Local Sealing Technique to Improve Production String Integrity Reliability

Local Sealing Technique to Improve Production String Integrity Reliability

A F Slivchenko[1], S V Lyubimova[1], A A Zalyatdinov[1]

[1]Almetyevsk State Oil Institute, Lenin street 2, Almetyevsk 423450, Russia

E-mail: lubimova-83@mail.ru

Abstract. The paper discusses the problem related to production casing leak repairs in the wells at the sites of PJSC Tatneft. The investigation showed that the most common and frequent problems occurring in the drilling facilities of the company are associated with the Serpukhov-Oka, Famennian and Frasnian stages. It has been found that high fluid loss, or absorption, is the major cause leading to well production string leak. The method of installing a profile liner in the borehole areas with high or complete loss of returns was proposed to prevent production casing string leaks and to improve the string integrity. The new technique involving a profile liner installation contributes considerably to string protection and integrity due to its metal wall thickness and squeeze cementing job quality in the string interval.

1. Introduction

Since most of the Russian oil fields have been explored and large discoveries are occurring less frequently, it is critical for oil producing companies to improve recovery from mature fields at their late stage of development. It is a common knowledge that crude oil reserves in mature fields have very high water cut values. One of the reasons influencing these values is connected with production casing string leaking and repairing, or sealing. Production string leaks may be caused by various criteria, primary cementing operation quality, and well operation peculiarities being the major ones among them. To control and prevent this sort of problem there are various techniques of repairing a leak in a well production string, and they involve using special tools and cementing slurry to improve fluid loss, each having some advantage and disadvantage [1].

2. General Information about the Research

To select a proper method for sealing a leak in the production string successfully it is necessary to study the case. The following data have been determined to start the study: horizons (stages) where the problems occurred more frequently; the number of applied techniques to eliminate the production string problems; satisfactory results of their application achieved in the wells at the sites of Tatneft subdivisions - NGDU Almetyevneft, NGDU Yelkhovneft and NGDU Yamashneft.

The study involved 725 wells; 660 of them have been drilled for the Devonian oil, and 65 wells for the Carboniferous. Horizons and stages of stratigraphic sequence with more frequent problems occurring have been determined, and Fig.1 shows that the most popular in this sense are the Serpukhov-Oka, Famennian and Frasnian stages. These were the stages with complications associated with the absorption of drilling fluid [3.4].

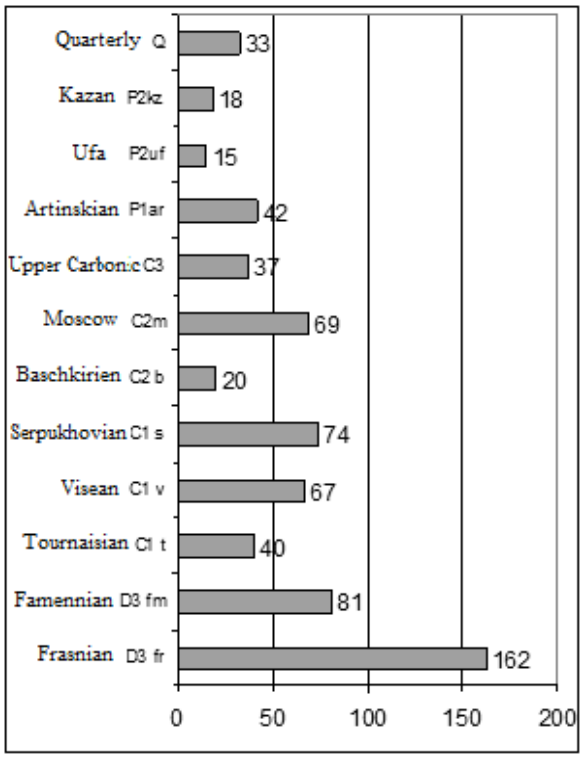

Figure 1. Production string problem occurrence according to the stratigraphic sequence, PJSC Tatneft.

