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Research and Field Application of Casing Return Well Treatment Technology in Fuyu Oil Field

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Abstract

At present, due to years of development and well pattern adjustment, there are some problems in most oil fields such as close well spacing, dense well pattern, too many oil-water wells, and changeable well conditions. In the process of overhaul, casings in some well are seriously broken, and spit mudstone is serious inside and outside the casing, so the traditional technologies such as overhaul and drawing casing, sweeping plug cannot achieve effective management purposes, and the problem of casing breaking in oil-water wells is becoming increasingly serious, which has become an unfavorable factors restricting the stable productions and efficient development of oil field. Through careful analysis of casing leap mechanism, the casing leap treatment technology has been formed in the process of continuous exploration and summary, which provides some experience and guidance for the future casing leap treatment.

Key words: Casing leap; Cement stable layer; Shale swelling

INTRODUCTION

Most of the domestic oilfields are old oilfield blocks, and the proportion of old well casing damage is getting higher and higher (Bruno, 2002; Li, et al, 2003; Wang, et al, 2011; Yu & Bo, 2005), which seriously affects the normal production or water injection of oil and water wells, and even some wells are forced to stop production, meanwhile, that workload and cost of maintenance operation are increased, which is not conducive to the efficient development of oil field, brought certain difficulties to the sustained and stable production of oil fields, especially those with low recovery and large reserves. Therefore, it is necessary to study the process technology from theory and production.

1. STUDY ON CASING LEAP MECHANISM

1.1 Causes of Casing Damage

1.1.1 Effect of Casing Disfigurement

Casing disfigurement refer to uneven wall thickness, microcracks or internal tissue defects, and large clearance of connecting threads during casing manufacturing. There may be problems such as poor connection, poor sealing, leakage after the casing putting into well. The outer surface of the casing is inevitably subject to severe friction with the hard rock formation. Especially in the case of a section with a serious " dogleg angle ", if the casing is forcibly pushed in, the casing is severely worn on the one hand, and the casing string is easily broken and bent, which is easily damaged. At present, the deformation of the new wells is mainly based on casing deformation, but the proportion of casing faults is increasing, mainly concentrated between 250-300 meters, mainly in inclined wells. Through the imprint, it is found that the sleeve is changed into a casing coupling. The main reason is that the casing thread is not tightly sealed or the casing thread is worn during drilling.

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1.1.2 Effect of Cementing Quality

Problems such as irregular drilling experience, substandard cementing cement, and bad cementation solidifying between cement and rock wall will affect cementing quality. The casing loses the protection of cement sheath due to poor cementing quality. The poor cementing quality causes the casing to lose the protection of the cement ring, and the casing is backlogged by the lateral deformation of the rock, causing damage to the casing; A communication channel is formed outside the casing, thus losing the function of isolating formations with different pressures and allowing the pressures outside the formations to blow through.; The casing is in direct contact with the formation, and chemical corrosion and electrochemical corrosion occur between the groundwater with high salinity and the casing. Biochemical corrosion occurs between sulfate-reducing bacteria, nitrate-reducing bacteria and casing in the formation, resulting in casing leakage.

1.1.3 Effect of Water Injection

With the increase of water injection pressure, the formation pore pressure also increases. The increase of pore pressure can improve oil displacement capacity, but it will cause casing deformation by various conditions (Wang, et al, 2011). After water injection, the number of casing deformation wells will increase each year.

The pressure in the pores of oil reservoirs increases with the increase of water injection pressure, while the shear strength of rock decreases with the increase of pore pressure. When the liquid pressure in the pores is equal to the vertical stress of rock, the shear strength of the rock becomes very small, and shear fracture is easy to occur once it is subjected to an external force.

With the increase of water injection pressure, the injection production pressure difference Δp between the injection well bottom and the production well bottom also increases correspondingly. This force acts on the rock matrix, when the injection production pressure difference is bigger than the shear strength of the rock, the rock will be fractured by shear, thereby the casing is pushed and deformed.

