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Mechanical Calculation of Collar Eye Grinding Shoes for the Entire Series of Casing

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Abstract: ***In response to the problem of low efficiency in milling/grinding, the new collar eye grinding shoes can greatly improve operational efficiency, shorten the adjustment well project period, and achieve the goal of cost reduction and efficiency improvement. The movement trajectory of the tool blade wing of the lead eye shoe grinding tool affects the tool design results. Therefore, research has been conducted on the movement trajectory of the tool blade wing. The study shows that when the size of the lead eye shoe grinding tool's supporting wing is constant, the maximum size of the lead eye shoe grinding tool blade wing is related to the scale of the casing to be processed, and is not related to the scale of the casing on the previous level.***

Keywords: Lead eye grinding shoes, Blade wing movement, Research.

1. Introduction

A large wellbore refers to a wellbore that is larger than 12-1/4 "compared to conventional wellbores (7", 8-1/2 ", and 12-1/4" wellbores); At present, some blocks of Bohai Oilfield have entered the mid to late stage of development, and the production and service time of oil and gas wells is long. It is inevitable that there will be a decrease in production or the shutdown of faulty wells; Meanwhile, the number of slots on offshore production platforms is limited; However, in order to achieve stable and increased production in the old block, using the old wellbore to arrange adjustment wells has become one of the effective means;

Conventional cutting and milling techniques can be used to handle single or multiple layers of casing in preparation for large wellbore side drilling operations. However, due to the limitations of well conditions, existing milling tools may encounter issues such as pressure support, casing splitting, leakage isolation conduits, and severe wellhead vibration during operation. In complex well conditions, only multi blade wing collar eye grinding shoes can be used for milling. The calculation of the blade movement trajectory of the leading eye shoe grinding tool is extremely critical, so it is necessary to conduct research on this topic.

2. Calculation of Blade Movement Trajectory for 7 "Eye Grinding Shoe Tool

At present, the 9-5/8 "casing in Bohai Oilfield is mainly available in two specifications: 47 pounds and 40 pounds, while the 7" tail pipe is mainly available in 29 pounds and 23 pounds; To determine the blade size of the 7-inch collar shoe grinding tool and clarify the movement trajectory of the collar shoe grinding tool, all 9-5/8 inch sleeves and all 7-inch tailpipes of the weighing class were combined, such as the 7-inch tailpipe under the 47 pound 9-5/8 inch sleeve (29 pounds and 23 pounds); A 7-inch tailpipe (29 pounds and 23 pounds) under a 40 pound 9-5/8 inch casing. Figures 1 and 2 show the 7 "tail pipe (29 pounds and 23 pounds) under a 47 pound 9-5/8" casing; Figures 3 and 4 show the 7-inch tailpipe (29 pounds and 23 pounds) under a 40 pound 9-5/8 inch casing.

