



Horizontal well fracturing sleeve Summary of the Development Research

Zhao Kang¹, Sun Xiaofeng², Liu Gehong³, He Dongsheng⁴

^{1&3}, Major in mechanical engineering, School of Mechatronic Engineering, Southwest Petroleum University, Chengdu, China.

², Sun Xiaofeng, Major in marketing, School of Economics and Management, Southwest Petroleum University, Chengdu, China

⁴, A associate professor in School of Mechatronic Engineering, Southwest Petroleum University, Chengdu, China

Abstract:

Based on the level of the underground fracturing sleeve Situation development research, reviewed existing fracturing sleeve opening and closing of the advantages and disadvantages of each approach and presence, and access to large diameter after fracturing completion method. Summarizes the main issues in the actual use of oilfield fracturing sleeve exist in the process, then work on the sleeve to make a summary and outlook.

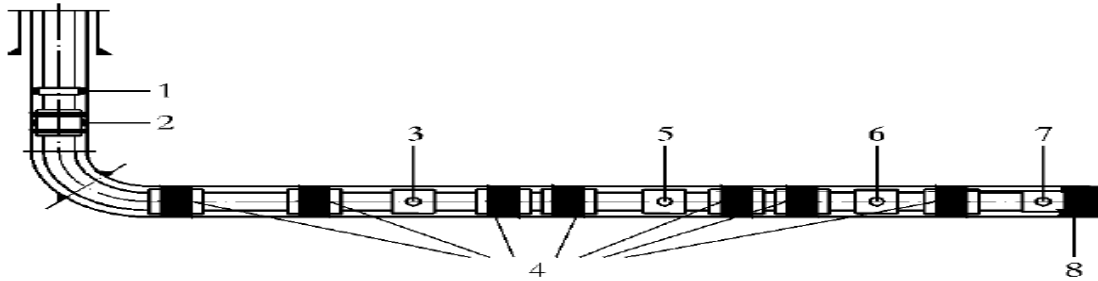
Key words: multistage fracturing, pressure-sleeve, hydraulic sleeve

Introduction

Since the 1960s, fracturing technique widely used in China's oil and gas field stimulation job. Fracturing main purpose is to improve the physical structure of the reservoir, artificially improve reservoir permeability, so well get yield. Essence fracturing technology is the use of high-pressure pumps will have a certain viscosity of liquid injected into the formation speed. When the pump pressure injection speed is greater than the absorption rate of formation, formation will produce rupture or expand

small gap so that the original opening, the formation of larger cracks. With the continuous injection of the liquid, cracks have formed continuously extending inwardly. After the pump stops to prevent the crack is closed again in the upper strata of gravity, to join in the injected liquid proppant surface to support the gap and avoid the re-closure. Thus, fracturing operations related support equipment can be widely used, and fracturing sleeve is one of the tools widely used in the fracturing process.

Oil and gas wells stratified, segmented measures in reconstruction, sleeve jacket is an important tool to achieve the oil passage. Sleeve features not only need to open the formation fracturing fluid into the formation of the flow path, but also with the closure ball / special tools with the hydraulic fluid flow to change direction, and its card bit packer pressure together to achieve the formation of pressure frac job. The success of open fracturing sleeve, directly related to the success of the fracturing work. Staged fracturing of horizontal wells into pressure-sleeve Open sleeve and the sleeve pitching blasting two kinds. In this paper, the existing fracturing sleeve from the open mode, working principle, advantages and disadvantages of other aspects of the sleeve are reviewed.



1-Hydraulic anchor ; 2-Suspension packer ; 3-Type sandblasting sliding sleeve 2 ; 4-Open hole packer ; 5- Type sandblasting sliding sleeve 1 ; 6-Differential pressure type open sliding sleeve ; 7-the ball seat;8-Guide shoe

Fig.1 Horizontal well fracturing technology column

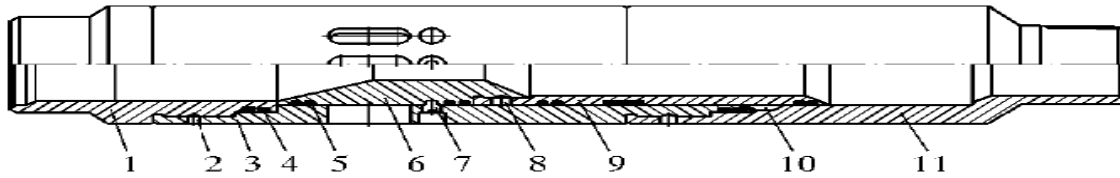
Downhole fracturing sleeve Open with Analysis

