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THE IMPACT OF POLISKREP TECHNOLOGY ON THE OPERATIONAL STABILITY OF PRODUCTION EQUIPMENT AND SAND PRODUCTION CONTROL IN OIL WELLS

Research paper

Nikola Vojvodić[1], Slavica Prvulović[2*], Jasna Tolmač[3], Branislava Radišić[4]
[1]University of Novi Sad, Technical Faculty "Mihajlo Pupin", Djure Djakovica bb, 23000 Zrenjanin

Abstract: Sand production is a significant challenge during oil well exploitation, causing damage to production equipment, frequent workover interventions, production downtime, and increased operating costs. This paper presents the application of the organosilicate Poliskrep technology for stabilizing the near-wellbore zone and controlling sand production in the X-200 production well. The operational history of the well was analyzed, including excessive formation sand production, high water cut, and limitations of previously applied remediation methods. The Poliskrep treatment procedure is described, including preparation and injection of the organosilicate polymer, application of a flushing spacer and nitrogen, and the operating conditions during treatment. Treatment effectiveness was evaluated based on well clean-up results and subsequent monitoring of well performance. Following application of the technology, no sand production from the near-wellbore zone was recorded, enabling well completion without a gravel-pack system. During 964 days of operation, no workover interventions were required, and no mechanical impurities were detected in the produced fluid. These results indicate improved operational stability of the production equipment and reliability of the production system. The findings demonstrate that Poliskrep technology can provide an effective solution for sand production control and contribute to extending the service life of production equipment under oil well operating conditions.
Key words: poliskrep technology; sand production; near-wellbore zone; production equipment; operational stability; oil well; organosilicate polymer; production reliability.

INTRODUCTION

Sand production is one of the most significant challenges encountered during the exploitation of oil and gas wells completed in poorly consolidated reservoirs. The presence of solid particles in the produced fluid causes abrasive wear of both downhole and surface production equipment, reduces the operating efficiency of artificial lift systems, leads to the plugging of perforations and production tubing, increases the frequency of workover operations, and results in substantial economic losses (Safaei, 2023; Abass, 2002). In addition to its direct impact on production performance, sand production significantly impairs the reliability and service life of production equipment, making it an important research topic from the perspectives of mechanical engineering and the maintenance of technical systems (Talaghat, 2009; Arbadov, 2025).

A wide range of mechanical and chemical methods has been developed to control sand production. Mechanical methods, such as gravel-pack systems, wire-wrapped screens, and pre-packed screens, have demonstrated high effectiveness; however, they increase the complexity of well completion, prolong [1]workover operations, and raise capital and operating costs (Abass, 2002; Saghandali, 2022). Consequently, increasing attention has recently been devoted to the chemical consolidation of the near-wellbore zone through the application of polymeric and organosilicate systems, which promote the bonding of formation grains while minimizing the reduction in formation permeability (Safaei, 2023; Tabar, 2021; Du, 2024).

Recent studies have shown that appropriately selected chemical consolidation systems can significantly reduce sand production, improve the mechanical strength of the near-wellbore formation, and extend the service life of production equipment while reducing production downtime and the frequency of workover interventions (Du, 2024;Tabar, 2021; Mishra,

[1]nikola.vojvodic@tfzr.rs
[2] Corresponding author, slavica.prvulovic@uns.ac.rs ORCID: 0000-0001-6353-7145
[3] jasna.tolmac@uns.ac.rs ORCID: 0000-0003-3860-2034
[4] branislava.radisic@uns.ac.rs ORCID: 0009-0007-3664-2012

2015). A major challenge remains the selection of a technology capable of simultaneously providing effective formation stabilization and preserving the production potential of the well (Gelfgat, 2022; Muhammad, 2025).
This study investigates the application of the organosilicate Poliskrep technology in the X-200 production well, which was affected by severe sand production. Particular emphasis is placed on evaluating the influence of the treatment on the operational stability of production equipment, the elimination of mechanical impurities from the produced fluid, and the extension of the production period without the need for workover interventions.

