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EVALUATION OF PREMATURE FAILURE ACCOUR IN SRP PUMP TO IMPROVE RUN LIFE PUMP IN HASA FIELD

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ABSTRACT

Sucker Rod Pump is an artificial lift used in the HASA field to lift high viscosity fluids. Over time there are several problems with SRP pumps such as premature failure, repetitive failure and normal failure. Premature Failure is a sudden problem that occurs early in production where abnormal conditions occur on the sucker rod pump and the pump failure occurs less than 30 days (run life). Premature Failure can cause a decrease in production. To overcome the event of premature failure on sucker rod pump in the HASA field, the parameters that can cause the occurrence are analyzed. The parameters analyzed are well heat temperature, sand rate, load_divison, Net displacement and Card Area. The parameter is analyzed by plotting the graph of the existing parameters for the time or run life. After analyzing there were 152 wells that experienced premature failure on the HASA field. The most dominant parameters causing the occurrence of Premature Failure are rising sand rate, Well heat Temperature, and Load. After being analyzed, it was found that 101 wells were damaged by the Pump Stuck and 51 were damaged by Not Pumping and some of them used 144 regular pumps and 8 special pumps at the time of the occurrence of premature failure

Keywords: *Premature Failure, Sand rate, Tempeature, Pressure, Run Life*

1. INTRODUCTION

The HASA field is a Heavy Oil field that contains high viscosity oils that are difficult to flow (Pumping, Field, Nagy, & Indonesia, 1991) so that artificial elevator Sucker Rod Pump (SRP) is used to lift the fluid. There are some wells in this field that use SRP. Over time, problems occurred (SRP) which caused a decrease in production. So sometimes a new SRP replacement is also done. The new SRP installed as a replacement for a damaged SRP sometimes experiences damage at the beginning of production called premature failure.

Premature Failure is a condition that occurs in sucker rod pump where the age of the new pump becomes so short that it is less than 30 days. Premature Failure can occur due to mechanical factors and also the reservoir factor. Damages that occur in the pump include pumping or pump notes stuck on the sucker rod pump. Premature failure because the stuk pump can occur due to the back pressure generated in the flow line due to scale, or problems at the gathering station. But pump stuck often occurs mechanically due to sand produced on the pump makes the gap or clearance clogged between the plunger and the barrel pump so that the pump becomes stuck or stops when the position is up stroke or down stroke. While Not Pumping's premature failure failure can be caused mechanically due to un screw or detachment of the rod, and Shear Coupling which functions in the event of a pump stuck, the shear will disconnect the existing pump so the pump

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will continue to move but no oil is produced. Not Pumping can also be caused due to the high temperature which makes the travel valve leak, standing valve, and ball and sheet, so that the fluid lifted to the surface becomes reduced in volume and the plunger inside the pump becomes scratched due to sand so that the longer the clearance will enlarge which also results in Not Pumping

The causes of premature failure include sand rate. The production of sand has a major role in causing the occurrence of premature failure, the higher the sand produced in a well, the faster it causes damage to the pump. Damage that occurs include the leakage of the traveling valve, standing valve, and the ball and sheet which causes the fluid to be lifted to the surface of the volume to decrease. The plunger inside the pump becomes scratched, so that the longer the clearance will increase which results in Not Pumping. The high sand produced can also cause Pump Stuck because the sand that fills the gap between the plunger and the barrel pump causes the plunger to not move up and down in the barrel.

The production of sand causes a rise in temperature at the pump. Temperature has a role to determine the symptoms before the occurrence of premature failure, because the higher the temperature of a well, it can cause damage to the sucker rod. A suddenly high temperature can occur due to cylic activity from the surface and due to friction caused by the presence of produced sand particles that fill the gap or pump clearance. This causes a rise in temperature in the pump which causes leakage in the ball and sheat position made of iron in the standing valve and traveling valve. When the sand particles are produced, the temperature inside the tubing increases, the position of the ball and seat does not close perfectly during up stroke and down stroke, because the seat on the existing ball is pumped which is made of iron which is not resistant to high temperature and pressure making the material expand and even damage so that damage often occurs so that the pump is faster to experience premature failure type not pumping.