In horizontal well multistage fracturing techniques, the use of various oils jacket sleeve Unicom downhole tool, which is to use a packer sleeve and reservoir development according to the needs of the horizontal section packer into several sections, open the sliding sleeve when fracturing through the appropriate manner, targeted construction, after fracturing is completed, the sleeve outlet open as late into the oil and gas extraction channel.

(1) Open cast plugging ball

Fracturing sleeve opening served by the wellhead pressure - the ball, when the ball reaches pressure - sleeve tee positions within the sleeve to form a seal, pressure - to achieve, shear pin when the pressure reaches a certain value, such that the outer sleeve pressure cylinder on the opening hole groove, thereby establishing fracturing channel. Such as "Development and

application of horizontal well fracturing sleeve" and other literature is typical of such works, the structure shown in Figure 1.



1- the joint; 2,8- top wire; 3 - the outer tube; 4,5-ring; 6- tee; 7- shear pin; within 9- sleeve; 10- locking mechanism; 11- lower joint.

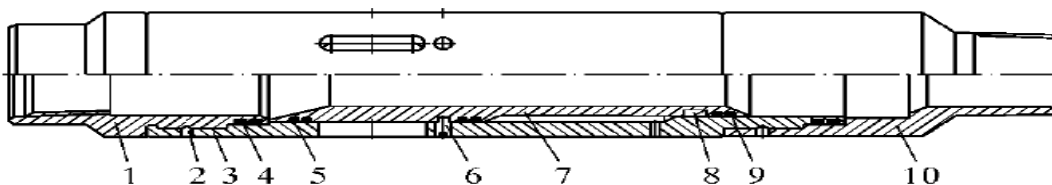
Fig.2 Pitching blasting sleeve structure diagram

Of which open the way technology is simple, especially for multi-stage fracturing, vote once blocking the ball multistage fracturing sleeve open goal.

By pitching gradual opening sleeve staged fracturing technique, in order to allow input through ball, fracturing completion intervals reach the bottom, the inner diameter of the bottom of the tee must be smaller than the inner diameter of the last tee by tee effect size fractionation arrangement, the number of segments and fracturing scale are greatly limited, affecting the effect of reconstruction; and the sleeve is pitching sleeve, so that the ball into the sleeve opening, when post-production can not be closed. As to the latter part of the production and selective when repeated fracturing, need to shut down the sleeve, the overall integration of the column will not be available.

(2) Differential pressure Open

Differential pressure principle open sleeve is pumped into the ground by high pressure fluid, so pressure-sleeve under the pressure difference between the effect of the slip to achieve fracturing operations.

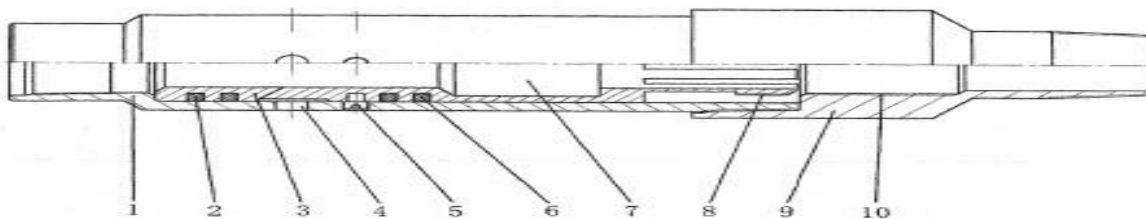


1- the joint; 2 - top wire; 3 - the outer tube; 4,5,9-ring; 6- shear pin; within 7- sleeve; 8- locking mechanism; 10- lower joint.