MATERIAL AND METHODS

Characteristics of the Investigated Well

The study was conducted on the X-200 oil production well, which represents a typical example of a well affected by severe formation sand production and an increased water cut in the produced fluid. The well was drilled as a directional production well with a measured depth (MD) of 809 m and a true vertical depth (TVD) of 760 m. Following the completion of the final workover operations, the production interval was established between 786 and 784 m.
During its long-term operation, the well experienced numerous operational problems that adversely affected production stability and the reliability of the production equipment. The increase in formation water production was accompanied by intensive formation sand production, which caused severe abrasive wear of the downhole sucker rod pump, valves, production tubing, and other components of the production system. As a consequence, production downtime increased, and workover interventions became more frequent.
Before the application of the Poliskrep technology, several remediation methods had been implemented, including production interval cementing, water-bearing zone isolation, chemical treatments, and the installation of a gravel-pack system. However, these methods failed to provide long-term stabilization of the near-wellbore zone or a permanent solution to the sand production problem. Consequently, the X-200 well was selected for the application of the organosilicate Poliskrep chemical consolidation technology.
The main characteristics of the investigated well are summarized in Table 1.

Table 1. *Main characteristics of the investigated well*

Parameter	Value
Well designation	X-200
Well type	Directional production well
Measured depth (MD)	809 m
True vertical depth (TVD)	760 m
Production interval	786–784 m
Primary operational problem	Sand production and high water cut
Production method	Downhole sucker rod pump
Applied technology	Organosilicate Poliskrep technology

Application of the Poliskrep Technology

The Poliskrep technology is a chemical stabilization method for the near-wellbore zone based on the application of an organosilicate polymer, with the primary objective of bonding formation particles and preventing their migration during production. Unlike conventional mechanical sand control methods, chemical consolidation stabilizes the rock matrix without requiring the installation of additional mechanical components within the production interval.
Prior to the treatment, the well was prepared and the wellbore bottom was cleaned and conditioned. Subsequently, the injectivity of the production interval was evaluated to verify that the hydraulic conditions were suitable for the treatment. After confirming satisfactory

injectivity, the treatment string equipped with an operational packer was run into the well, and the target interval was isolated for the chemical treatment.
The treatment procedure began with flushing the production interval using the specialized PoliRIR-NFAS spacer fluid to remove fine particles from the pore space and improve the adhesion of the polymer to the rock matrix. This was followed by the injection of the organosilicate Poliskrep polymer. Nitrogen was subsequently used as the displacement fluid to promote uniform distribution of the polymer throughout the treated interval. After completion of the injection process, the well was shut in for the prescribed curing period to allow complete polymer hardening and the formation of a consolidated zone around the perforations.
The principal operating parameters of the Poliskrep treatment are summarized in Table 2.

Table 2. *Main operating parameters of the Poliskrep treatmen*

Parameter	Value
Volume of flushing spacer fluid	1.4 m³
Volume of Poliskrep polymer	1.25 m³
Total amount of nitrogen	Approximately 8,800 kg
Injection pressure	40–100 bar
Duration of final nitrogen injection	15 h
Well shut-in time	12 h

Research Methodology

The effectiveness of the applied technology was evaluated by comparing the operational performance of the well before and after the implementation of the Poliskrep treatment. The analysis included monitoring the key technical and production parameters that directly influence the reliability and operational performance of the production system.
The primary evaluation criteria included the occurrence of formation sand production, the presence of mechanical impurities in the produced fluid, the operational stability of the downhole sucker rod pump, the need for workover interventions, the feasibility of well operation without the installation of a gravel-pack system, and the duration of uninterrupted production following the treatment.
The results obtained during well clean-up and the subsequent production period were analyzed to assess the effectiveness of the chemical stabilization of the near-wellbore zone, the protection of production equipment against abrasive wear, and the improvement in the reliability of the production system.
To ensure an objective assessment of the treatment performance, the evaluation was based on both qualitative observations and quantitative operational indicators collected during the well clean-up stage and the subsequent production period. The comparison between the pre-treatment and post-treatment operating conditions enabled the identification of changes directly attributable to the application of the Poliskrep technology. Particular attention was given to parameters that reflect the integrity of the near-wellbore zone and the operational reliability of the production system.
The analysis also considered the continuity of well operation and the long-term behavior of the production equipment under field conditions. The absence of formation sand and mechanical impurities in the produced fluid was regarded as an indicator of successful chemical consolidation, while uninterrupted production without equipment failures or workover interventions was used to evaluate the durability of the treatment. In addition, the necessity for auxiliary sand-control measures, such as gravel-pack installation, was examined as an important practical criterion for assessing the overall effectiveness of the applied technology.
The methodological approach adopted in this study is based on field performance evaluation rather than laboratory testing, providing direct evidence of the technology under actual production conditions. Such an approach allows a realistic assessment of the operational

