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PREVENTIVE MAINTENANCE OF TURBINES IN UNIT 3 AT PT. PLN INDONESIA POWER BANTEN 3 POMU LONTAR

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Graphical abstract

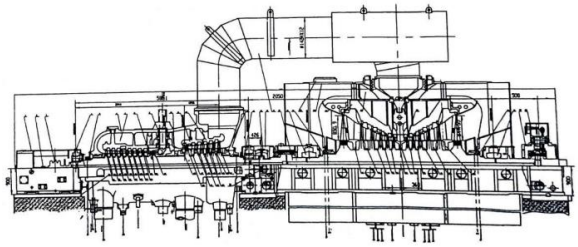

Figure 1. Steam Turbine Engineering Drawing

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Abstract

Maintenance on the turbine must always be carried out, because if one component of the turbine engine is damaged, it will affect the entire performance of the turbine engine. The function of bearing lubrication in turbines is to prevent direct contact between the bearing and the turbine shaft. Therefore, lubrication is needed. Bearing lubrication on the turbine is a very important issue so that the turbine should not be rotated without lubrication will cause material damage. Preventive maintenance of turbines can be pursued by implementing QCC PM. Adding a portable purifier when excessive water content occurs, adjusting the pressure steam seal serves to prevent main steam from entering the bearing area which can cause high water content due to mixing of oil with water. Making a steam block serves to prevent steam from entering the bearing area lubricated by VG 46 medium oil, causing high water content. And routine maintenance to check the mesh aims to assess the feasibility of the mesh and the suitability of the needs of the cleanliness purifier oil system which can be seen from the CBM data, namely tribology monitoring.

Keywords: Lubrication, Maintenance, Purifier Oil System, Turbine Lube Oil System

Abstrak

Pemeliharaan pada turbin harus selalu dilakukan, karena jika salah satu komponen mesin turbin mengalami kerusakan maka akan memengaruhi seluruh kinerja dari mesin turbin. Fungsi dari pelumasan bantalan pada turbin adalah untuk mencegah kontak langsung antara bantalan dengan poros turbin. Oleh karna itu sangat di butuhkan pelumasan. Pelumasan bantalan pada turbin adalah masalah yang sangat penting sehingga turbin tidak boleh di putar tanpa pelumasan akan menyebabkan kerusakan material. Preventive maintenance turbin dapat diupayakan dengan cara melaksanakan QCC PM. Penambahan purifier portable apabila terjadinya water content yang berlebih, mengatur pressure steam seal berfungsi sebagai pencegah main steam masuk ke area bearing yang dapat menyebabkan water content tinggi karena tercampurnya oli dengan air. Pembuatan steam block berfungsi untuk mencegah masuknya uap ke area bearing yang dilumasi oil medium VG 46 sehingga menimbulkan water content tinggi. Dan pemeliharaan rutin untuk memeriksa mesh tujuannya untuk menilai kelayakan mesh serta kesesuaian kebutuhan dari cleanliness purifier oil system yang dapat dilihat dari data CBM, yaitu tribologi monitoring.

Kata kunci: Pelumasan, Pemeliharaan, Purifier Oil System, Turbine Lube Oil System

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1.0 INTRODUCTION

Starting with the management of Power Plants in Java Bali, currently Indonesia Power has developed the Operation and Maintenance Services Business throughout Indonesia both through self-management and Maintenance Services Business Development throughout Indonesia both through self-management, and through subsidiaries. PT PLN Indonesia Power manages 4 Power Generation Units (PGU), 13 Operation and Maintenance Services Units (OMU) and 5 Power Generation Units (PGU). (OMU) and 5 Power Generation and O&M Services Units (POMU) [4].

There are 3 products of PT PLN Indonesia Power, namely 1. Power Generation Unit (PGU). Power generation function through 4 (four) PGUs with a total installed capacity of 5,582 MW, 2. Operation and Maintenance Services Unit (OMU). Indonesia Power operates and maintains power plants with a total installed capacity of 5,281 MW through 13 Operation and Maintenance Services Units (OMU), and Power Generation and O&M Services Unit (POMU). Indonesia Power has 5 (five) Power Generation and O&M Services Units (POMU) with a total installed capacity of 5707 MW [4].

