

Cement Packer

Deployment of modified cement retainer to address multiple leaks in production tubing with 2 phase cement packer operation

Abstract

This paper outlines a two-phase cement packer operation designed to address multiple leaks identified in completion tubing during well intervention operations. Following a well leak detection survey, a two-step intervention was implemented to restore well integrity and prevent fluid migration. In Phase 1, slickline intervention was used to install an isolation plug below the first cement packer, serving as a base for the cement. Sliding Sleeve Door #1 (SSD#1) was opened, and a communication pathway between the tubing and the A-annulus was created by punching a hole at SSD#1. A modified cement retainer, equipped with a pop-out valve with a preset burst rating, was set above SSD#1 to control cement flow. Phase 2 involved coiled tubing intervention for depth correlation and cementing. A CT packer was deployed above the cement retainer, and cement was pumped through the coiled tubing. The pop-out valve in the retainer burst under required pressure, allowing the cement to enter through the cement retainer & the A-annulus via opened SSD#1 and punch hole, effectively isolate until required top of cement below the leak point at completion tubing to avoid cement backflow into completion tubing and on top of CT Packer which led CT string to bury with cement. This systematic approach successfully addressed the leaks, restored well integrity, and ensured long-term zonal isolation, highlighting the importance of precise coordination in cement packer operations.

Introduction

Wellbore integrity is critical in oil and gas operations, as it ensures the isolation of different geological zones and prevents unwanted fluid migration. When leaks occur in the completion tubing, they can compromise well integrity, potentially leading to fail cementing operation as it will bury the CT with cement, significant production losses, environmental hazards, and costly remedial operations. Addressing these leaks promptly and effectively is essential for maintaining the operational safety and efficiency of the well.

One of the most effective methods for resolving wellbore leaks is

the use of cement packers. Cement packers are devices used to isolate sections of the wellbore, allowing for precise cement placement to seal off leaks and reinforce the well's structure. Despite their effectiveness, the implementation of cement packer operations can present challenges, especially in complex well environments where leaks are detected at multiple points along the completion tubing.

This paper presents a two-phase approach to cement packer operations, employed to mitigate leaks identified during a well leak detection survey. The operation involved slickline intervention to install an isolation plug as cement base plug and a coiled tubing (CT) intervention for precise cement placement, utilizing a modified cement retainer with a pop-out valve. The operation successfully restored the well's integrity and prevented further fluid migration. This paper details the step-by-step process and discusses the techniques used to overcome operational challenges in ensuring effective zonal isolation.

Problem Definition

In well intervention operations, maintaining the integrity of the well is essential to prevent fluid migration between different geological zones. However, in this project, a well leak detection survey revealed multiple leaks in the completion tubing, compromising the zonal isolation and posing significant risks to wellbore integrity. If left unaddressed, these leaks could lead to contamination of producing zones, loss of pressure containment, environmental hazards, and potentially costly production downtime.

The primary challenge is to effectively confirm the integrity test of the cement retainer as the first barrier of cement isolation to avoid cement passing through the cement retainer and risk of having cement bury the CT inside completion tubing. By having the modified cement retainer with preset burst rating will allow the user to conduct integrity test in between modified cement retainer & CT Packer regardless of having leak point at completion tubing above the CT Packer setting depth to confirm no leakage prior to cementing operation.

The solution requires a two-phase intervention that combines the precise isolation capabilities of a cement packer with slickline and coiled tubing technologies. This approach must address several key issues:

1. Isolating the wellbore below the leaks to prevent fluid migration during the cementing process.
2. Creating a reliable communication pathway between the

tubing and A-annulus to allow for controlled cement placement.

3. Ensuring that the cement reaches TOC accurately, without risking further damage to the well structure.

The complexity of the leaks and the need for precise depth correlation and isolation necessitate a carefully coordinated cement packer operation.

Benefit to Dimension Bid and to Client

The successful implementation of a two-phase cement packer operation offers significant benefits to both the service provider and the well operator. For the service provider, executing a high-precision operation enhances reputation and market competitiveness, showcasing technical expertise and innovation while increasing business opportunities in leak mitigation and cementing services. It also leads to improved efficiency and cost savings by reducing the likelihood of costly errors or additional remedial operations. Meanwhile, the operator experiences restored well integrity and operational continuity, allowing for resumed production without the risk of fluid migration or contamination. This cost-effective leak mitigation strategy minimizes downtime and extends the well's lifespan, maximizing production potential. Furthermore, addressing leaks promptly improves safety and ensures compliance with environmental regulations, ultimately reducing the risk of fines and remediation efforts. Together, these outcomes enhance overall operational efficiency and asset value for both parties involved.

Project Objectives

The primary objective of this project is to effectively mitigate multiple leaks identified in the completion tubing during well intervention operations through a systematic two-phase cement packer operation. This involves restoring well integrity by implementing targeted interventions to seal the leaks and ensuring proper zonal isolation to prevent fluid migration between geological zones. The project aims to utilize advanced techniques, including slickline intervention for installing an isolation plug and coiled tubing intervention for precise cement placement, to maximize the effectiveness of the cement packer operation.

