Reasons and Control Management of Over and Short through Oil-gas Gathering

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Abstract. Over and short is an important production parameter during the output and gathering of crude oil. It can reflect the basic management of working level from some aspects which could affect the real situation of the crude oil output more directly. Therefore, the sufficient analysing about the reasons of changing and control management scientifically of the over and short is very significant for the pertinence of enforcing basic management of working in crude oil output as well as the guidance of the running in production to refer and guide.

Keywords: Oil-gas gathering, over and short, control management.

1. Preface

The over and short is the crude oil output minus the exportation output which takes the percentage of the output of wellhead. It is an index of the wellhead output and exported measure which should be up to 5% of the normal range theoretically that means the percentage of the deviation between wellhead output and real output. The bigger the over and short becomes, the more the real deviation becomes which shows the result that we haven't get well knowledge of the single wells' real output more and more reasonably which is not benefit for the analysis and adjustment of the blocks.

2. The Present Situation of the Over and Short

In 2015, the average over and short is 8.66% annually in the No.1 Oil Field. After the adjustment of blocks in January in 2016, the over and short grows up fast to the maximum value 26.7%. We cannot calculate the output separately between two oil fields after adjustment which shows a very difficult situation for analyzing the reasons of the change of over and short. Moreover, the incapability of the single calculation must make some effects of the verification of the production. But according to the basic study of the No.1 oil field, we will find problems and govern the over and short among produced wells, transfer station and united station. The out and short of No.1 oil field is 18.9% at present which has gone down to 7.8% contrasted with the highest point.

3. The Reasons and the Analysis of the Over and Short

We can analyze the reasons from two aspects: one is the calculation of wellheads including produced fluid and water content of single wells; another one is the measure of output including the monitoring of produced fluid of transfer station and the calculation of output of united station.

3.1. Factors of Wellhead

3.1.1. Error of the Calculation of Produced Fluid At present, there are three kinds of equipments to calculate the oil in No.1 oil field which is separator, two phase cyclone separators and weighing method. There are mainly two aspects which will affect the accuracy of calculating the oil for the separator. The first one is the effect of the viscosity of crude oil. The situation that the crude oil stick on the surface of the separator will become more and more serious with the growing viscosity of the crude oil and the decreasing of water content which will decrease the cross-sectional area of the oil tank and the slow of the liquid level which would cause some positive errors in the measuring of single wells' production. The second aspect is the reading by people. It is known that calculating with glass tube is one way that could be read the time of the growing liquid level by people to calculate the wells' output. Therefore, the errors would show some affects to the calculating. The two-phrase cyclone separator is the way of using computers as we know. It is the same with the weighing method. The longer time they are taken, the smaller errors will happen.

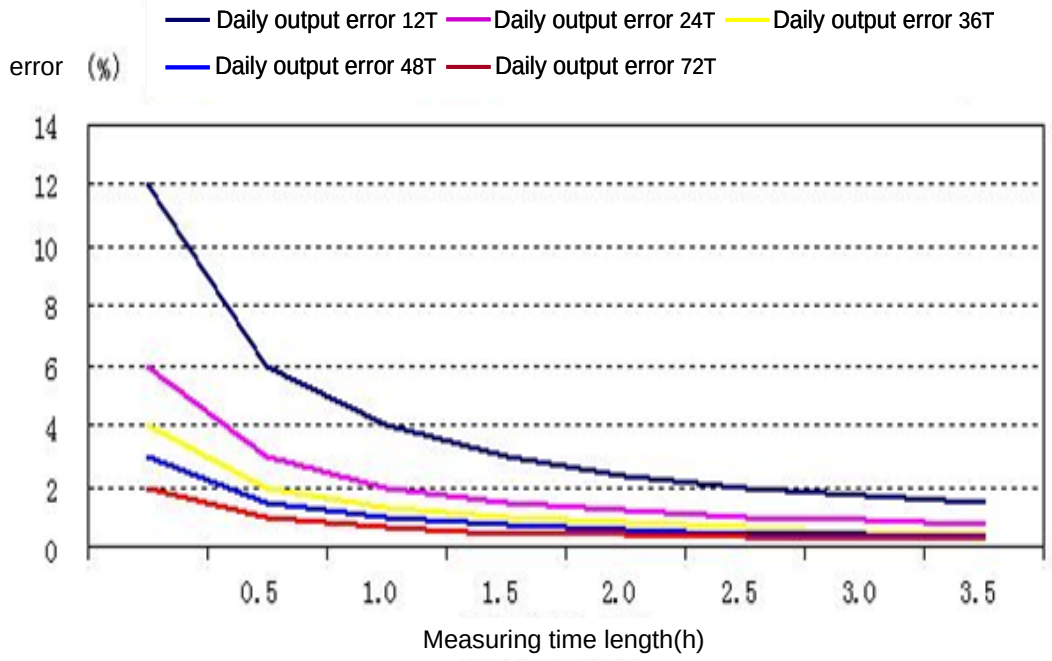

Fig .1 Pictutre one the output errors under different time of measuring

3.2. The Influences of Ground Technological Process

The precision measurement is not enough for output of two stringing wells. As an example, well set A and B is are the two wells in a series of process. Point A and point B are the junctions of the manifold and oil pipeline of two wells. P_A is the oil pressure of well A and $P_{B\ is}$ the oil pressure of well B. P_{A1} is the pressure number that the well A fluid worked on point B pressure value which shows the same of P_{B1}. P_{AY} is the vertical force that well A fluid worked on point B and P_{BY} is the vertical force that well B fluid worked on point B.