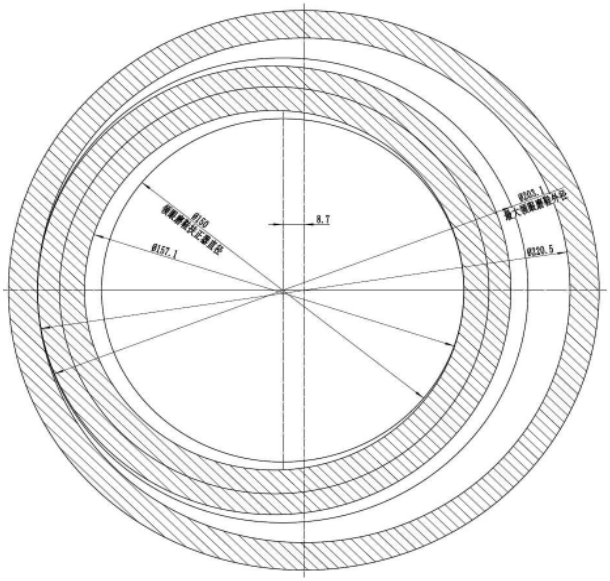

Figure 1: 29 pound 7 inch tailpipe under 47 pound 9-5/8 inch casing

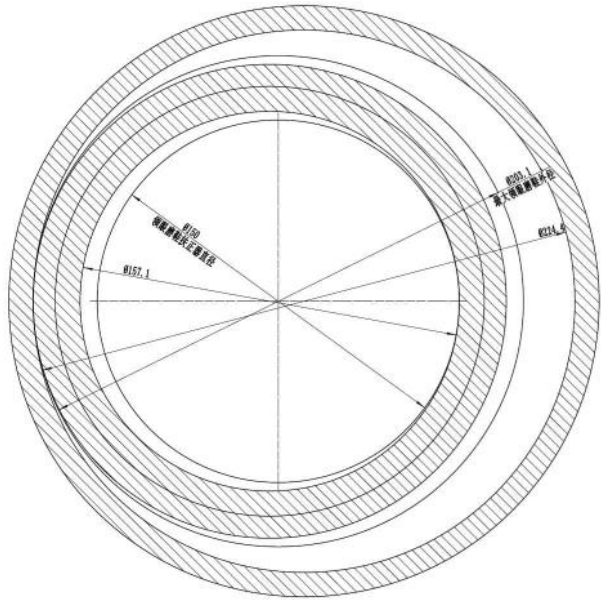

Figure 2: 23 pound 7 inch tailpipe under 47 pound 9-5/8 inch casing

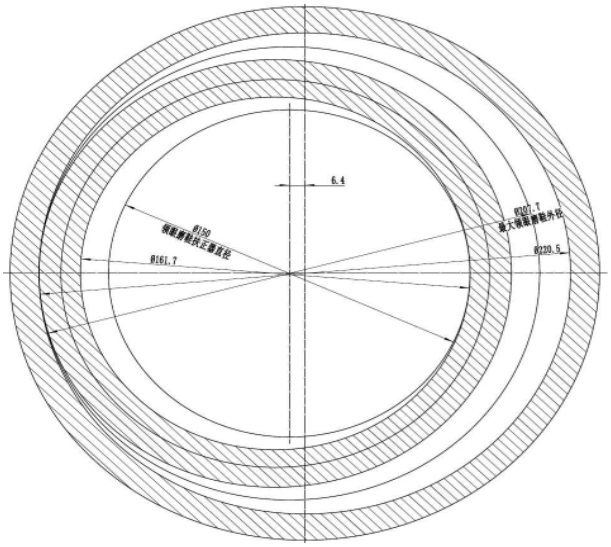

Figure 3: 29 pound 7 inch tailpipe under 40 pound 9-5/8 inch casing

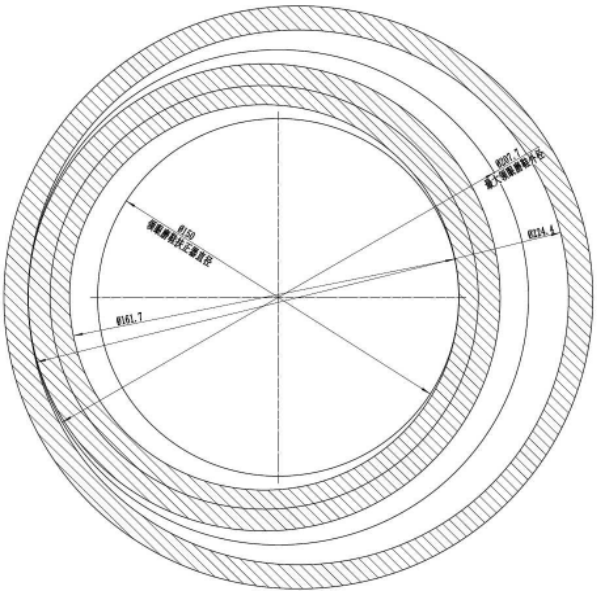

Figure 4: 23 pound 7 inch tailpipe under 40 pound 9-5/8 inch casing

From Figures 1 and 2, it can be seen that when the size of the leading eye grinding shoe straightening wing is constant, the maximum size of the leading eye grinding shoe blade wing is related to the scale of the casing to be processed, and is not related to the scale of the casing in the previous wellbore.