benefits achieved after treatment, including improved equipment reliability, reduced maintenance requirements, and enhanced production stability. The selected evaluation criteria are consistent with those commonly applied in recent studies dealing with chemical sand control technologies and production system reliability.
Figure 1 illustrates the methodology adopted for the implementation of the Poliskrep treatment and the evaluation of its effectiveness.

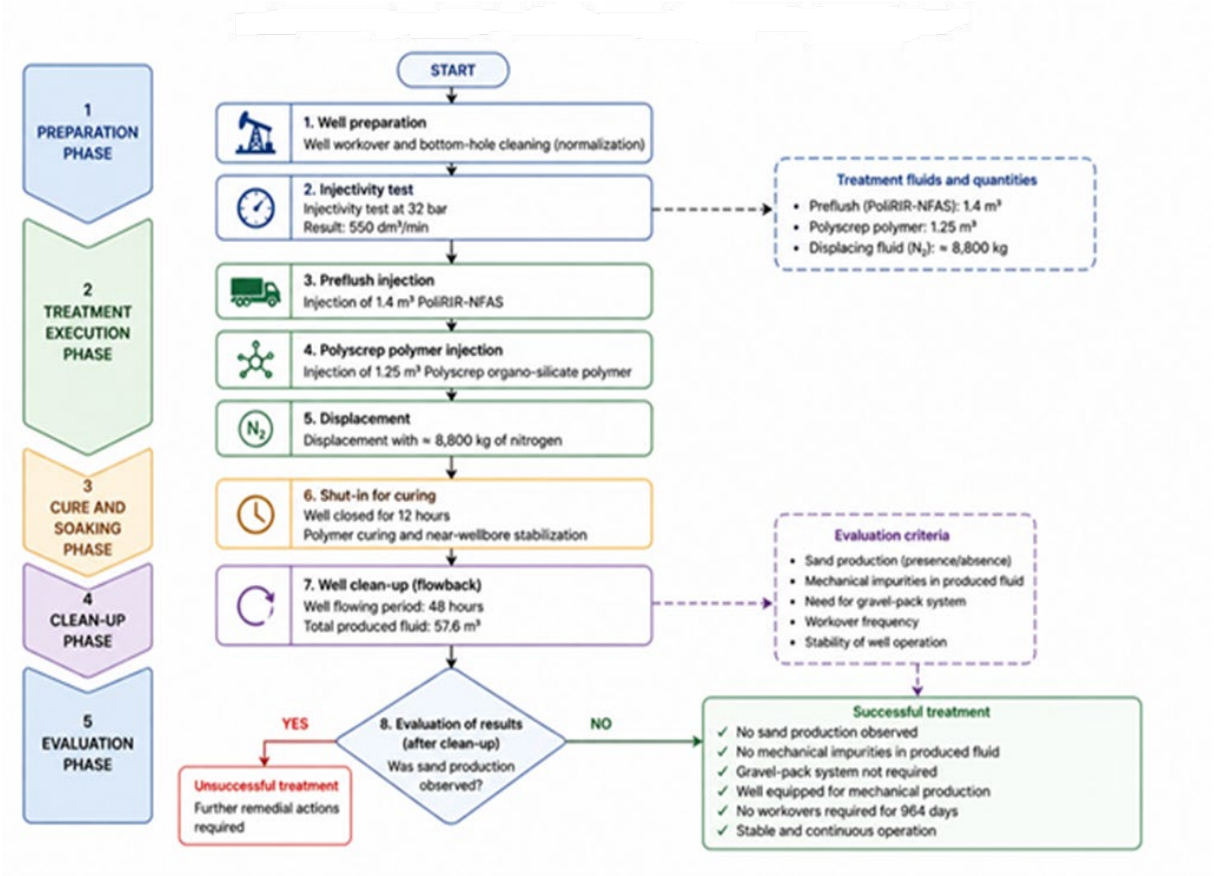


Fig. 1. *Methodology for the implementation of the Poliskrep treatment and evaluation of its effectiveness.*

RESULTS AND DISCUSSION

The analysis of production data revealed that, prior to the application of the Poliskrep technology, the X-200 well was affected by severe formation sand production and a progressive increase in water content in the produced fluid. After the well was brought into production, a fluid production rate of approximately 13 m³/day was achieved, with a water cut of about 35%. During the subsequent production period, the water cut continuously increased, reaching approximately 96% in 2018 and around 98% in 2019. At the same time, intensive migration of formation particles was observed, resulting in frequent failures of the downhole sucker rod pump, increased abrasive wear of production equipment, and a higher frequency of workover interventions.
Conventional remediation methods, including production interval cementing, reperforation, chemical treatments, and the installation of gravel-pack systems, provided only temporary improvements in production conditions. After a certain period, sand production problems reappeared, indicating that the applied methods did not provide long-term stabilization of the near-wellbore zone.
Following the implementation of the Poliskrep treatment, well clean-up operations were performed over a period of 48 h, during which a total of 57.6 m³ of fluid was produced.

Inspection of the production interval after completion of the clean-up process confirmed the absence of formation sand, representing the first indication of successful chemical consolidation of the near-wellbore zone. Based on these results, a decision was made to equip the well with an artificial lift production system without installing a gravel-pack system, which had previously been required during earlier production stages to prevent the migration of produced sand.

The most important production performance indicators after the application of the Poliskrep technology are presented in Table 3.

Table 3. *Key results after the application of the Poliskrep technology*

Parameter	Result
Well clean-up duration	48 h
Fluid produced during well clean-up	57.6 m³
Presence of sand after well clean-up	Not detected
Installation of gravel-pack (GP) system	Not required
Mechanical impurities in produced fluid	Not detected
Production period without workover intervention	964 days

