Investigation of Diode Holder Plate Damage on ATR 72 Type Aircraft for the 2022-2023 Period

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Abstract. One common problem that may occur is a short circuit or broken connection on the diode holder plate. This can be caused by wear, mechanical stress, or overuse over time. The method used in this research is quantitative-comparative research which functions to compare two or more treatments of a variable, or several variables at once. The aim of various quantitative research methods such as comparative is to see the differences between two or more situations, events, activities, or programs. In order to have a good culture in terms of engine repairs, it is better if the engine does not need to be overhauled or if it is required to be overhauled. In fact, the time is faster when the engine is not overhauled but only repaired. All components have their own repair schedule, which means they can be predicted according to their lifetime.

Keywords: Component Investigation, AC Generator, Diode Holder Plate

1 Introduction

The diode holder plate is part of an aircraft's lighting system, which is usually related to generating electrical power through a generator [1]. One common problem that may occur is a short circuit or broken connection on the diode holder plate [2]. This can be caused by wear, mechanical stress, or overuse over time [3]. Corrosion can occur on the diode holder plate if there is high humidity or if there is a fluid leak around the area. Corrosion can damage electronic components and disrupt generator performance [4]. Overheating can cause damage to the diode holder plate and the diode inside. This can be caused by excessive electrical load or inadequate ventilation around the generator [5].

[1]E. Alfianto, N. P. Y. Nurmalasari, A. Sa'diyah, A. Fatkhulloh, B. Anwar, and C. Wibowo, *KONSEP PESAWAT TERBANG*. Get Press Indonesia, 2023.
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The diode holder plate can also be damaged due to mechanical damage such as impact or excessive vibration during aircraft operation. Like other electronic components, diode holder plates have a limited lifespan [6]. Once they have passed their lifespan, they may become unreliable and need to be replaced. Repairs or replacement of the diode holder plate on the ATR 72 aircraft AC generator must be carried out by a technician experienced in aircraft maintenance. This is important to ensure that the aircraft's electrical systems function properly and safely [7]. In addition, good preventive maintenance and regular monitoring are the keys to preventing damage to the diode holder plate and other components on the aircraft AC generator. This will help maintain aircraft reliability and performance in optimal conditions. Below we will explain several diode plate holders according to the serial number on the ATR-72 aircraft AC generator in Figure 1.

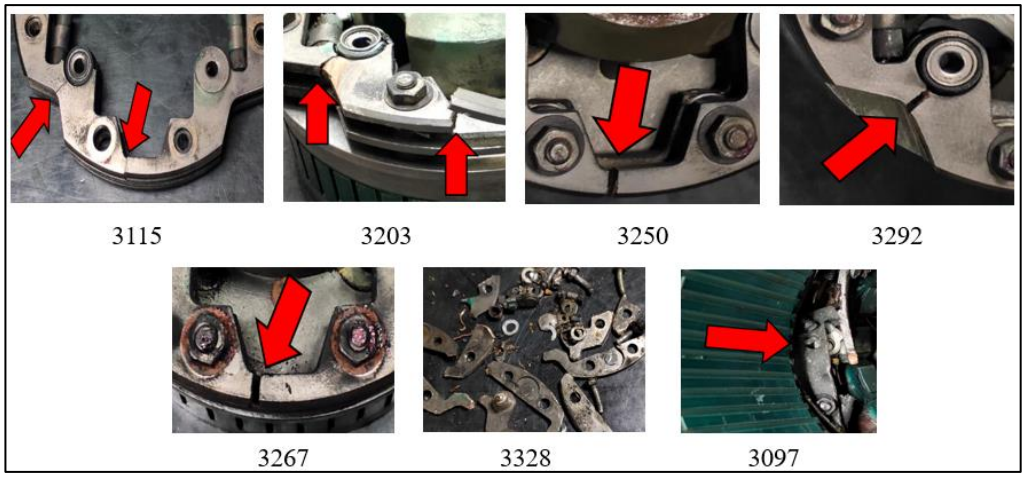

Fig. 1. Several diode plate holders according to the serial number on the ATR-72 aircraft AC generator (source: author)

This research aims to find out which AC generator repair time takes the most time during 2022-2023 on ATR-72 aircraft engines. Find out which types of AC generators 2022-2023 often undergo overhaul and repair 2022-2023 on ATR-72 aircraft engines. Find out which types of AC generators during 2022-2023 often undergo scheduled repairs or not on ATR-72 aircraft engines. The use of more advanced analytical technologies, such as scanning electron microscopy and thermal analysis, can allow researchers to more deeply understand how plate holder diodes behave during aircraft use. This can help in detecting potential problems early. The development of a more sophisticated health monitoring system can help aircraft operators detect diode holder plate problems in real time. This system can provide early warning if there are signs of damage or dysfunction [8].

[6]A. C. Muhammad *et al.*, "KONVERSI ENERGI".
[7]F. M. Dewadi, C. Wibowo, D. Mulyadi, M. Dahlan, and R. A. Nanda, *PROSES PRODUKSI MANUFAKTUR*. Get Press Indonesia, 2023.
[8]I. Santosa, A. Firdaus, R. Hidayat, R. Rusnoto, A. Wibowo, and F. M. Dewadi, "The Optimization of Vapor Compression Type for Desalination of Seawater Using the DFMA Method," *Jurnal Teknik Mesin Mechanical Xplore*, vol. 3, no. 1, pp. 1–8, 2022.

2 Method

The method used in this research is quantitative-comparative research which functions to compare two or more treatments of a variable, or several variables at once. The aim of various quantitative research methods such as comparative is to see the differences between two or more situations, events, activities, or programs [9]. The comparison looks at how all the elements in the research component are related to each other. The calculations used by various quantitative research methods such as comparative are in the form of similarities and differences in planning, implementation, and factors supporting the results [10].