3. 9-5/8 "Collar Eye Shoe Grinding Tool Blade Movement Trajectory Calculation

At present, the 13-3/8 "casing in Bohai Oilfield is mainly available in two specifications: 68 pounds and 61 pounds, while the 9-5/8" casing is mainly available in 47 pounds and 40 pounds; To determine the blade size of the 9-5/8 "collar shoe grinding tool and clarify the movement trajectory of the collar shoe grinding tool, all pound grade 13-3/8" sleeves and all pound grade 9-5/8 "sleeves are combined, such as 9-5/8" (47 pounds and 40 pounds) under the 68 pound 13-3/8 "sleeve; 9-5/8 "casing (47 pounds and 40 pounds) under a 61 pound 13-3/8" casing. Figures 5 and 6 show 9-5/8 "casing (47 pounds and 40 pounds) under a 68 pound 13-3/8" casing; Figures 7 and 8 show 9-5/8 "casing (47 pounds and 40 pounds) under a 61 pound 13-3/8" casing.

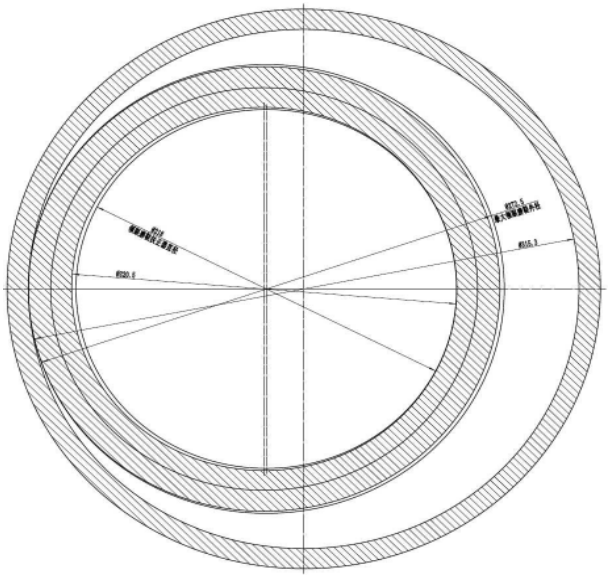

Figure 5: Under a 68 pound 13-3/8 inch casing, there is a 47 pound 9-5/8 inch casing

