GENERATOR SET MAINTENANCE ANALYSIS IN SIMALUNGUN CITY HOTEL

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Abstract

The need for electrical energy at Simalungun City Hotel is very high, especially to support all hospitality activities and activities. Therefore, if the electricity goes out, all activities at Simalungun City Hotel will be disrupted. For this reason, it is necessary to have other energy reserves that can replace electricity from PLN when there is a blackout. This energy reserve is obtained from the Generator Set installed at Simalungun City Hotel. In use, the Generator Set (Genset) needs to be maintained and cared for regularly to minimize damage, extend service life and so on. From the results of the research conducted, it was found that the generator set maintenance procedures at Simalungun City Hotel had been properly stated in the Genset maintenance SOP at Simalungun City Hotel. In addition, the level of generator fuel use at Simalungun City Hotel during the study period was 300 liters, where the average hourly use of fuel was 30 liters. So that the level of Genset fuel usage at Simalungun City Hotel is included in the very efficient category when compared to the tables for Genset usage efficiency in general.

Keywords:Backup energy, Generator Set, Maintenance, Simalungun City Hotel

INTRODUCTION

Background

The provision of electrical energy is needed by companies or industries in running their business. The main supply of electrical energy, namely PLN, is very influential in the provision of electrical energy for the community. Electrical energy from PLN is not always distributed continuously, one day there will be a blackout from PLN, which is why it is necessary to provide backup electrical energy, one of which is a Generator Set.

Simalungun City Hotel is one of the users of electricity provided by PLN. Simalungun City Hotel is a four-star hotel which was established on November 28, 2011 on Jalan Sutomo Griya Hapolakan Raya.

The need for electrical energy at Simalungun City Hotel is very high, especially to support all hospitality activities and activities. Therefore, if the electricity goes out, all activities at Simalungun City Hotel will be disrupted. For this reason, it is necessary to have other energy reserves that can replace electricity from PLN when there is a blackout. This energy reserve is obtained from the Generator Set installed at Simalungun City Hotel.

This generator will provide electrical energy as a substitute for the main electrical energy (PLN) in the event of a disturbance or blackout. In use, Gensets need to be maintained and cared for regularly to minimize damage, extend service life and so on.

Based on this background, a Final Project was created entitled ". ANALYSIS OF GENERATOR SET MAINTENANCE IN SIMALUNGUN CITY."

Objective

1. To find out the Genset maintenance procedures at Simalungun City Hotel
2. To find out whether generator maintenance at Simalungun City Hotel is efficient or not

LITERATURE REVIEWS

Basic Theory of Generator Set (Genset)

Generator Sets image

Generator Set or commonly abbreviated as Genset, is a tool/machine that is assembled/designed/combined into one unit, namely:

1. Propulsion Machine / Engine as a converter of energy from fuel, water, gas, air and so on into motion energy.
2. Generator / Alternator itself As a converter of motion energy into electrical energy.

These two components are combined so that they can produce electrical energy. The engine is the rotating device while the Generator/Alternator is the power generating device. The engine can be a diesel engine with diesel fuel or a gasoline engine, while the generator/alternator is a copper coil or coil consisting of a stator (static coil) and a rotor (rotating coil).

A combination device between a generator (generator) and a propulsion engine combined in a set of units to produce electricity. The propulsion engine in Genset is generally an internal combustion engine in the form of a motor / diesel engine with diesel fuel and an engine with gasoline fuel. Genset is a form of power plant where as the main mover (prime mover) is a diesel engine that is connected (coupled) with an electric generator in one base (base frame) that is sturdy and properly installed so that it can be operated properly. As a power plant unit driven by a diesel engine, it has parts and systems that are closely related to each other.

Types of Machines used in Generators

Genset engines as mentioned above use various types of engines. Among them:

1. Gasoline Engine.
   Gensets that use gasoline engines generally have a low power capacity. And usually it is limited to producing a maximum power of up to 10 Kw. Usually it uses a 1-cylinder engine in line with 1 spark plug and has a portable shape so you can take it anywhere.
2. Diesel engine.
   Diesel engines as power generators are very common everywhere. Diesel engine applications that are used as generator engines have a wide power range. Starting from an output capacity of 5Kw to 2MW. Diesel engines used as generators of this kind have various technical and development specifications. The number of cylinders ranging from 2 cylinders to 16 cylinders. In Indonesia, the most common diesel fuel is diesel.
3. Gas engine
   As the name implies, gas engines use gas fuel as a resource for consumption. The gas engine is the result of modern human thinking that realizes that the availability of petroleum fuels throughout the world is dwindling. So for that we need an alternative to fuel, namely gas. The gas used is processed from natural gas.
4. Turbine Engine
   Gensets that use turbine engines can already be categorized as Power Generators. Generally have a capacity above 2MW. A generator with a turbine engine can light up a small town. A turbine is built with careful calculations and adapted to the conditions and circumstances around it.