3 Result

The diode holder plate is a critical part of the aircraft power generation system. They are made from special materials that must withstand harsh environmental conditions, such as extreme temperature changes, vibration, and pressure. Over time, the durability of these materials may decrease due to wear or structural damage. Aircraft overhaul is an important process to ensure that all aircraft components are in optimal condition. Regularly replacing the diode holder plate can be a preventive measure to avoid power generation system failure which could endanger flight safety. Aircraft overhaul is carried out in accordance with the maintenance schedule determined by the aircraft manufacturer or aviation authority. Diode holder plate replacement may be included in this scheduled maintenance schedule. Newer plate holder diodes may have better technology or be more efficient at generating electricity. By replacing them periodically, aircraft can benefit from improved power generation system performance. Aviation authorities regulate the maintenance and replacement of aircraft components to ensure flight safety and security. Following applicable recommendations and regulations may be another reason to replace the diode holder plate periodically. The following will explain the repair time according to the component serial number, work category, and repair conditions in table 1.

Table 1. AC Gen SN based on repair time, work category, and repair condition (source: author)

No	AC Gen SN	Repair Time (Day)	Work Category	Repair Condition
1	3097	10	Overhaul	Scheduled
2	3328	101	Overhaul	Scheduled
3	3115	17	Overhaul	Scheduled
4	3203	10	Repair	Unscheduled
5	3250	21	Overhaul	Scheduled
6	3292	18	Repair	Unscheduled
7	3267	35	Overhaul	Scheduled

[9]F. M. Dewadi, D. Dahlan, and E. Maulana, "Frame e-Bike Optimization Capacity 48V," *Journal Online Jaringan Pengajian Seni Bina (JOJAPS)*, vol. 14, pp. 129–138, 2019.
[10]C. Wibowo and F. M. Dewadi, "DESIGN PRESSURE REDUCTION SYSTEM (PRS) UNTUK COMPRESSED NATURAL GAS (CNG) KAPASITAS 30 NM3/H DALAM SISI TEKNIS DAN EKONOMIS," *TEKINFO*, vol. 2, no. 2 Juni, pp. 60–65, 2022.

Based on what is explained in Table 1, it turns out that there are components that have quite a long repair duration. Therefore, a diagnosis is needed in this case, so it is important to remember that long-term damage will have an adverse impact. The following will explain the repair period in Figure 2.

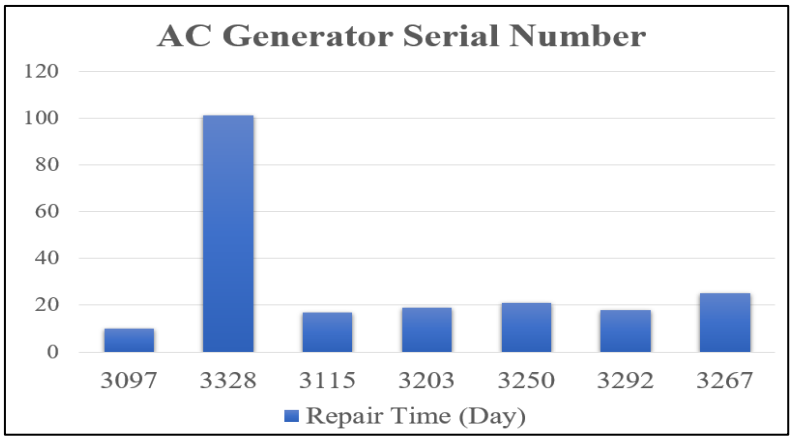

Fig. 2. Repair time based on AC generator serial number (source: author).

By referring to the author's notes regarding several references from catalogs and the like, references were obtained from maintenance component manuals with problems of damage from the impact of abnormal vibrations resulting in noise which was a source of failure due to unbalanced rotors and damaged ball bearings. Thus, it is necessary to replace the rotor equipped and replace the ball bearings so that the damage in this case can be resolved. The following will be explained in table 2 regarding fault isolation.

Table 2. Fault Isolation (source: author)

FAULT	POSSIBLE CAUSE	CORRECTION
The AC GENERATOR does not start	Main stator cut off.	Replace the stator.
	Short circuit of the stator	Replace the stator.
	Stator of exciter cut off	Replace the stator exciter.
	Connection in the rotor cut off.	Replace the rotor equipped.
	Stator of PMG cut off.	Replace the stator of PMG.
	Current transformer cut off.	Replace the stator.
	Torque shaft broken.	Replace the torque shaft.
	Feeders or connectors disconnected.	Verify the electrical connections.
	Fault on diode.	Replace the rotor equipped.
Abnormal vibrations and noises	Unbalanced rotor.	Replace the rotor equipped.
	Ball bearings defective.	Replace the ball bearings.
Abnormal voltage values across	Partial short circuit of the stator.	Replace the stator.
AC Generator terminals.	Stator voltage unbalanced.	Replace the stator.
	Fault of excitation.	Replace the rotor equipped.
	Partial short circuit of exciter stator	Replace the rotor equipped.
Overheating	Ball bearings defective.	Replace ball bearings.

4 Conclusion

In this research, the AC generator SN 3328 took the longest to repair because it took 101 days. In order to have a good culture in terms of engine repairs, it is better if the engine does not need to be overhauled or if it is required to be overhauled, just carry out more diagnostics so that it doesn't take time to work, in fact, the time is faster when the engine is not overhauled but only repaired, for example on AC generator components. SN 3203 and 3292 which are quite short repairs. All components have their own repair schedule, which means they can be predicted according to their lifetime. However, it is very unfortunate that this is not always appropriate, even though some parts experience unscheduled replacement, such as AC generators SN 3203 and 3292.

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