Additionally, it seeks to enhance operational efficiency by minimizing downtime and production losses, reducing the need for subsequent remedial actions. Safety and compliance with environmental regulations are prioritized by addressing wellbore

leaks in a manner that mitigates risks associated with uncontrolled fluid migration and potential contamination. Ultimately, the project aims to extend the lifespan of the well and optimize its production potential by reinforcing its structural integrity and maintaining effective isolation of producing zones, thereby contributing to improved wellbore management practices and overall operational performance for both the service provider and the operator.

Project Deliverables

The project will deliver a successfully sealed wellbore, with all leaks in the completion tubing effectively mitigated to restore well integrity and zonal isolation. Key deliverables include the installation of an isolation plug using slickline intervention below the first cement packer, serving as a base for the cementing process, and the setup of a modified cement retainer with a pop-out valve above SSD#1 to regulate cement flow. Coiled tubing (CT) intervention will be used to deploy a CT packer above the retainer and facilitate precise cement pumping to fill the A-annulus and seal the leaks. Additionally, the project will provide a detailed operational report covering the two-phase process, including depth correlation, equipment used, and verification of leak sealing. A post cementing operation with cement bond log will also be conducted to confirm the success of the cementing process and ensure the wellbore is secure and compliant with safety and environmental standards, contributing to enhanced long-term well performance.

Project Time Line, Resources & Cost

The project is expected to be executed once platform crane is back online with the support from other service provider such as Weatherford (Thru Tubing Provider), UZMA (Radial Bond Logging Tool Provider) & Baker Hughes (Cement Provider). In term of resources, will be utilized current CT #01 package at Dulang C Platform that has been idle for 3 months due to crane issue. The cost estimation for a full CTU Package is RM2,500,000.00 for 18 days of operation excluding cost from consumable (CT Packer, Cement Retainer & RBT Tool).

Project Risks

The cement packer operation carries several risks that must be managed to ensure success and long-term well integrity. Mechanical failure of the packer or modified cement retainer, such as leaks or improper deployment, could lead to incomplete sealing and require remedial. Depth correlation errors might result in improper placement of cement retainer or CT packer,

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compromising the cementing process. Coiled tubing equipment malfunctions, including pressure control issues or blockages, could disrupt cement delivery, while cement flow obstruction due to wellbore blockages may prevent effective sealing. There is also a risk of pop-out valve of modified cement retainer malfunction, which could cause premature burst. Properly anticipating and mitigating these risks is crucial for ensuring a successful outcome and maintaining long-term well integrity. Best practice & recommendation from previous cementing operation should be followed especially during job design stage & operation in order to avoid recurrence issue occur.

Conclusion

The two-phase cement packer operation proposed in this project represents a systematic and effective approach to perform cementing operation in case there is a leak at completion tubing above the cement retainer setting depth, ultimately restoring well integrity and preventing fluid migration. Through the integration of slickline and coiled tubing interventions, the project successfully addresses the complexities associated with leak management, employing advanced techniques such as the installation of isolation plugs and modified cement retainers equipped with pop-out valves. By carefully coordinating these efforts, the operation enhances the efficiency of cement placement and ensures effective cementing operation, thereby minimizing downtime and reducing the need for subsequent remedial actions. Additionally, this approach upholds safety and environmental standards, safeguarding against potential contamination and operational hazards. The successful execution of this project not only prolongs the lifespan of the well but also optimizes its production potential, delivering significant benefits to both the service provider and the operator. Overall, the strategies and outcomes outlined in this paper contribute to improved wellbore management practices and set a precedent for future interventions in similar scenarios.

**This proposal should be kept to a maximum of 6 pages.
Any supporting documentation should be attached in the abstract**

	Prepared and Submitted By:	Verified By:	Approved By:
Sign:			
Name:	M. Ameerul Zaeem	Kung Yee Han	M. Khairul Ridhwan Azizan
Position:	Field Engineer 2	Technical Advisor	Field Service Manager
Date:	14 th October 2024	15 th October 2024	15 th October 2024

DIMENSION BID

SQIP/BREAKOUT PROJECT EVALUATION FORM

COILED TUBING SERVICES

PERSONNEL DETAILS

FULL NAME

Muhammad Ameerul Zaeem Bin Md Zuhri

POSITION

Field Engineer 2

PROJECT NAME

Deployment of modified cement retainer to address multiple leaks in production tubing with 2 phase cement packer operation

PROJECT FOCUS LEVEL

Design and Execution

DATE OF PROJECT APPROVAL

15/10/2024

PROJECT OVERALL SCORE

88%

DATE OF PROJECT PRESENTATION

15/10/2024

PROMOTION STEP

FE 2 to GFE

EVALUATION CRITERIA	Rating (Please ✓ where appropriate)										COMMENTS
	STRONG			ADEQUATE			IMPROVEMENT NEEDED				
	10	9	8	7	6	5	4	3	2		

PROJECT PRESENTATION

1 Audibility & Speech		✓								
2 Clarity & Organization			✓							
3 Visual Presentation				✓						
4 Hand-outs/Publication			✓							

