

PERFORMANCE ANALYSIS OF BOILER FEED WATER PUMP SULZER AT PLTU AT PT INDONESIA CHEMICAL ALUMINA

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Accepted: 02-11-2021

Revised: 29-11-2021

Approved: 01-12-2021

ABSTRACT

In this research, boiler feed water pump at PLTU PT.ICA has a flow rate capacity of 85 m³ / h which is installed sporadically with a motor to drive the pump. This pump has an important role and the main pump for filling feed water from dearator into the steam drum (boiler) which is always used for 2 years with varying flow rates. Data needed for evaluation include pressure and temperature of the suction, pressure and temperature of the discharge, flow rate and electric current. The data were taken starting in January to Maret 2019. Data processing was performed using a centrifugal pump calculations includes head, water horse power (whp), brake horse power (bhp) and efficiency presented in tables and graphs using Microsoft Excel. Boiler feed water pump sulzer during operations 3 months amounted the highest head amounted 1212,23 m, the highest whp amounted 223,25 kW, the highest bhp amounted 237,21 kW and the highest efficiency amounted 95,67 %, while the lowest head amounted 928,53 m, the lowest whp amounted 72,68 kW, the lowest bhp amounted 197,14 kW and the lowest efficiency amounted 36,85 %. Change of performance bfp occur due to changes flow rate and pressure suction which adjust operational needs.

Keywords: performance; pressure; temperature; boiler feed water pump sulzer.

1. INTRODUCTION

At PT. Indonesia Chemical Alumina (PT. ICA) has its own power plant with a capacity of 2 x 12 MW to meet operational needs in the company. The pump is a fluid engine that is used to transfer fluid from a low place to a higher place or from a low pressure to a higher pressure. One of the boiler feed water pumps at PLTU PT. ICA has a flow rate capacity of 85 / hour which is installed sporadically with a motor to drive the pump. This pump is the main pump for filling feed water into the steam drum (boiler) which is always used continuously for the needs of the operational

process at the steam power plant at PT. ICA for more than 2 years with varying flow rates, so this causes the writer to be interested to carry out research that will be poured into a thesis with the title "Performance Analysis of Sulzer Water Pump Boiler Feed in PT. PLTU". From the results of the analysis that will be obtained later, it is hoped that follow-up can have a positive impact on improving the performance of the boiler feed water pump so that the operational process can run well, safely and smoothly.

Sukamta et al. (2015) conducted a research analysis of the performance of a boiler feed

water pump turbine (BFPT) for a boiler capacity of 2000 tons / hour at PLTU Cirebon, West Java. In this study the data needed is pressure, temperature and flow capacity. The results of this study the efficiency during operations in 2014 decreased in February - March amounted to 17.91% (BFPT A) and 18.04% (BFPT B). BFPT A highest efficiency obtained in January amounted to 73.76%, the lowest in March amounted to 55.45%. The highest efficiency of BFPT B in February was 72.94%, the lowest in March was 54.9%. Changes in BFPT performance occur due to changes in generator power plant loads which cause changes in pressure and flow capacity. Another factor that decreases BFPT performance is due to continuous operation for 24 hours and BFPT's age is quite old which causes a decrease in pump performance [1].

Wardianto, Dedi (2019), conducted a research on the performance of the mercury pump MP-700 single arrangement, series and parallel. In this study using two pumps of the same type. As a result, the performance of the two pumps is relatively similar, after being compared with the "Bernoulli" legal theory formula. The results of the experiment that from the reduction in flow rate accumulates lower head elevation, for the reduction in flow rate in the series circuit is the head height is not too large, while the parallel arrangement increases the maximum head height. This study cannot show the lowest head because the flow capacity is measured using a scaled glass and stopwatch at a height of 30 cm [2].

Harahap S, Tiansa Y (2016), conducted a research on the performance analysis of centrifugal pumps as chemical supply pumps [3]. The main objective is to determine the capacity, head and efficiency of the pump, as well as losses that occur in the piping system. The results of this study will be compared back to standard operation to determine that the pump is still suitable for operation. Referring to the standard operation which produces a flow rate of 2477.6 gpm and a head of 72.916 m, then the hydraulic power is 156.07 hp and the pump efficiency is 83%. In addition, head loss calculations in the banking system are 15,086 m. As a result of this study it can be concluded that the pump is still suitable for operation and cavitation will not occur because

the pump has fulfilled the cavitation requirements $NPSH_a > NPSH_r$ [4-12].

2. METHODS

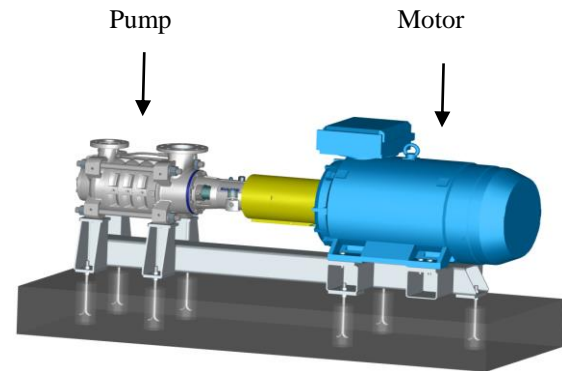


Figure 1. Sulzer water pump feed boiler

The research methods carried out are as follows:

- a). Literature method, namely by studying several references that are able to support to conduct research, references used include sources from books, articles, sources from the internet and other sources related to research.
- b). The method of observation, namely conducting research directly boiler feed water pump sulzer at PT. Indonesia Chemical Alumina in order to obtain accurate data to facilitate and succeed this research.