1.2. Study on the Mechanism of Mudstone Expansion and Formation Collapse

Under high water injection pressure, the injected water may intrude from the primary microcracks and joints of mudstone or along the sand-mudstone interface. For shale, the injected water invades along its bedding plane through outer channeling. When the shale contains water, its shear strength and friction coefficient are greatly reduced. Moreover, as the mudstone is rich in montmorillonite and other water-absorbing minerals, the volume of the mudstone will expand, and the mudstone is often in a plastic state. When it has a certain inclination Angle, the plastic flow will occur, which will squeeze the casing and lead to casing damage.

At the leakage of casing, further large amount of water absorption of mudstone will lead to accumulation and expansion around the casing, which will lead to the casing leap and the collapse of mudstone. A large amount of debris of mudstone will enter the bury oil layer. At this time, a large amount of injected water will enter the mudstone layer, aggravating the expansion of mudstone.

2. SUPPORTING TREATMENT TECHNOLOGY OF CASING LEAP AND VOMITING MUDSTONE WELLS

There are more than 20 casing leap and vomiting mudstone wells in a factory. There are three major technical difficulties in the process of treatment: a lot of split mudstone, because of casing leap and formation collapse; massive formation leakage and wash-over operation without returning to mud; surface casing and production casing is not centered, wash-over operation is difficult and the cycle is long.

For the above problems, the 18 wells were successfully treated by cementing to stabilize collapsed mudstone, little-channel to open the way and casing patch to restore normal production of oil and water wells through site construction.

2.1 Cementing to Stabilize Collapsed Mudstone

Firstly, the cement is injected into the breakpoint 30-50T, and the closed well is condensed for 24-36 hours. The cement and the collapsed formation are cemented and solidified to reach a stable formation, inhibit the discharge of mudstone and discharging into the wellbore. The problems of discharge of mudstone outside the casings, no headway while flushing, no single drill string added can be solved; Meanwhile, the casing is cemented and the casing is fixed to ensure that the tool can be grinding and milling, and the horizontal displacement of the casing due to the collapse of the mudstone outside the casing is solved.

2.2 The Technology of Little-Channel to Open the Way

The small diameter casing damage channel system is essentially a comprehensive casing shaping and reaming technology. The process is to use the cone milling method to shape and expand the casing loss of small diameters

and forcibly expand the down space. To restore the original diameter, the diameter of the casing after treatment is around 30 § 120mm to meet the requirements of patch, and further treat the casing to keep the wellbore clean and free of falling objects.

Due to the serious casing leap, it is necessary to adopt the pilot milling technology for the treatment. The selected tools include a flat-bottomed pilot milling, a concave-face pilot milling, and moving pilot milling.

2.3 The Technology of Casing Patch

After the completion of the treatment, the expansion tube is used to supplement the faulty casing, and the strength of the casing is restored to prevent the mudstone from being spit into the wellbore and affecting normal production. The traditional casing patching technology requires the casing diameter to be more than 120mm, that is, the Φ120mm*4000mm diameter well which meets the problem of no scratching and no collision. Because the casing leap is serious and the large repair and treating casing must ensure the diameter of more than 120mm. In actual construction. It is difficult to meet the requirements; the large-diameter expansion pipe technology does not require high requirements on the casing diameter, and it can be ensured that the patching pipe can be placed under the patching position. After the large repair and treatment, the requirements can basically meet the requirements.

Check the quality of the patch, and test the packer K344-105 under the tamping device. The clamp is in the position of the patch. The upper column of the wellhead is connected to the pressure test device, and the pressure is 15Mpa, which is not reduced as qualified.

CONCLUSION

The article aims at the difficulties of casing leap, formation collapse, the discharge of mudstone and no single drill string being added in the sweeping operation. Through field application of supporting treatment technology of wells with casing leap and the discharge of mudstone, the above technical difficulties can be solved and the oil and water wells can be restored, but the number of casing damage wells is increasing by more than 100 for a year. but the number of damaged wells increased by more than 100 wells per year, and the capacity loss due to casing damage is still high. Therefore, it is necessary to focus on prevention, adjust and formulate reasonable injection and production pressure, reduce casing pressure and extend service life; It is necessary to implement subdivision water injection, implement the layered water injection scheme in time, adjust the water absorption profile, and balance the water injection intensity.

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