PROJECT EVALUATION

1 Project Objectives		✓								
2 Project Implementation			✓							
3 Costing Beneficial			✓							
4 Project Impact on DB				✓						
5 Project Impact on Client		✓								
6 Continuous Monitoring and Improvement			✓							

OTHERS

1 Proposal				✓						
2 Project Communication			✓							
3 Risk Control		✓								
4 Resources Management		✓								

PROJECT EVALUATOR

Task completed

CANDIDATE'S SIGNATURE



INSTRUCTOR'S SIGNATURE



MANAGER'S SIGNATURE



DATE

15/10/24

Title	Service Quality Improvement Project (SQIP)				
Target Population	Field Engineers & Field Specialists				
This requirement is applicable to:	✓	JFE	✓	FST	EOT
	✓	FE1	✓	FS1	EO1
	✓	FE2	✓	FS2	EO2
			✓	FS3	EO3
					✓

Objective:

The objectives of this task are:

- To assess employee’s ability in applying critical thinking and problem solving
- To develop employee’s communication and organizational skills
- To evaluate employee’s ability to collect and study data, and draw substantive conclusion
- To create an opportunity for the FE and FS to improve his presentation skills by practicing with a large and critical audience.

Tasks:

- The FE / FS is to prepare a proposal on Service Quality Improvement Project to Line Management. The objective of the project must focus on improving operational performance such as recommendations on equipment modification, leaner working environment, cost reduction initiatives for efficient operations etc.
- To obtain approval and support from respective mentor and FSM.
- Prepare a presentation slides and present the project to the Line Management and technical team (Operation Engineer). You will have 20 minutes for presentation and 30 minutes for question and answer session.

REQUIRED EVIDENCE:

- 1 Slide Presentation
- 2 CTS-FORM-84 CTS Improvement Project Abstract Template
- 3 CTS-FORM-85 SQIP/Breakout Project Evaluation Form
- 4 Attendance Form



MENTOR / ASSESSOR's Comments & Recommendation:

Objective met. Tasks completed

Signature	<i>[Signature]</i>	Assessment Date	<i>15/10/24.</i>
Name	<i>KUNG YEE HAN</i>	Position	<i>TA.</i>

FSM / OM Comments & Recommendation:

Task completed.

Signature	<i>[Signature]</i>	Assessment Date	<i>15/10/24</i>
Name	<i>RICHARD A212AN</i>	Position	<i>FSM</i>

Title	Break Out Project					
Target Population	Field Engineers & Field Specialists					
This requirement is applicable to:	✓	JFE	✓	FST		EOT
	✓	FE1	✓	FS1		EO1
	✓	FE2	✓	FS2		EO2
			✓	FS3		EO3
					✓	GEO

Objective:

The objectives of this task are:

- To assess the employee’s ability in applying critical thinking and problem solving
- To assess the employee’s communication and organizational skills
- To assess the employee’s technical, QHSE and management skills
- To assess the employee’s ability in the entire DEE cycle; data collection & analysis, complete stages of job executions and job evaluations.
- Create an opportunity for the FE and FS to improve his presentation skills by practicing with a large and critical audience.

Tasks:

- Select an operational subject for the project and obtain approval from respective the Mentor and FSM. Mentoring and management supervision is essential in this technical exercise.
- For FE; collect and analyze all data required to do a complete design of the operation including all applicable Cerberus modules.
- Get involved in the pre-job preparations ie. all resources needed for the operations (personnel, and equipment).
- As the second supervisor on site, the FE / FS is expected to supervise and record the job execution therefore he needs to have a complete understanding of the operation.
- For the FE, prepare a technical evaluation of the actual operation design against the actual job. During this stage the FE must calibrate the job parameters for the upcoming operations (friction coefficient, fluid friction table, fluid rheology, additives concentrations, etc.).
- Prepare a technical presentation (up to 20 slides) supported by a detailed document in SPE paper format (4 pages min); taking into consideration all technical and operational aspects related to the project.
- Finalize the project and present to Line Management and technical team (Operation Engineer). You will have 20 minutes for presentation and 30 minutes for question and answer session.

Notes:

- Project scope: the project is to be based on Coiled Tubing operation - Standard or Advanced services application. The evaluation is focusing on the employee's understanding on technical and operational process and his ability to apply them in the project.
- The FE/FS must be fully involved in the DEE cycle.
- The project should provide detail of all technical tools and/or software used to develop it.

REQUIRED EVIDENCE:

- 1 Slide Presentation
- 2 CTS-FORM-84 CTS Improvement Project Abstract Template
- 3 CTS-FORM-85 SQIP/Breakout Project Evaluation Form
- 4 Attendance Form



MENTOR / ASSESSOR's Comments & Recommendation:			
<i>Objective met. Task completed</i>			
Signature	<i>[Signature]</i>	Assessment Date	<i>15/10/24</i>
Name	<i>KUNG XEE HAN</i>	Position	<i>TA.</i>

FSM / OM Comments & Recommendation:			
<i>Task completed</i>			
Signature	<i>[Signature]</i>	Assessment Date	<i>15/10/24</i>
Name	<i>RIDWAN AZIZAN</i>	Position	<i>FSM</i>