Special attention was paid to out of service wells that had leaks. Wells with complete loss of circulation were compared in relation to the results in their repairing, as they were sealed with the use of profile liner and without using it (different methods). In the intervals with profile liner installed there were no leaks recorded. In the rest of the wells compared, where the problems were caused by intense drilling fluid absorption zone, the leaks were sealed with backfill material. Comparing the wells with and without special liners installed in the same intervals made it possible to prove that the technique is reliable for preventing from aggressive formation fluids and increase the life circle of the well (Fig. 2) [5].

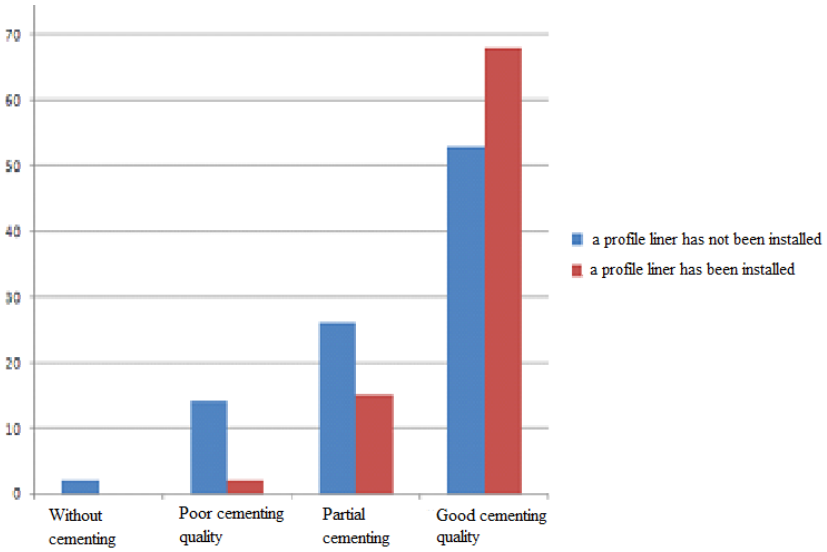

Figure 2. Cementing job matching the intervals with complete loss of the drilling fluid (blue- without a profile liner, red with it).

3. Conclusion

Being aware of drilling complications and knowing the intervals where the problems related to partial or complete mud absorption are the most common ones, it is recommended to install a profile liner, and the thickness of its metal wall and better squeeze cementing in this certain interval are able to contribute to improvement of the production casing string reliability. It is a solution to improve well architecture, mitigate drilling hazards, and increase production capacity. After investigating the quality of the cementing job with the use of the relevant profile liner installed and without it we have come to the conclusion that intervals with profile liners had been cemented better, and this leads to significant increase in the lifespan of the well. This can be accounted for the fact that the absorption intervals partially absorb cement as well and this , in turn, causes corrosion of the string, and definitely would have an adverse effect on the integrity of the string.

Using the knowledge gained from multiple successful installations we can state that there are advantages associated with the use of the technology. One of them is the potential to reduce the number of repair works caused by annulus and borehole wall integrity damage, or loss. Moreover, it makes it possible to avoid additional costs for operations undertaken to seal the annulus and provide the well's integrity.

The technology means that a drilling company does not need to make additional big investments and operational changes when using it in conventional drilling. It is a contingency solution to ensure improvement of the well architecture, though, in some cases, it may be planned beforehand for other reasons. The field experience studied revealed that the wells with the profile liner installed have proved to work successfully several years longer compared to those without of them, and a certain amount of the latter no longer is in operation because of the cementing and integrity loss.