Lontar Steam Power Plant which has an installed capacity of 4 × 315 MW is located in Lontar Village, Kemiri District, Tangerang Regency, Banten Province. PLTU Lontar is under the management of PT PLN Indonesia Power. This business unit is known as PLTU Banten 3 Lontar Power Generation and O&M Service Unit (POMU) [6].

Steam power plant (PLTU) is one example of conventional electrical energy supply. The working principle of the PLTU is by making high-pressure steam from burning coal, which then the steam is able to rotate the turbine and generator so as to produce electrical energy. PLTU consists of several operating units including: economizer, superheater, turbine, condenser, deaerator, and other operating units [4].

Therefore, maintenance on the turbine must always be carried out, because if one component of the turbine engine is damaged, it will affect the entire performance of the turbine engine [6].

2.0 METHODOLOGY

There are 3 methods used in this research, namely [2]:

1. The interview method is carried out by asking questions to senior supervisors, field supervisors, technicians, operators, or officers concerned in data collection.
2. The observation method is carried out by making direct observations of activities that occur at PT PLN Indonesia Power Banten 3 Lontar POMU.
3. Literature study is carried out by reading literature in the form of reference books, guidebooks, and journals on the topic being analyzed so that it can help in preparing the report.

Parts of the Turbine Lubrication System

1. Main Oil Tank

Main oil tank is a tank that can accommodate large amounts of lubricating oil and serves to remove gases accumulated in the lube oil tank and help the rotation of lubricating oil back into the tank. The temperature of the lubricating oil is always monitored and kept within the limits set so that the lubrication process can run properly [1].

Figure 2. Main Oil Tank

2. Main Oil Pump

The main oil pump is a pump that is directly coupled to the HP turbine rotor [1].

Figure 3. Main Oil Pump

3. AC Pump

AC Pump is a pump that is driven by an AC motor and feeds lubricating oil to the turbine during turbine start up or during low rotation [1].

Figure 4. AC Pump

4. DC Pump

This pump is driven by a DC motor that is supplied from a battery. This pump serves to supply lubricating oil in emergency conditions, such as during a black-out, where AC voltage is lost, and is used during turbine unit shutdown. The purpose is to supply lubricating oil to each bearing to prevent damage to the unit [1].

Figure 5. DC Pump

5. Lube Oil Cooler

Main oil tank is a tank that can accommodate large amounts of lubricating oil and serves to remove gases accumulated in the lube oil tank and help the rotation of lubricating oil back into the tank. The temperature of the lubricating oil is always monitored and kept within the limits set so that the lubrication process can run properly [1].

Figure 6. Lube Oil Cooler

6. Oil Purifier System

Oil Purifier system is a tool that serves to clean lubricating oil from liquid and solid impurities in the MOT (Main Oil Tank) [1].

Figure 7. Oil Purifier System

3.0 RESULTS AND DISCUSSION

Why is the water content and cleanliness high in turbine lubricating oil? Due to a steam leak at the gland steam seal which can be resolved by adjusting the steam seal pressure so that the main steam can be held before entering the MOP (Main Oil Pump) which can cause the water content to be high. In addition, another solution is to make a steam block. Steam block functions as holding the remaining main steam that has passed the pressure steam seal.

The cause of water content can also occur due to leaks in the heat exchanger. The heat exchanger in the turbine lube oil system is called the Lube Oil Cooler. In the Lube Oil Cooler, leaks can occur which can cause mixing between oil and demin water, so the way that can be done is to block the tube that has leaked by installing a heat exchanger tube plug on both sides of the tube.

In the line oil system there are impurities, such as corrosives that can cause high cleanliness. In the line oil system, the phenomenon of corrosion is inevitable. The use of metal as an instrument and its environment that tends to be corrosive are the main causes of the need for knowledge of corrosion phenomena to overcome it. One type of corrosion that occurs is top of line (TOL) corrosion. In addition, the cause of high cleanliness can occur because Oil Medium VG 46 is not up to standard due to storage factors for months in the Oil Medium VG 46 industry which can cause sedimentation in Oil Medium VG 46. The cause of high cleanliness can occur due to MOT (Main Oil Tank) inspections which can cause dirt to enter the MOT (Main Oil Tank). Although there is low potential as one of the causes of cleanliness, there is still potential that can cause cleanliness to increase.