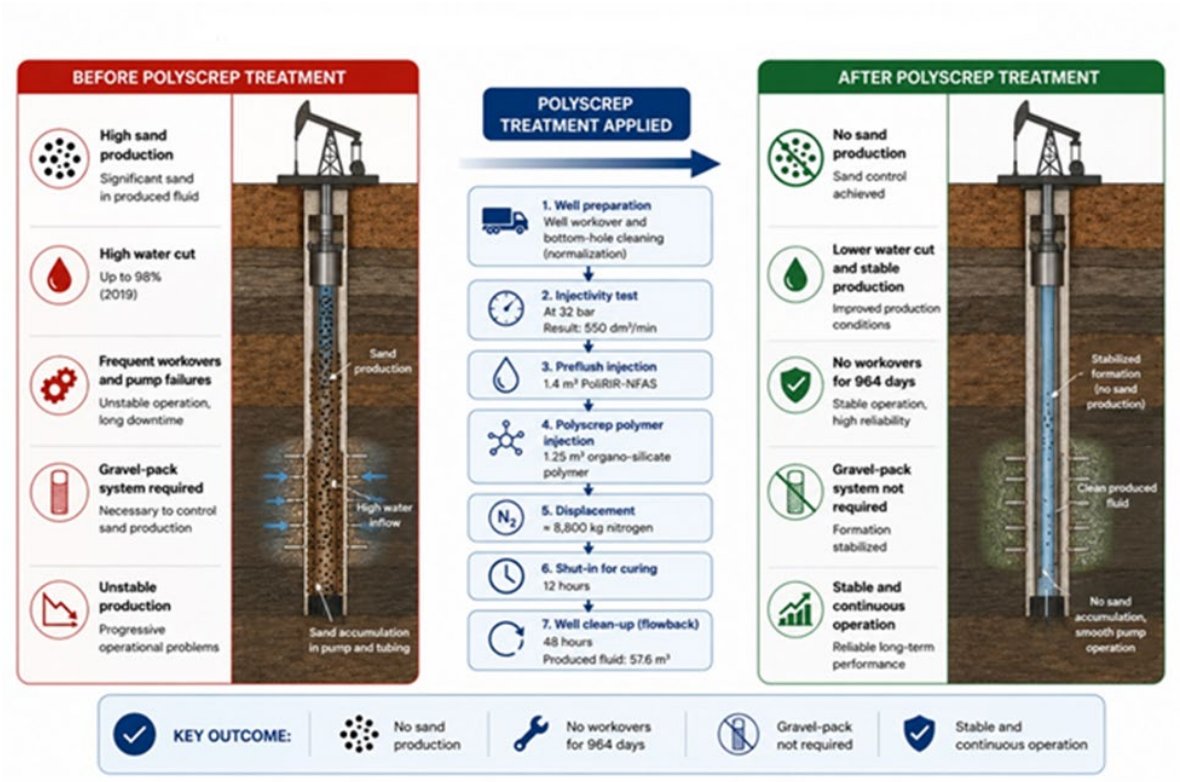


Fig.2. *Schematic representation of the well condition before and after the application of the Poliskrep technology.*

Monitoring of the well performance after returning the well to production demonstrated that, during the subsequent 964-day production period, no mechanical impurities were detected in the produced fluid, and no workover interventions were required. Compared with the previous production period, during which sand production caused frequent operational interruptions and failures of the downhole sucker rod pump, the treated well achieved continuous and stable operation of the production system. These results confirm that the chemical consolidation of the near-wellbore zone successfully prevented the migration of formation particles and ensured long-term stabilization of the production interval.