This study begins with the retrieval of pump specifications and boiler feed water pump data, piping systems at PLTU PT. Indonesia Chemical Alumina, then takes data flow rate, temperature suction, pressure suction, temperature discharge, pressure discharge and electric current that are accessed in the computer control room during operation in January to March 2019. Furthermore, data processing is done using Microsoft Excel is used to calculate pump performance, while density and viscosity are calculated using an intra-isolation formula with temperature as a reference. The parameter data is used to calculate pump performance including total head, water horse power (whp), rotor power, brake horse power (bhp) and pump efficiency. The calculation results obtained are presented in tabular form which has been taken on average every day. Then an efficiency chart is made every month and a graph of the

relationship of discharge with head, whp, bhp and pump efficiency.

3. RESULTS AND DISCUSSION

On the January to March 2019 debit chart it can be seen that the flow rate has increased and decreased (fluctuations), the flowrate is unstable and changing. For the highest flow discharge in January 2019 obtained at 65.34 m³ / hour and the lowest flow discharge at 33.61 m³ / hour, for the highest flow discharge in February 2019 obtained at 67.72 m³ / hour and the lowest flow discharge at 33,96 m³ / hour, while the highest flow rate in March 2019 was 65.23 m³ / hour and the lowest flow rate was 28.75 m³ / hour, as shown figure 2, 3, and 4.

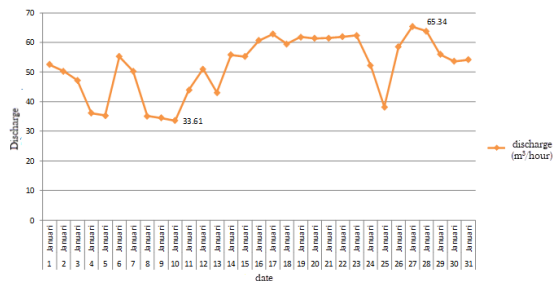


Figure 2. Graph of discharge in January 2019

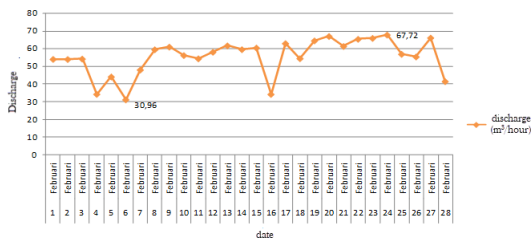


Figure 3. Graph of discharge in February 2019

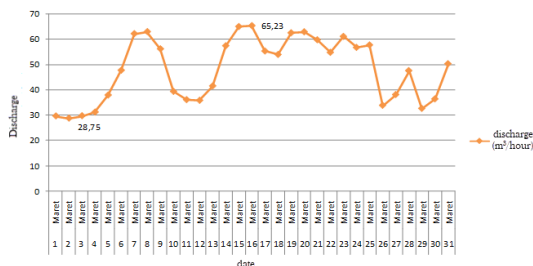


Figure 4. Graph of discharge in March 2019

The flowrate value on the sulzer water pump feed boiler in PT.Indonesia Chemical Alumina is influenced by the need for steam which has 2 main functions, which are used as a generator drive and also used in the heating process of chemical alumina production materials which must be adjusted to operational needs. If seen from the discharge chart above, the highest average discharge value was obtained in January 2019 due to the increased need for steam used for generators and heating materials in the production process.

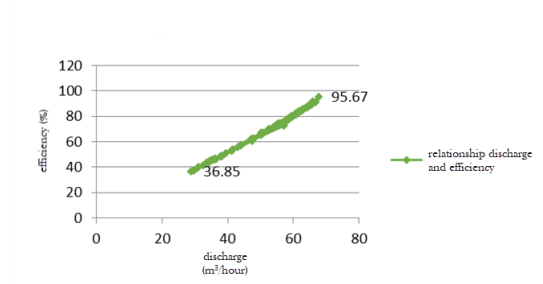


Figure 5. Relationship of discharge and efficiency

From the figure 5 as shown the relationship of discharge and efficiency it can be seen that the magnitude of the numbers that are increasingly rising, this shows that the relationship between discharge and efficiency when the pump is working.

From the description above shows that the value of efficiency is influenced by the flow flow, the smaller the flow flow, the smaller the efficiency (the efficiency of the pump decreases) and if the greater the flow flow, the greater the efficiency (the greater the pump efficiency).

4. CONCLUSION

From the results of calculations that have been obtained during operation from January 2019 to March 2019, it can be concluded as follows the performance of the sulzer water feed boiler pump on the power plant at PT. Indonesia Chemical Alumina has changed with several indicators. In February 2019 it was the highest boiler feed water pump performance with a flowrate of 67.72 m³ / hour. As for the highest total head of 1212.23 m, the highest whp of 223.25 KW, the highest bhp of 237.21 kW and the highest efficiency of 95.67%.

While the lowest boiler water pump feed performance is obtained in March 2019 with a flow rate of 28.75 m³ / hour. As for the lowest total head of 928.53 m, the lowest whp of 72.68 kW, the lowest bhp of 197.14 kW and the lowest efficiency of 36.85%.

Changes in the performance of the sulzer water pump feed boiler can occur due to changes in flow flow and suction pressure where it is adjusted to operational needs.

THANK-YOU NOTE

This work was supported by Muhammadiyah University Pontianak (UMP) West Kalimantan, Muhammadiyah University Jakarta (UMJ).

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