Figure 8. Purifier MOT Unit 3

In the purifier there is a coalescent filter and a cleanliness filter. The coalescent filter aims to separate the demin water from the oil in the MOT (Main Oil Tank), while the cleanliness filter functions as a filter for impurities in the MOT (Main Oil Tank).

Figure 9. Purifier Portable MOT Unit 3

In the coalescent filter, the normal maximum allowable limit is 500 ppm. If the water content in tribology monitoring unit 3 exceeds the normal maximum allowable limit of 500 ppm, it is necessary to filter and purify both the MOT unit 3 purifier and the MOT unit 3 portable purifier. After filtering and purifying the water content back to the normal allowable limit of 500 ppm, there is no need for additional MOT unit 3 portable purifiers or even replacing the coalescent filter. The quality of the coalescent filter can be seen from the differential pressure indicator. The differential pressure on the filter, which can be controlled with a differential pressure switch, can indicate whether the coalescent filter is clean or dirty. Similarly, if the cleanliness has exceeded the permissible limit of 18/16/13 µm, an additional portable purifier is required to assist in filtering impurities in the MOT (Main Oil Tank).

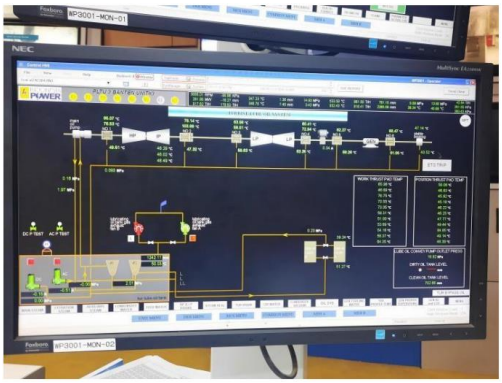

Figure 10. Turbine Lube Oil System Unit 3

The quality of filter cleanliness can be seen from CBM data in the form of tribology monitoring according to the unit being checked for filter cleanliness quality. If the quality of the cleanliness filter from the CBM data has shown a warning, then what needs to be done next, namely replacing the old filter with a new one and the mesh size is reduced. If the mesh size has been reduced but the cleanliness value of the CBM data remains high, then the solution is to find the source of the problem that can cause the high cleanliness value.

Strainer is a device used as a filter to separate solid particles that flow through the pipe. Solid particles carried by the flow are usually sand, scale, metal flakes or other solid objects that will be trapped into the strainer filter [6].

Figure 11. Strainer

The circulation filter has been designed and manufactured to meet the highest requirements in terms of quality and finish. The main feature of this filter is that the filter element cleans itself continuously, the sediment collects in a built-in chamber. The collecting chamber can be emptied during operation by automatic activation of the flush valve. Meanwhile, protective filters are filters designed to protect the purifier system itself [6].

Figure 12. Circulation Filter and Protection Filter

A coalescer or coalescing filter is a device used to separate fluid mixtures into individuals using the principle of coalescence. Coalescence is the process by which liquid molecules come together (coalesce) to form a larger whole. Coalescing filters can separate particulate components from a mixture with comparable efficiency as particulate filters [6].

Figure 13. Coalescent Filter

Figure 14. Inside of the Coalescent Filter

Figure 15. Coalescent Filter Inner Details

4.0 CONCLUSION

Steam turbines at PT PLN Indonesia Power Banten 3 Lontar POMU have specifications with type N315-16.67/538/538 made by Dongfang. steam turbines in units 1-4 have the same capacity, the total capacity of all steam turbines is 4 X 315 MW = 1260 MW.

Preventive maintenance of turbines can be pursued by implementing QCC PM. Adding a portable purifier when excessive water content occurs, adjusting the pressure steam seal serves to prevent main steam from entering the bearing area which can cause high water content due to mixing of oil with water. Making a steam block serves to prevent steam from entering the bearing area lubricated by VG 46 medium oil, causing high water content. And routine maintenance to check the mesh aims to assess the feasibility of the mesh and the suitability of the needs of the cleanliness purifier oil system which can be seen from the CBM data, namely tribology monitoring.

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