Premature failure at HASA Field occurred because of increased productivity of sand into the pump causing a decrease in the average efficiency of SRP pumps by 65.70% on damage to pumping notes and 35.31% for pump damage stuck. To find out how much influence the sand rate has on pump damage and how to deal with it, an SRP pump that experiences premature failure is evaluated.

2. METHODOLOGY

The data needed to analyze and evaluate premature failure on SRP pumps include data production, sand rate, well head temperature and load. The first step before evaluating identifies wells that experience premature failure, then identifying parameters that cause premature failure of the SRP pump on the HASA field and analyzing the effect of these parameters on premature failure. Premature failure problems are evaluated based on the work data that has been done so that it can be grouped into several problem categories. To find out the problem categories of premature failure that occurred in the HASA field, a dynamometer card was used. The dynamometer card is used to record the movement and load of polished rods during the pump cycle, on a dynamometer the card will show the condition of loss of load and pump conditions during up stroke and down stroke (Desi Arini, A. Taufik Arief, & Ubaidillah Anwar Prabu 2013). Based on the results of the identification of the problem of premature failure in the HASA field occurs because the pump is stuck and not pumping. Pump stuck and pumping notes are affected by the amount of sand produced in the wells in the HASA field. Therefore, evaluation of sand production in wells that have pump stuck and not pumping is done to determine the effect of these parameters on premature failure

3. RESULT AND DISCUSSION

Premature failure problems are evaluated based on the work data that has been done so that it can be grouped into several problem categories. To find out the problem categories of premature failure

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that occurred in the HASA field, a dynamometer card was used. The percentage of damage between pump stuck and Not Pumping in the HASA Field is as follows:

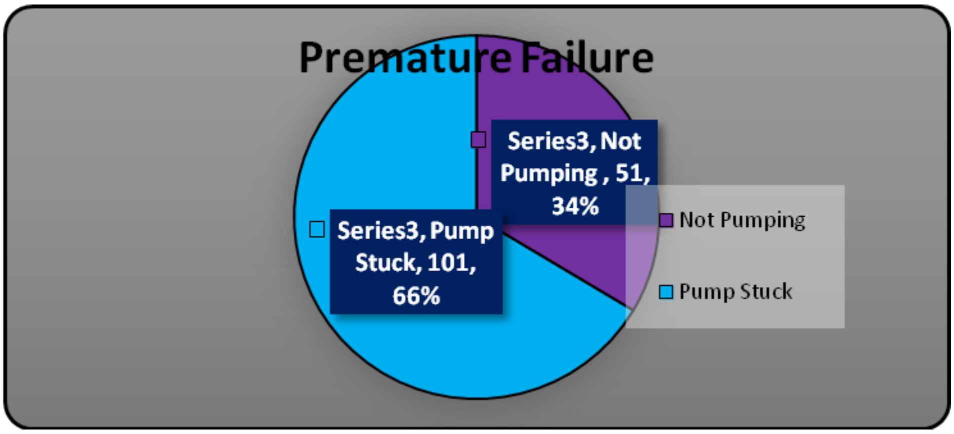

Figure 1. Percentage of damage to premature failure that occurs in the HASA field

Based on picture 1, pump stuck was obtained, there were 101 cases or the percentage was 66% and pumping notes, there were 51 cases or the percentage was 34%. Pump stuck failure occurs because of the sand that is produced in the tubing so it will be very disturbing when the pump works, which makes the clearance or gap between the plunger and barrel pump become scratched. As a result of the sand particles produced on the pump, the pump becomes stuck or stuck in the pump because the gap between the plunger and the barrel pump is filled with sand particles, so the power of the prime mover is no longer able to pull the pump during a stroke or down stroke, so the pump becomes die or stop. The data on sand production in HASA Field shows an increase in the average sand produced into the wellbore before the occurrence of premature failure. Following is the sand rate data in the HASA Field on pump stuck failure.