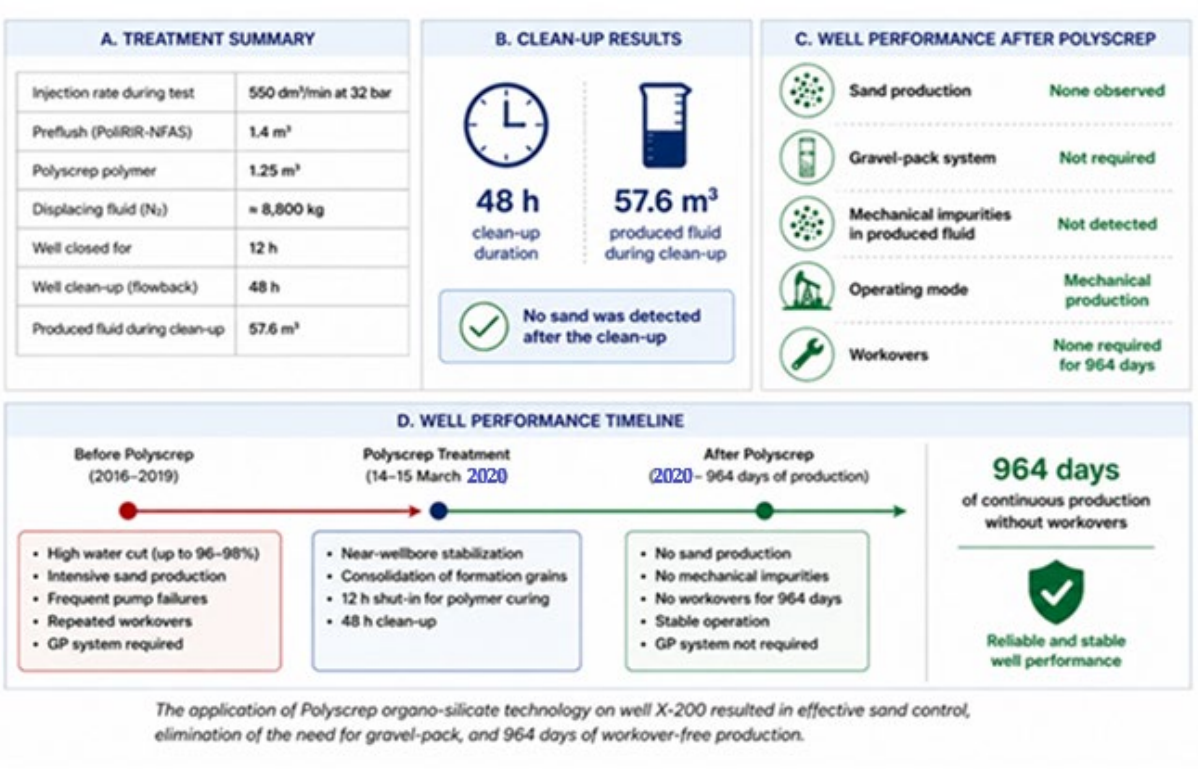


Fig. 4. *Results of the Poliskrep Treatment and Subsequent Well Performance – Well X-200*

From a mechanical engineering perspective, the elimination of sand production has multiple implications for the reliability of the production system. The presence of abrasive particles represents one of the primary causes of wear affecting pistons, valves, pump cylinders, production tubing, and other components of downhole production equipment. By stabilizing the near-wellbore zone, the detachment of rock particles and their transport through the production system were prevented, thereby significantly reducing the conditions leading to abrasive wear and mechanical damage of equipment. As a result, the availability of the production system was improved, the service life of equipment was extended, and the need for workover interventions was reduced.

A particularly important practical outcome of the achieved results is the fact that, after the application of the Poliskrep technology, there was no need for the installation of a gravel-pack system. Unlike mechanical sand control methods, chemical consolidation enabled formation stabilization without additional sand-retaining components, thereby simplifying the well completion design and reducing the complexity of future intervention operations.

The obtained results are in good agreement with findings reported in recent studies, which demonstrate that organosilicate and polymer-based chemical consolidation systems can effectively reduce sand production while preserving reservoir production characteristics. In most published studies, treatment performance is evaluated based on the reduction of sand production, extension of the period between workover interventions, and improvement of production equipment reliability. The results obtained from the X-200 well confirm these findings and demonstrate that the Poliskrep technology represents an effective alternative to conventional sand control methods, particularly in wells where previously applied mechanical methods have failed to provide satisfactory long-term results.

CONCLUSION

