come to an end. In this context, the importance of effective well performance restoration techniques have gained significant attention.

Well performance restoration plays a crucial role in maintaining and enhancing hydrocarbon production from both new and existing wells. Over time, wells experience a decline in productivity due to various factors such as reservoir depletion, formation damage, and interference from neighboring wells. To counteract this decline and sustain production levels, operators employ various methods, including acid treatments. The success of well performance restoration directly impacts the bottom line, as it allows operators to maximize the potential of existing assets without the need for extensive drilling and completion operations. By optimizing production from existing wells, operators can achieve greater operational efficiency, cost-effectiveness, and environmental sustainability.

The purpose of this whitepaper is to provide a comprehensive comparison between two commonly employed approaches: acid bullheading and focused restimulation techniques. By examining these approaches from various angles, including their technical aspects, economic considerations, overall effectiveness, and real-world case studies, we aim to equip industry professionals with valuable insights to make informed decisions. Additionally, this whitepaper seeks to address common misconceptions, highlight the advantages and limitations of each technique, and emphasize the importance of selecting the most suitable approach based on reservoir characteristics, formation damage assessment, and other relevant factors.

OVERVIEW

Acid bullheading, a traditional approach to well performance restoration, involves pumping acid from the surface into the wellbore to remove formation damage and enhance production. This method relies on the bulk application of acid to the entire well section, which can lead to uneven treatment distribution and potential drawbacks.

In contrast, focused restimulation techniques take a more targeted and precise approach. These techniques, such as pinpoint acidizing or hydraulic fracturing, aim to selectively treat specific zones within the wellbore that require stimulation. By concentrating treatment efforts on the areas with the greatest potential for improved production, focused restimulation techniques offer enhanced control and optimization.

In the following sections, we will delve deeper into the intricacies of each technique, providing a comprehensive comparison of their methodologies, outcomes, economic considerations, and operational factors. By examining the strengths and weaknesses of acid bullheading and focused restimulation techniques, operators can make informed decisions when selecting the most appropriate method for restoring well performance. Through this whitepaper, we aim to equip industry professionals with the knowledge needed to maximize production recovery and unlock the full potential of their existing wells.
ACID BULLHEADING TECHNIQUE

Acid bullheading is a well performance restoration technique that has been widely employed in the industry for many years. This approach involves pumping acid from the surface into the wellbore to remove formation damage and stimulate production. While acid bullheading has demonstrated some effectiveness in certain scenarios, it also comes with inherent limitations and challenges. While acid bullheading has been a commonly used technique, it is essential to consider both its advantages and limitations:

**ADVANTAGES:**

a. Familiarity and Established Practice: Acid bullheading is a well-established method in the industry, and many operators are familiar with its execution.

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**LIMITATIONS:**

a. Lack of Precision: Acid bullheading lacks the precision and targeting capabilities necessary to address specific zones within the wellbore. As a result, there is a risk of uneven treatment distribution and potential bypassing of areas that require stimulation.

b. Potential for New Formation Damage: The bulk application of acid during bullheading can lead to the creation of new formation damage, such as emulsion or scale precipitation, which may negatively impact well productivity in the long term.

c. Uncertainty of Uplift Potential: Acid bullheading treatments may yield inconsistent and unpredictable results in terms of production uplift. The variability in treatment effectiveness can be attributed to factors such as reservoir heterogeneity, fluid flow dynamics, and acid-rock interactions.

d. Inefficient Use of Resources: Acid bullheading treatments often require a larger volume of acid to be pumped into the well, resulting in higher costs and potential environmental impact.
In recent years, the oil and gas industry has witnessed significant advancements in focused restimulation techniques. These innovative approaches have emerged as viable alternatives to acid bullheading, offering improved precision, targeted stimulation, and more efficient well performance restoration.

Focused restimulation techniques involve the selective treatment of specific zones within the wellbore to address formation damage and enhance production recovery. These techniques leverage advanced tools, data analytics, and engineering expertise to optimize treatment design and placement.

Focused restimulation techniques offer several distinct advantages over acid bullheading including:

**PRECISION AND TARGETING:**
By selectively treating specific intervals or zones, focused restimulation techniques ensure that the treatment is precisely delivered where it is needed most. This results in improved stimulation efficiency and optimized production recovery.

**REDUCED FORMATION DAMAGE:**
The targeted nature of focused restimulation techniques minimizes the risk of creating new formation damage. By avoiding bulk acid applications, the potential for emulsion formation, scale precipitation, or other detrimental effects is significantly reduced.

**ENHANCED TREATMENT CONTROL:**
The use of advanced modeling and reservoir simulation tools enables operators to optimize treatment parameters, proppant placement, and fluid chemistry. This level of control enhances treatment effectiveness and maximizes production uplift.