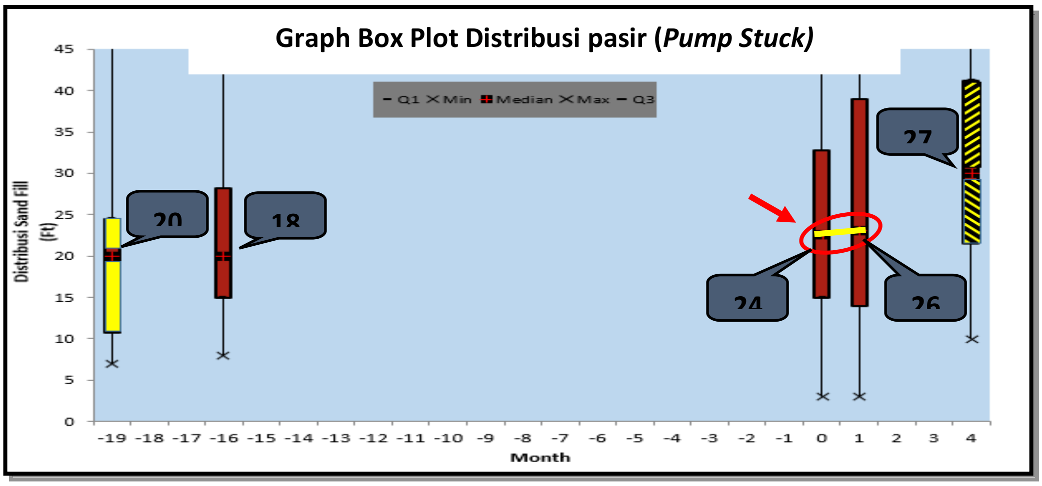

Figure 2 Graph of sand production in HASA Field

Figure 2 shows the average increase in sand produced in the wellbore, where the average sand increases before damage of 24 ft and after the damage occurs the average is 26 ft. The presence of sand that enters the pump causes an increase in temperature inside the pump, because the sand is sandwiched between the gap of the tubing and plunger, so that during up stroke and down stroke there is excessive friction which makes the heat increase in the barrel tubing. However, the

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temperature at HASA Field did not experience a significant temperature increase, the temperature before the damage occurred at 197 of and after the replacement of the new pump and the pump experienced a return of the last temperature of 197 of. This is because when the pump is damaged, the pump is immediately stuck or stopped due to friction between the plunger and tubing pump. So that the device that measures the temperature at the well head temperature measures the last temperature of the fluid.

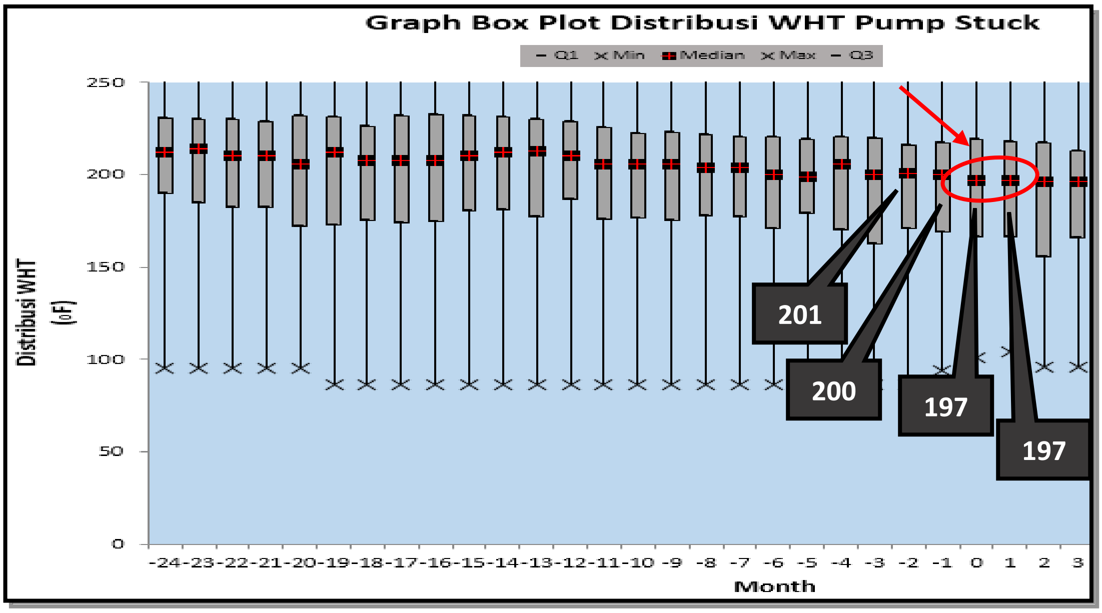

Figure 3. Graphic Well Temperature Head at HASA Field

The presence of sand particles in the barrel tubing makes friction which also increases the load received by the rod, so that the load received by the rod will increase. Before the damage occurred, the average load at HASA Field was 393 pounds and after experiencing a new pump change and for 30 days it was damaged again, the load increased to 402 pounds. Suck pump damage, is a type of damage that can immediately be known physically, so that action can be taken immediately to be replaced at the new SRP pump, which is expected to minimize production decline due to pump stuck damage that occurs.