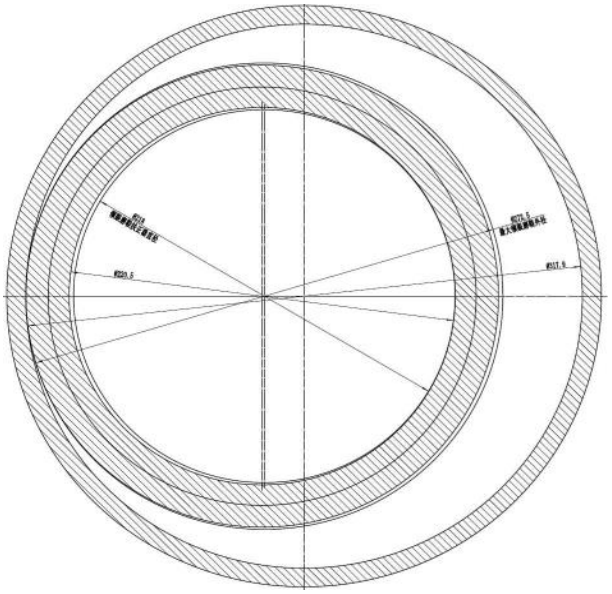

Figure 6: 40 pounds 9-5/8 inches under a 68 pound 13-3/8 inch casing

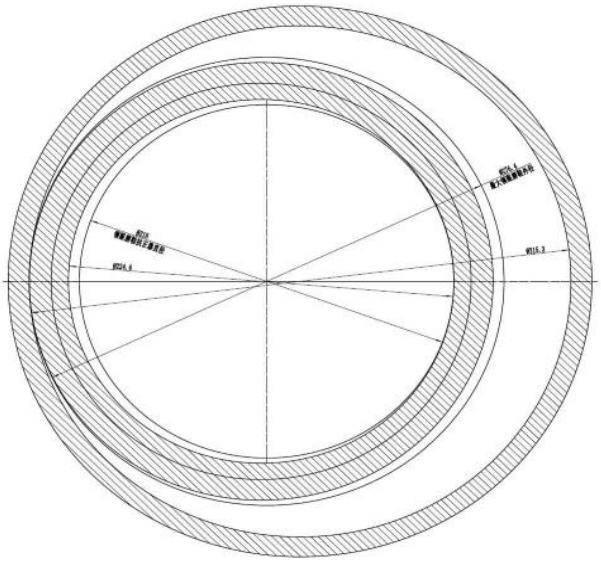

Figure 7: 61 pounds 13-3/8 "casing under 47 pounds 9-5/8"

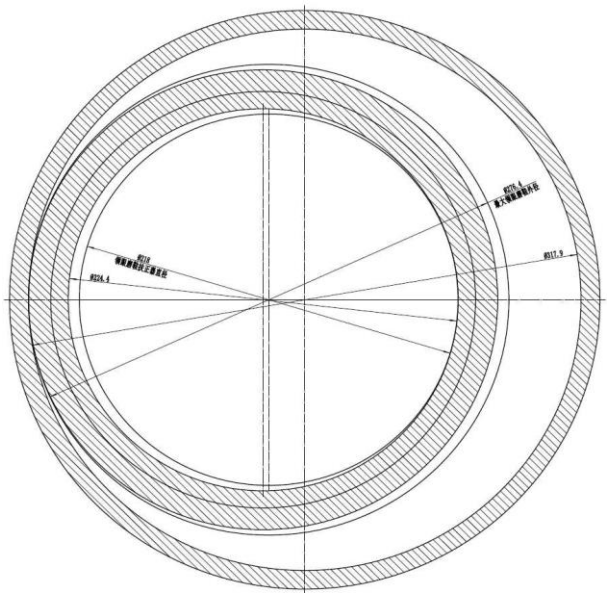

Figure 8: Under a 61 pound 13-3/8 inch casing, there is a 40 pound 9-5/8 inch casing

4. Calculation of Blade Movement Trajectory for 13-3/8 ″ Eye Grinding Shoe Tool

At present, the 20 inch riser in Bohai Oilfield is mainly available in two specifications: 106.5 pounds and 94 pounds, while the 13-3/8 inch casing is mainly available in 68 pounds and 61 pounds; To determine the blade size of the 13-3/8 "collar shoe grinding tool and clarify the movement trajectory of the collar shoe grinding tool, a combination of all 20" riser pipes and 13-3/8 "sleeves was used for all weight classes, such as: 13-3/8" (68 pounds and 61 pounds) under the 106.5 pound 20 "riser pipe; 13-3/8 "casing (68 pounds and 61 pounds) under a 94 pound 20" riser. Figures 9 and 10 show 9-5/8 "(47 pounds and 40 pounds) under a 68 pound 13-3/8" casing; Figures 11 and 12 show the 13-3/8 "casing under a 61 pound 13-3/8" casing (68 pounds and 61 pounds).