Fig.3 Pressure-sleeve open structure diagram

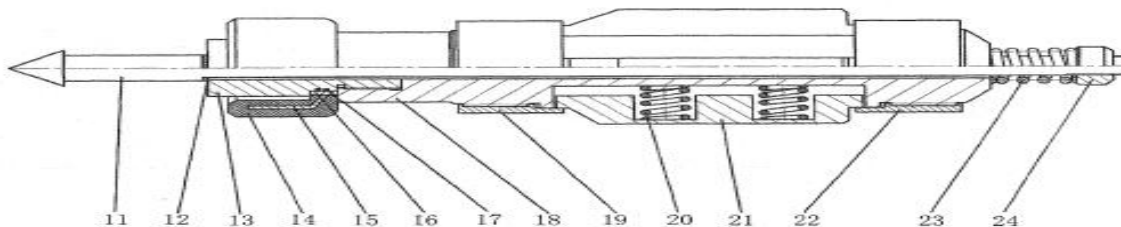
(3)Special tools to open

Switch by putting special tools to ensure that the sleeve can be repeated at the switch, it is possible to meet the need for multiple fracture stimulation operations. Such special tools in the structural design can be achieved and fracturing sleeve fixed lock, so that the sleeve can be pushed down on the lift function. Both can be overcome step by step formula to open the necked pitcher Fracturing sleeve production diameter small contradiction in stratified operation can be implemented separately control each zone open and close function. Used for horizontal well multistage fracturing, bushes and switch tools with the use of flexible closed water, grave outlet hole section can also open and close sections of horizontal wells stimulations, with accurate positioning, high efficiency operation Advantage. As China's patent CN201120380116.4 "one kind of oil horizontal wells and multi-stage fracturing sleeve opener" [presentation] fracturing sleeve, the structure shown in Figure 3.



1- outer cylinder; 2 - on the ring; slide the tube 3-; 4- side through hole; 5- shear pin; 6- under seal; 7- slot; 8- jaw; 9- lower joint; 10- tooth

Fig.4 Closed fracturing sleeve structure



11- balancing pole; 12- rectangular ring; 13- pressure cap; 14- cup; 15- steel; steel ring 16-; 17- seals; 18- spindle; 19- gland; 20- spring; 21- inlay tile; 22- gland; 23- spring; 24- pressure cap

Fig.5 The tool of fracturing sleeve

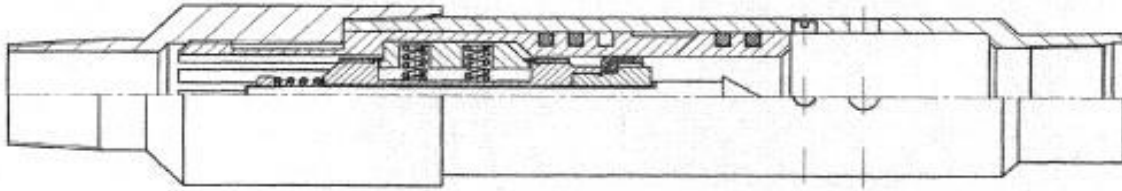


Fig.6 Fracturing opener sleeve and cooperating structure

(4) Otherwise open

Domestic and foreign existing fracturing sleeve open the way, in addition to pressure-open and open pitching style, but there are still open hydraulic sleeve [], to open the hydraulic pressure control sleeve [etc.]. These types can be applied to specific situations in the case of fracturing.

Sealing ball recovery and sleeve fracturing method to obtain large diameter

Process of multi-stage multi-country in recent years carried out, most of the time after which the pressure sleeve tee stay down the hole plugging tee ball through the anti-blowout Sort discharged. After the current international oil service technology companies such as Baker Hughes, Weatherford, Halliburton, Schlumberger and other multi-stage fracturing system supporting sleeve fracturing are used by way of drilling and grinding balls and tee drill out, in order to obtain effective flow of the well completion string, coiled tubing drilling and grinding tool belt for failure to timely return the ball and path string within a relatively small tee conduct drilling and grinding operations to a larger diameter . Achieve large diameter column, switchable purposes.

Now there are designed to salvage tee multistage fracturing pitching sleeve, this sleeve fracturing can guarantee the lower part of the sleeve by pitching sequentially turned implement fracturing and acidizing operations, but also in the coiled tubing operation through a one-time fishing a multi-stage sleeve tee and ball, so as to obtain the largest possible diameter of the inner tube to facilitate easy oil and gas wells to enhance production and post jobs. China Patent

CN201210168819.X as the "switchable fracturing sleeve" [] is that you can achieve multi-multi-stage fracturing oil and gas wells reformed remove the ball and the ball seat.