4. References

[1] Aminev M H, Smeu A A 2011 Isolation of leakage in the production string with packers *Drilling and Oil* **10** 46-49

[2] Takhautdinov Sh F, Slipchenko A F, Salatov M Sh 2014 *Technology for capital repair of oil and gas wells* Almetyevsk: AGNI 344pp

[3] Khuzina L B, Lyubimova S V, Slivchenko A F, Golub S I, Shaikhutdinova A F, Latypov R F 2013 Analysis of sealing the production casing and suggestions for enhancing its effectiveness *Sci Report* Almetyevsk State Oil Institute 42pp

[4] Khuzina L B, Lyubimova S V, Slivchenko A F 2014 On the influence of complications arising in the process of drilling on tightness of casing in the initial period of operation *Sci Proc of Almetyevsk State Oil Institute* **12** 38-42

[5] Khuzina L B, Salaidinov A A 2016 Designs of wells, the timing of their operation until the first repair work to restore the integrity of casing *Izvestiya vuzov: Oil and Gas* **3** 34-37

[6] Khuzina L B, Lyubimova S V, Slipchenko A F 2015 On the methods used to eliminate leaks in operation: case study of NGDU Aznakaevskneft, PJSC Tatneft *Sci Proc of Almetyevsk State Oil Institute* **14** 33-36

[7] Khuzina L B, Lyubimova S V, A F Slivchenko On the technologies to eliminate leaks from production casing: case study of Tatneft oil fields *Sci Proc of Almetyevsk State Oil Institute* **1** 90-93

[8] Khuzina L B, Lyubimova S V, Slivchenko A F, Golub S I 2015 Technology of production casing leakage elimination: case study of JSC Tatneft oil fields *Sci Report № 715G Almetyevsk state oil Institute* 98pp

[9] Khuzina L B, Lyubimova S V, Zagitova L R, Slivchenko A F 2016 Basic reasons for complication while drilling wells to the depth of Verey-Bashkir deposits depth by PJSC Tatneft *Sci Proc of Almetyevsk State Oil Institute* **XV** 3-5

[10] Khuzina L B, Lyubimova S V, Zagitova L R, Slivchenko A F 2016 Objective and subjective reasons for complications while drilling wells to the depth of Verey-Bashkir deposits depth by PJSC Tatneft *Sci Proc of Almetyevsk State Oil Institute* **1** 47-50
[11] Khuzina L B, Lyubimova S V, Slipchenko A F, Golub S I, Ismagilov Z F 2015 Application of technologies of elimination of leakage in production casing in the wells of Tatneft subdivisions *Oil Business* **12** 121-123
[12] Zalatdinov A A, Khuzina L B, Abdrakhmanov G S 2018 Analysis of the isolation quality influence on the loss of integrity of the production casing *Oil Business* **1** 36-37
[13] Zalaldinov A A, Khuzina L B 2017 Elimination of disastrous drilling mud loss through application of profile packers *Oil Gas Innovations* **10** 20-21
[14] Khuzina L B, Zalaldinov A A 2017 Isolation of complicated areas by packers in expanded boreholes *Neftegaz.RU* **10** 55-57
[15] Zalaldinov A A 2017 Increase the life of the well due to the use of profile packer *The energy of the Youth for Oil and Gas Industry* **1C** 292-294
[16] Khuzina L B, Zalaldinov A A 2017 Application of relevant controls, water zone isolation when cementing the well *Sci Proc of Almetyevsk State Oil Institute* **XVI** 80-84
[17] Zalaldinov A A, Khuzina L B 2016 Analysis of well design and life until the first repair work performed on restoring the integrity of casing *News of Higher Educational Institutions: Oil and Gas* **5** 56-59
[18] Abdrakhmanov G S, Ahmadishin F F, Khamitianov N Kh, Vildanov N N, Filippov V P 2017 The development of technology of local well casing *Oil Business* **6** 34-36
[19] Abdrakhmanov G S, Salatdinov A A 2016 Improving the techniques of the profile expandable casing *News of higher educational institutions: Oil and Gas* **3** 34-37
[20] Abdrakhmanov G S, Ahmadishin F F, Khamitianov N Kh, Vildanov N N, Filippov V P, Pronin E V, Timkin N Ya 2013 Improving the technology of extensible pipes in JSC Tatneft *Collection of research papers of TatNIPIneft, Kazan* 267-275
[21] Abdrakhmanov G S, Salatov M M, Goldenberg R L, Fomin M V, Timkin N Ya, Arslangaliev I G 2012 Use of expandable casing to eliminate complications in the construction of deep oil and gas wells *Oil Business* **5** 48-50