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REVIEW ARTICLE

SIGNIFICANCE OF WELLBORE CLEANUP AND CHEMICAL DISPLACEMENT IN WELL COMPLETION PROCESS OF ELU-01 WELL IN NORTH-EASTERN NIGER DELTA, NIGERIA

Chukwu, C. Ben[a,*], Zi, I. Chollom[b], Ngeri, A. Paddy[a], Udota, S. Benjamin[c]

[a]Department of Physics, Faculty of Science, Rivers State University, Port Harcourt, Nigeria.
[b]Binarina Energy Services Limited, Plot 144 Trans-Amadi Port Harcourt, Nigeria.
[c]Department of Geology, Faculty of Science, Rivers State University, Port Harcourt, Nigeria.
[*]Corresponding Author's Email: benedict.chidi@yahoo.com

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ABSTRACT

This research examines the significance of wellbore cleanup and chemical displacement in well completion process of Elu-01 well in North-Eastern Niger Delta, Nigeria. The aim of wellbore cleanup and chemical displacement is to prepare the well for completion following the drilling phase. Wellbore cleanup is an important component of any well development and completion processes. Failure to successfully clean the wellbore can result to challenges in running the completion tools which may lead to large amounts of non-productive time (NPT) with all the associated risks and monetary costs. Well completions are often comprised of debris sensitive equipment. Failures when running completions can be very costly both in rig time losses and equipment cost. Wellbore cleanup and chemical displacement improves operational efficiency by reducing risk and non-productive time. Wellbore cleanup mechanical tools and chemical displacement flush out debris which obstruct normal well completion operations without damaging the well structure and displaces the drilling fluid (mud oil) to completion brine. Wellbore clean up and debris removal ensures successful completion operations and increases well return fluid as well as the productivity of a well.

KEYWORD

Debris, Surfactant, Blowout, Brine, Mud.

1. INTRODUCTION

The importance of wellbore cleanup is sometimes overlooked, but it is very crucial in well completion processes, as its impact on the well cannot go unrecognized. A successful wellbore cleanup and fluid displacement is the first step to an optimum completion. Debris which are not evacuated from the wellbore, including from areas such as the blowout preventer (BOP) stack and liner top can cause problems and operational risks during well completion. Large sums and efforts are lavished on the drilling and completion designs, however when it comes to bringing the well "on-line", very little thought is given as to how to put the well in its best condition for effective or maximum production (Hans-Heinrich *et al*., 2022).

Wellbore cleanup entails the removal of solids, drilling fluid or mud oil and sand workover fluids from the well (SPE, 2018). It is a cleaning operation done after the well is drilled to its total depth, this is before completion in order to avoid down-hole completion tools failure and formation damage.

A clean wellbore is important when running completion strings. Any failure while carrying out well completion will have a high impact in well costs. Therefore, debris removal and collection are of high importance (Archer, 2018). On completion of the drilling process, and with the liner or casing cemented in place, the well is usually left full of oily mud, consisting largely of an oily base fluid to which water and clay have been added for viscosity. However, in order to subsequently displace the well to water or brine, not only does the oily mud require displacing, the casing surfaces also need to be changed from oil wet to water or brine wet (Dimude *et al.,* 2018).

Wellbore cleanup mechanical tools and displacement chemicals can be applied on land, swamp, shallow water as well as deep water for displacement of drilling fluid to completion fluid and ensure cleanliness of the wellbore. Wellbore cleanup mechanical tools can be used during completion and workover operations to remove debris from wellbore (SPE, 2018).

2. WELLBORE CLEANUP TOOL

Wellbore clean up mechanical tools include equipment for casing cleaning, debris or waste management, drill bit, blowout preventer (BOP), riser cleaning, bit sub and sometimes jetting tool as shown in Figures 1 – 5 (General Electric, 2018). The casing scraping tool which has different sizes is used to scrape casing run in the well, casing brush as the name implies brushes the inside of the casing, the junk basket (waste retrieval) receives or traps all the waste materials generated as a result of the scraping and brushing of the casing while the casing magnet (magnetic tool) traps by magnetizing all the metallic or ferrous waste generated from the scraping of the casing pipes.

Figure 1: Casing Scraper Tool

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Figure 2: Casing Brush Tool

Figure 3: Junk Basket/Waste Retrieval Tool

Figure 4: Casing Magnet Tool

Figure 5: Drill Bit

3. Wellbore Cleanup Procedure and Chemical Displacement

It is essential to remove debris and residue in the wellbore and displace the drilling fluid to completion brine prior to well completion. The purpose of the cleanup operation is to efficiently scrape, clean and displace the casing sections in a single and direct displacement train, thus rendering the casing pipes water-wet to a cleanliness specification of total suspended solid (TSS) as may be required. The well will be efficiently clean using both mechanical scrapper and a blend of pills prior to being displaced to clean filtered brine. Wellbore cleanup process involves, first to ensure proper connection of the bottom hole assembly (that is pick up and make up of the BHA) as required followed by run in hole of the BHA and then scrapping the zones of the casing before pulling out of hole of the bottom hole assembly. BHA is the sequential arrangement or connection of wellbore cleanup mechanical tools, bit sub or cross-over and the drilling bit. A typical wellbore cleanup bottom hole assembly (BHA) is shown in Figure 6. After pulling out of hole of the BHA, follows chemical displacement which involves the pumping and circulation of prepared or mixed pills which include suspension cocktail (Hi-Vis), surfactant and spacer.

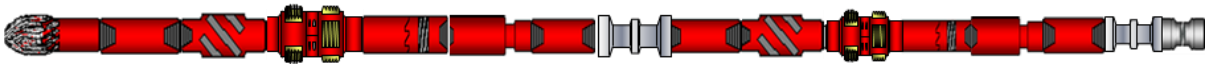

Figure 6: A Typical Wellbore Cleanup Bottom Hole Assembly

5. Conclusion

From the examination of the significance of wellbore cleanup and chemical displacement in well completion process of Elu-01 Well in North-Eastern Niger Delta, Nigeria, the following conclusions are made:

- Failure to successfully clean the wellbore can cause challenges in running the completion tools which may large amounts of NPT with all the associated risks and monetary costs.
- Before a well set to begin production, all well completion processes especially wellbore cleanup and chemical displacement should be carried out.
- Contingency plans should be put in place for possible equipment failure and then incorporated in the well completion program.
- To eliminate or bring commercial issues to the barest minimum, there should be upfront planning to include a thorough review of any contractual issues which may hamper delivery on job objectives.

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