**ECONOMIC EFFICIENCY:**
Focused restimulation techniques focus resources and treatments on specific intervals, resulting in more cost-effective operations. By avoiding unnecessary treatments in non-productive zones, operators can optimize their investment and achieve better economic returns.
Key Considerations in Selecting The Appropriate Technique

Selecting the most suitable technique for restimulating a well requires careful consideration of various factors. The following key considerations can guide operators in making informed decisions:

A. Formation and Reservoir Characteristics:

The nature of the formation and reservoir plays a crucial role in determining the appropriate restimulation technique. Factors such as rock type, permeability, reservoir pressure, and presence of natural fractures need to be assessed.

Acid bullheading may be more suitable for certain formations with specific characteristics, while focused restimulation techniques may be more effective in others.

B. Damage Mechanisms and Treatment Objectives:

Understanding the specific damage mechanisms affecting the well and defining the treatment objectives are essential in selecting the appropriate technique. Acid bullheading is commonly used to remove near-wellbore damage and enhance overall well productivity. In contrast, focused restimulation techniques can effectively address complex damage mechanisms, such as fracture driven interference (FDI), and optimize the recovery potential of the well.

C. Treatment Design and Execution Flexibility:

The flexibility of treatment design and execution is another important consideration. Acid bullheading offers simplicity in terms of pumping acid from the surface into the wellbore. However, it may lack the precision and control required for targeting specific zones and achieving optimal treatment placement. Focused restimulation techniques provide greater flexibility in designing and executing treatments, allowing for stage-by-stage stimulation and precise control over fluid placement.

D. Economic Viability and Cost Considerations:

Evaluating the economic viability of each technique is crucial in decision-making. Factors such as the cost of materials, equipment, and operational logistics need to be considered. Acid bullheading may offer a relatively lower upfront cost, but it may result in suboptimal outcomes and potential long-term costs associated with formation damage. Focused restimulation techniques, while potentially requiring higher initial investment, can yield superior results and long-term cost savings by addressing the root cause of the production decline.
E. Operational Experience and Expertise:

Considering the operational experience and expertise of the team is vital in implementing the chosen technique. Acid bullheading, being a more conventional approach, may be easier to execute with existing resources and expertise. On the other hand, focused restimulation techniques may require specialized knowledge, equipment, and a thorough understanding of treatment design and execution. Collaboration with experienced service providers and consultants can bridge any knowledge gaps and ensure successful implementation.

An example of Focused restimulation technique is the EXCITE platform. It combines advanced engineering, data analytics, and digital integration to deliver superior wellbore coverage and fluid penetration into the formation, resulting in longer-lasting production recovery of underperforming wells. With the EXCITE platform, operators can unlock the full potential of their existing wells, overcome the challenges of acid bullheading, and achieve sustained production recovery.
CASE STUDY

To provide practical insights into the effectiveness of both restimulation techniques, this section presents real-world case study to showcase the application of these techniques in restoring well performance, achieving sustained production uplift, and maximizing the recovery potential of existing wells.

**Background**
A multi-stage horizontal lateral well located in the Midland Basin experienced a sudden 150 bpd drop in production just 75 days after completion.

**Initial Solution**
A bullhead treatment of 15% HCL was pumped down the backside of the tubing to address the issue. A positive production uplift was initially observed, however the production trended downwards below the original levels a month later, indicating the inefficiency of the bullhead treatment.

The operator needed a more effective and sustainable solution to address the production degradation issue and decided to try a focused restim approach.

**Final Solution**
The EXCITE technology platform was leveraged to conduct flow assurance evaluation, design optimization, and treatment execution. The analysis identified iron sulfide as the source of damage restricting well flow. A 26-stage targeted 15% HCL treatment was designed to eliminate the skin damage caused by the iron sulfide buildup. The EXCITE System enabled the operator to place the design at the targeted intervals along the lateral, completing the execution on a single trip.

The production was restored above the type curve, confirming the treatment’s effectiveness at eliminating all the skin damage caused by the iron sulfide buildup. The sustained production performance resulted in the recovery of an additional 45,000 bbl. of oil that would have otherwise been lost.

When both solutions are compared, the focused ReStim solution with the EXCITE platform, generated over 2.1 times production recovery versus the acid bullhead treatment across a one-year period. This translated to over $2 million of incremental cashflow generated from the focused ReStim solution.
Summary

In this whitepaper, we have explored the comparison between acid bullheading and focused restimulation techniques for restoring well performance. Through an in-depth analysis of the challenges, limitations, and advantages associated with each method, it is evident that the focused restimulation technique offers a superior solution for operators in the oil and gas industry.

In conclusion, the focused restimulation techniques, like the EXCITE technology platform, provide superior value for enhancing production recovery of existing wells. Beyond immediate economic gains, it offers long-term value creation for operators. By restoring the productivity of underperforming wells and extending their economic life, operators can generate consistent cash flows, maximize asset value, and strengthen their competitive position in the market.

The EXCITE platform stands out with its ability to provide precise, targeted stimulation in a wellbore, ensuring excellent coverage and fluid penetration into the formation. This results in longer-lasting production recovery, improved well performance, and increased hydrocarbon recovery. By eliminating the root cause of damage, the EXCITE platform offers a more sustainable and effective solution compared to traditional methods.

References