The main problems

(1) horizontal section easy ball seat, the tool can not complete the packer, packer cause seal failure

(2) At present, most of the pitching sleeve fracturing has not yet considered how to achieve after fracturing string Chase Drive. Tee to stay at the bottom, will form a reducer in the wellbore, not only affect the yield, but can not be a conventional test tool into the wellbore after the fracturing, downhole affect future job application or testing tool.

(3) If you choose to drill off the drilling and grinding process can easily jammed, drilling and grinding long period, but could not make out even after successfully drilled borehole diameter is formed, or will affect the operation or use of conventional downhole test tools. After fracturing is completed, the water can not be achieved if the wellbore to fracture closure segment, will largely affect the production, if the wells could lead to flooding throughout the wellbore or scrapped. Unable to achieve the second fracturing, or other stimulation measures after completion of staged fracturing operation. At present, because the construction of large displacement, proppant fracturing will wear sleeve tees, cards caused the ball, the ball was stuck in the fracturing tee problems have occurred, resulting in the production of the well can not be normal, so the card due to wear ball problem, differential between the tee can not be achieved very little.

(3) Although there are existing tools can salvage tee, but often complicated, cumbersome process operation, low feasibility.

Conclusion and Outlook

On the basis of extensive research status of domestic fractured horizontal well development on the sleeve, the sleeve fracturing analysis principle all kinds of advantages and disadvantages of working methods, research design for the next fracturing sleeve instructive. Fracturing horizontal wells to improve the success rate of a certain reference and practical significance, we can proceed from the following points:

By special tool to open the sleeve fracturing and other ways, compared with many advantages, the future development should be the mainstream trend.

Throw a ball you can achieve multi-stage fracturing fracturing stepless sleeve fracturing has many advantages, the new stepless fracturing sleeve sleeve will be the future direction of development.

We should strengthen the underground sleeve sealing and increased research wellbore path method, etc., to improve the safety and reliability of the downhole tool.

References

- [1]Zhang Huanzhi, He Yanqing, Liu Jia, Zhang Huazhen foreign horizontal well fracturing technology present situation and trend of development [J] Petroleum Technology Forum, 2012,06: 47-52 + 71-72.
- [2]Jingzhou Seric Energy Technology Co., Ltd. one kind of tee formula fracturing sleeve: China,201120276453.9[P/OL].2012-03-07.<http://www8.drugfuture.com/cnpat/SecurePdf.aspx>.
- [3]China National Petroleum Corporation; Daqing Oilfield Co., Ltd. mechanical hydraulic fracturing can switch sleeve: China,CN203463069U[P/OL].2014-03-05.<http://www8.drugfuture.com/cnpat/SecurePdf.aspx>.
- [4] Han Yongliang, Liu Zhibin, Cheng Zhiyuan, Zhang Peng, James Fortune, Zhouhou Jun, Luo Jinyu, Zhang staged fracturing of horizontal wells sleeve Development and Application [J] Petroleum machinery, 2011,02: 64-65 + 93.
- [5] Tron Karamay oilfield technology services limited liability company one kind of oil horizontal wells and multi-stage fracturing sleeve opener: China,CN202431261U[P/OL]. 2012-09-12. <http://www6.drugfuture.com/cnpat/SecurePdf.aspx>.
- [6] China National Petroleum Corp. can switch fracturing sleeve: China,CN103452542A[P/OL].2013-12-18.<http://www10.drugfuture.com/cnpat/SecurePdf.aspx>.
- [7] China National Offshore Oil Corporation; COSL A hydraulic sleeve: China, CN103277078A[P/OL].2013-09-04.
<http://www11.drugfuture.com/cnpat/SecurePdf.aspx>.
- [8] China National Petroleum Corporation Igawa Drilling Engineering Co., Ltd. can salvage tee multistage fracturing pitching sleeve: China,CN103590800A[P/OL].2014-02-19.
<http://www11.drugfuture.com/cnpat/SecurePdf.aspx>.