If the output of well B in a series process is high, that is, in the condition that P_A is less than or equal to P_B, the fluid will flow from A to B. Because of the pipe loss in the flow process, it will show the situation of $P_{A1} < P_{B1}$when it reaches to point B. At point B, the well fluid in part B will flow back to the measure room, and the other part of the fluid which is due to the influence of pressure differentials will cause the interaction force with the fluid in well A. If the number of produce liquid between the two wells is close which means P_{A1} is lightly smaller than P_{B1}, fluid in well A would slow down or stop at point B which affects oil measuring accuracy. If difference between wells is large which means the

oil production of well B is higher than well A, in another word, it show the situation of $PB_1 >> P_{A1}$. Factors due to the pressure differentials, there will have a phenomenon that well B's output fluid will flow into the well of A which is named the backward flow, resulting to the situation that the output of two wells are lower than normal status when we combine the output of two wells.

In the case of well A has high output in a series of process which means in the condition of $P_A > P_B$, there are two situations when the well A fluid flow to the point B:

Situation 1: when the difference between wells becomes large, that is, when the well A's output is much higher than B, $P_{A1} > P_{B1}$. At point B, the flow of P_{A1} in the pipeline is divided into the horizontal flow and vertical flow. Because well A's fluid pressure P_{AY} is far greater than the well B's vertical force P_{BY}, the part of well A's fluid will flow into the well B which will cause the well B's oil is not well fluid and another part of the oil will return back to the measurement room. Thus, a situation will be appeared that the true number of measuring equals to the output of high production of wells approximately when we combine the final number of measuring.

Situation2: when the difference between wells becomes smaller while it is showed that $P_{A1} > P_{B1}$, the flow fluid of well A's output in the pipeline is divided into horizontal flow and vertical flow at the point Bowen the well A's fluid pressure P_{AY} is greater than the well B's vertical force P_{BY}, the fluid of well A and well B will influence each other as well as the measuring effects.

If the production of oil fluid is close with each other, that is, P_A is close to P_B. Due to the small differences of production between wells, well A's pressure P_{A1} have a small effect on well B at point B which could be ignored. So, the status of measuring oil is relatively stable. Therefore, it is proved the same situation of the interaction of three wells in a series of process.

3.2.1. he Impact of Intermittent Oil Wells. At present, the most common site is the use of the oil separator. The measurement time is relatively short and the time of oil production can be short to dozens of seconds. Using instantaneous flow in a short time to calculate the whole day's output, there is a large error itself. Moreover, oil well production is not very stable and fluctuates a lot in one day, as a result it is not necessarily representative to use the short time measurement to calculate the whole day's output. The error caused by the reasons above is called the measurement sampling error. The measurement sampling error varies with the output of the well.

3.2.2. Influence of Low Yield Well. Low yield liquid well metering has some blind angles. The wells whose fluid producing is under 10 tons, the time of measuring the oil is generally around 40 minutes because of the low amount of produced fluid. We always convert the number when it is measured. Moreover, the winter is unable to measure because of the season.

3.3. Error in Sampling Process.

3.3.1. Keep Empty or Not in Sampling. According to the requirements of the sampling now, we must discharge the sampler's "dead oil or water" in pipeline which has a great influence on the representative of the sample. If the emissions of the "dead oil or water" are not clean enough, those may be cause the content of moisture in the sample. That will become lower or higher which will affect the accuracy of the determination of moisture content. By comparing the multiple wells, the samples were taken continuously during the same time to ensure the comparison of samples. It can be found from table 5 that whether we keep it empty or not could cause a great influence on the determination of the moisture content of crude oil, which is the main factor affected the determination of the moisture content of crude oil. In general, wells with high water in the sampling valve will have the "dead oil". If we don't keep it empty, that will lead to the higher determination of moisture content. While for the wells with low water who has "dead oil", it will lead to the low determination of moisture content without keeping empty.

3.3.2. The Different Degrees of Opening Valve in Sampling. The degrees of opening the valve will cause a higher moisture content. The main reason is that the viscosity of crude oil is large which will lead to the different flow resistance between oil and water. When we open the valve in a small degree as well as the oil-water separation, that will make the free water's priority through the valve which would cause the determination of the moisture content increased. Therefore, opening degree of valve is the main factor which will affect the determination of moisture content.

3.3.3. Influence of the Time of Sampling The crude oil flows from the surface ground into the bottom hole and rises to the wellhead. The mixture in horizontal movement in circular tube is due to the motion of the pump piston which drives the liquid into the tubing string with the emergence of the donkey head's movement under a pulse. Since the sucker rod has an elastic elongation and a certain amount of compressible gas exists in the string, the movement of liquid in the horizontal pipe of wellhead will lag behind the head of the donkey. When the piston undergoes the stroke, the liquid in the pipeline is in a static state. The crude oil tends to the wall and the upward trend is the strongest as a result of the taking out of the oil samples have higher content of free water.

4. Conclusion

Management of over and short is a long and complicated task which should be taken by the "hardware" and "software". "Hardware" refers to the configuration and management of metering equipment which is using for ensuring the accurate and reliable measurement equipment. "Software" refers to the management of the standard operation and process controlled by operating personnel. We should try out best to minimize the impact of human factors. Bad factors which cause the over and short are complex. Some factors can be eliminated, but some factors cannot be eliminated under the condition of current technology. Therefore, we should constantly summarize and fumble the analysis of these factors and put forward on feasible solutions to control the over and short in a reasonable range.

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