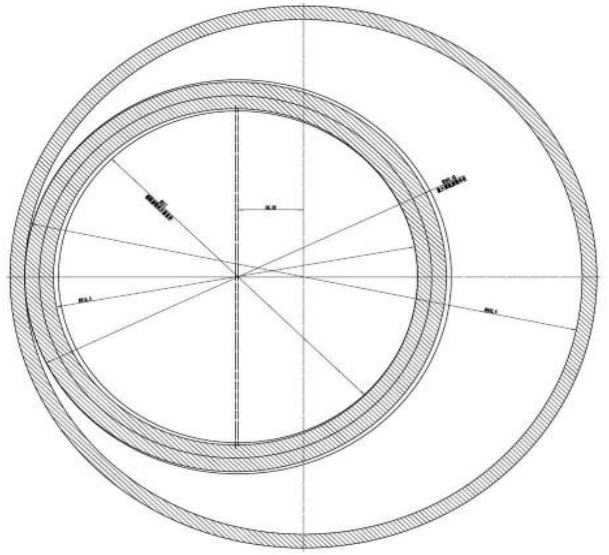

Figure 9: 68 pound 13-3/8 "casing under 106.5 pound 20" riser

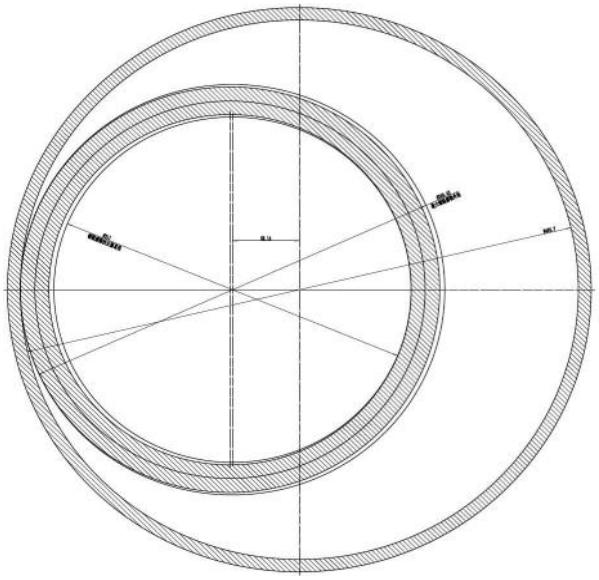

Figure 10: 61 pound 13-3/8 "casing under 106.5 pound 20" riser

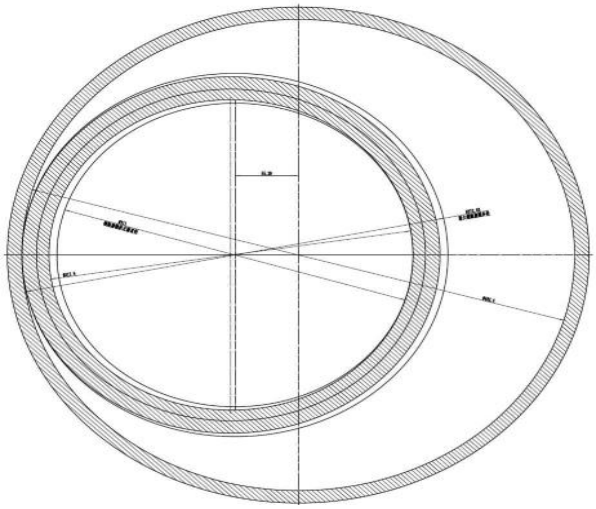

Figure 11: A 68 pound 13-3/8 inch casing under a 94 pound 20 inch riser

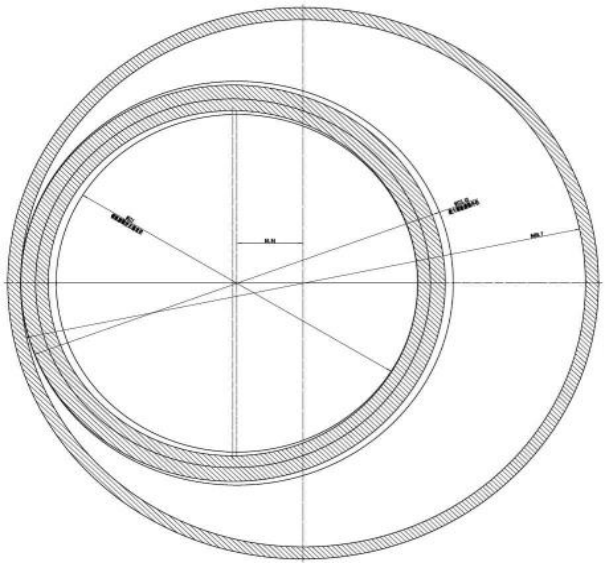

Figure 12: 61 pound 13-3/8 inch casing under 94 pound 20 inch riser

5. Summary

The maximum outer diameter of the six types of collar shoe grinding blade wings under severe misalignment of the casing is given. The maximum outer diameter of the collar shoe grinding blade wing for a 29 pound 7 "tailpipe is 203.1mm; The maximum outer diameter of the collar eye shoe grinding blade wing for a 23 pound 7 inch tailpipe is 207.7mm; The maximum outer diameter of the collar eye shoe grinding blade wing for a 47 pound 9-5/8 inch casing is 272.5mm; The maximum outer diameter of the collar eye shoe grinding blade wing for a 40 pound 9-5/8 inch casing is 276.4mm; The maximum outer diameter of the collar eye shoe grinding blade wing for a 68 pound 13-3/8 inch casing is 369.43mm; The maximum outer diameter of the collar grinding shoe blade wing for a 61 pound 13-3/8 inch casing is 372.03mm.

When the size of the leading eye grinding shoe straightening wing is fixed, the maximum size of the leading eye grinding shoe blade wing is related to the scale of the casing to be processed, and is not related to the scale of the casing in the previous level.

References