Not Pumping's premature failure, failure mechanically is caused by un screw or detachment of the rod, and Shear Coupling which functions in the event of a pump stuck, the shear will disconnect the connection in the pump so the pump will continue to move but no oil is produced. In the HASA Field Not Pumping occurs because the sand which is modulated during the up stroke and down stroke makes the plunger inside the pump become scratched, and ball and sheat in the traveling valve abrasion, so that the longer clearance and abrasion that occurs on the ball and sheat enlarge which results in damage to Not Pumping. The following is a graph of the distribution of sand in the wellbore for Not Pumping damage in the HASA Field.

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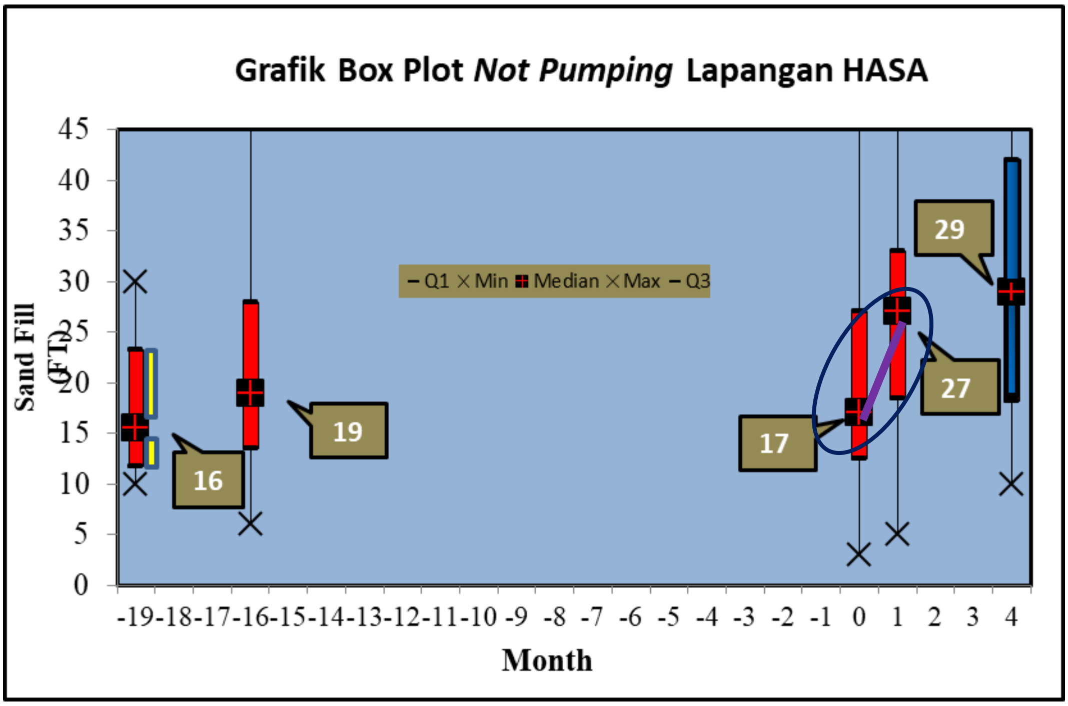

Figure 4. Graph of sand distribution at the pump in the HASA field

Figure 4 shows the significant increase in sand production in the wellbore. Can be seen when the pump is damaged, the sand thickness in the wellbore is 17 ft on average, while at the time of the new pump changes, and the pump is damaged again, the sand produced in the wellbore has an average increase of 27 ft. The presence of sand particles produced also makes load and temperature cause unstable. When the Not Pumping damage occurs, the area card on the surface will read the load received by the rod to change and become unstable.