Based on the conducted research, it can be concluded that the application of the organosilicate Poliskrep technology represents an effective method for near-wellbore zone stabilization and sand production control in oil wells affected by severe abrasive wear of production equipment. The analysis of the X-200 well performance demonstrated that

previously applied remediation methods failed to provide long-term stability of the production system, highlighting the need for the implementation of an advanced chemical formation consolidation technology.

Following the Poliskrep treatment, no sand production was detected during the well clean-up operation, enabling the completion of the well with an artificial lift production system without the installation of a gravel-pack system. Furthermore, no mechanical impurities were identified in the produced fluid samples after the well was returned to production, confirming the successful stabilization of the production interval.

A particularly significant result is that, after the treatment, the well remained in continuous operation for 964 days without the need for workover interventions. This indicates a substantial improvement in the reliability of production equipment operation and a reduction in the adverse effects of sand production on the performance of the downhole pump and other components of the production system.

The obtained results confirm that the Poliskrep technology can represent an effective alternative to conventional mechanical sand control methods, particularly in cases where previously applied approaches have failed to achieve satisfactory long-term performance. In addition to improving production stability, the application of this technology contributes to reducing the frequency of workover interventions, increasing production equipment availability, and lowering maintenance costs.

The achieved results indicate significant potential for the application of Poliskrep technology under similar production conditions. Future research should focus on the analysis of a larger number of wells, long-term monitoring of production parameters, and comparative evaluation of performance with other sand control technologies in order to establish optimal candidate selection criteria and further improve the reliability of production systems.

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