[1] Xue Yongan, Chai Yongbo, Zhou Yuanyuan. Recent new breakthroughs in hydrocarbon exploration in Bohai sea [J]. China Offshore Oil and Gas,2015,27(1):1-9.
[2] Gao Jiaqiang. Structure design and mechanics analysis on the key components of super short-radius horizontal well flexible drilling [D]. Daqing: Northeast Petroleum University ,2012.
[3] Zhao Xia. Mechanics analysis and safety evaluation of flexible drill string in ultra short radius horizontal well [D]. Daqing: Northeast Petroleum University ,2013.
[4] Xu Tingting. The design and mechanics analysis of flexible drilling tool for ultra short radius horizontal well [D]. Daqing: Northeast Petroleum University ,2016.
[5] Liu Yang. Research on the key technique of short radius sidetracking to increase production in Suizhong 36 block of Bohai oil field [D]. Daqing: Northeast Petroleum University, 2017.
[6] Wu Bin. Research of directional drilling technology in shallow large diameter well [D]. Daqing: Northeast Petroleum University, 2016.
[7] Liu Weipo, Liu Hui, Han Lianhe, etc. Application of retrieving cemented prodution casing technology to sidetrack surface casing [J]. Oil Drilling & Production Technology, 2012,34(4):40-42.
[8] Yang Baojian, Fu Jianmin, Ma Yingwen, etc. Window sidetracking technology for Ø508mm riser[J].Oil Drilling & Production Technology, 2014,36(4):50-53.
[9] Kong Dingliang. Study on the breakage mechanism and the optimization design of PDC bit in basal conglomerate formations[D]. Qingdao: China university of petroleum (East China),2011.
[10] Dong Xingling, Wang Changli, Liu Shujie, etc. Offshore drilling manual [Z]. Beijing: Petroleum Industry Press, 2009:135-140.