The load received by the rod becomes unstable because at the time of the up stroke position the fluid that has been pushed by the plunger will return to the tubing and will continue to exit or return during the upward plunger movement. Significant decrease in load in the 3 months before the occurrence of premature failure, the average load of 340 pounds before experiencing premature failure changes to 360 pounds, but the production continues to decline. This indicates that the problem of sandiness has begun to affect the performance of the pump so that the load continues to increase, but production decreases. At the time of the replacement of the new pump, the load increased again but the production decreased and less than 30 days, the pump was damaged again. The increase in load due to the problem of sandiness that occurs at the pump indicates that the screen liner in the well has begun to break down so that it cannot inhibit the rate of sand production to enter the pump (S. Hamid, 1997).

In addition, at 3 months before experiencing damage, the well head temperature graph showed a significant decrease from 185 0f to 174 ^{o}f, and after experiencing a new pump change, with a duration of less than 30 days, the pump was damaged again and the temperature showed a decrease of 173 ^{o}f

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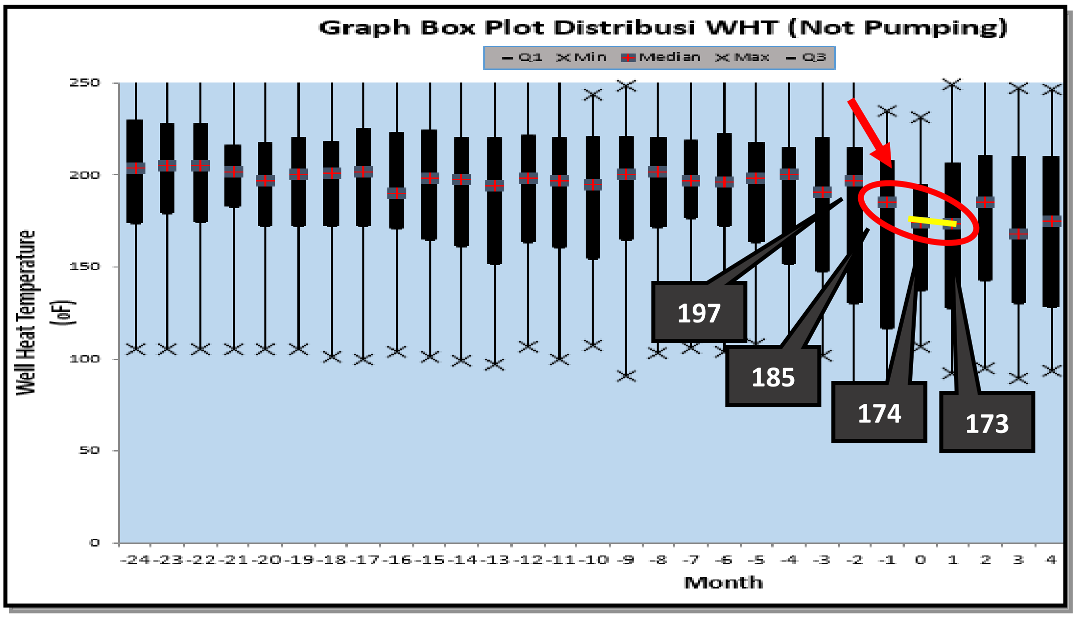

Figure 5. HASA Field Temperature Well Graph

Not Pumping damage causes a decrease in pump efficiency so that it disrupts the performance of the pump in the HASA Field. And it can be seen from the production data which shows a decrease which indicates that there has been a leakage in the pump and the load lifted by the pump continues to rise. This causes the slippages on the pump to continue to show large numbers, the magnitude of the slippages tolerance depends on each company. The slippage tolerance is large from 10%, indicating that the pump will experience a change because it is no longer good.

4. CONCLUSION

Based on the occurrence of premature failure at the HASA Field, the following conclusions are obtained:

1. After being analyzed using the sand rate data, it was found that 101 wells were damaged by the Pump Stuck and 51 were damaged by Not Pumping and some of them used 144 regular pumps and 8 special pumps at the time of the occurrence of premature failure.
2. When the pump is stuck, the pump experiences an increase in production before the damage occurs at 422 BFPD to 424 BFPD after damage, and the load at HASA Field before the damage is 393 pounds and after damage to 402 pounds, the temperature remains , which before damage was 197 0f and after damage occurred 197 0f. As for the damage to pumping notes, the production decreased before 407 BFPD became 387 BFPD after damage, and the load before the damage occurred was 343 pounds to 350 pounds, and the temperature before the damage occurred 174 0f to 173 0f after damage.

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