Diesel engine

The diesel engine is a special type of internal combustion engine, as the name implies internal combustion engine is a heat engine in which the chemical energy of combustion is released in the engine cylinder. The characteristic of a diesel engine that distinguishes it from other combustion engines is the method of ignition of the fuel. In a diesel engine, fuel is injected into the cylinder, which contains high pressure air. During compressed air in the engine cylinder, the air temperature increases, so that when the fuel in the form of fine mist comes into contact with hot air, it will ignite and no other external ignition device is needed. For this reason it is also called compression ignition engine. Another important characteristic of diesel engines is that they produce torque independent of speed, because a large amount of air enters the cylinder in each intake stroke of the piston, only a small amount is affected by the engine speed. Diesel engines also have more heat efficiency than other combustion engines. With less fuel for each of the same power supply and the use of fuel that is cheaper than gasoline.

How Diesel Engines Work

Prime mover or prime mover is equipment that functions to produce the mechanical energy needed to rotate the generator rotor. In diesel engines, self-ignition occurs, because the working process is based on pure air which is compressed in the cylinder at high pressure (± 30 atm), so that the temperature in the cylinder rises. And at that time the fuel is sprayed in a cylinder with a high temperature and pressure exceeding the flash point of the fuel so that the injected fuel will burn automatically. The addition of heat or energy is always carried out at constant pressure.

The gas pressure resulting from the combustion of fuel and air will push a piston which is connected to the crankshaft using a piston rod, so that the piston can move back and forth. The reciprocating motion of the piston will be converted into rotational motion by the crankshaft. And conversely the crankshaft rotational motion is also converted into reciprocating motion of the piston on the compression stroke.

Genset Function

1. In general

   The function of the Genset is a tool to generate electricity. One of the driving engines is Diesel, it can also use gasoline or gas. Generators can generate electricity independently without being connected to the power grid. Gensets can generate a large amount of power, but like all mechanical items, they are prone to breakdown and require repair. Generator repair can disrupt daily activities, but is an important part of owning and operating a generator.
2. In particular

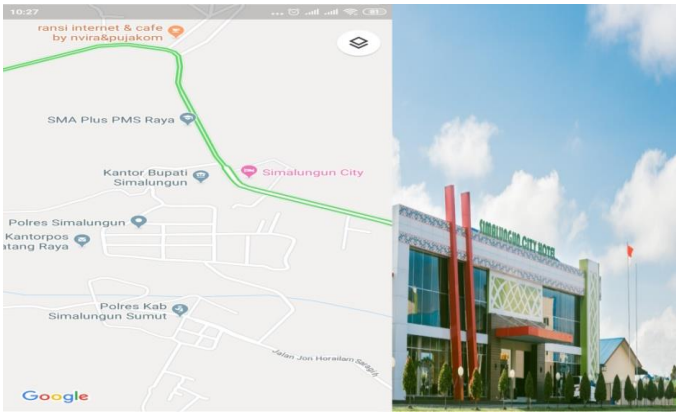
   This generator function will provide electrical energy as a substitute for the main electrical energy (PLN) in the event of a disturbance or blackout

How the Genset Machine Works

The generator works for 10 seconds when the power goes out, 10 seconds after that the electricity is switched to the generator, at that time the lights can come back on. The way the generator generator works, which provides electricity after 20 seconds, is supported by the AVR (Automatic Voltage Regulator). Inside the AVR, there is a Mutual Reactor (MT), which is a kind of CT (Current Transformer) type transformer that produces an electric current based on the amount of load current passing through it (in series circuit). The resulting electric current is used to strengthen the magnetic field in the rotor winding. So for a large load, the resulting current is also large. However, to maintain the stability of AVR, not only with AVR,

METHODS

Research Place



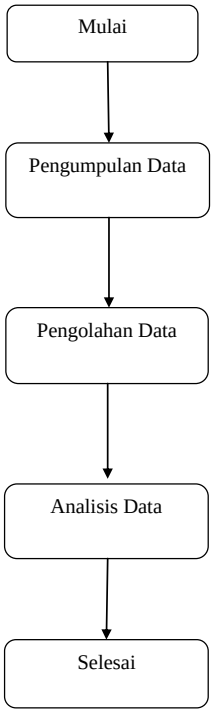
Simalungun City Hotel pictures

The research was conducted at Simalungun City Hotel, Simalungun Regency, Simalungun City Hotel is a four-star hotel which was established on November 28, 2011 on Jalan Sutomo Griya Hapolakan Raya.

Research time

The research was conducted from July to September 2019.

Research Flowchart



Research Flowchart Image

Early Stages of Research

The initial stages of the research began with direct observation at the Simalungun City Hotel and conducting interviews with the company. Preliminary observations were made in the maintenance department (machine maintenance section). The results of these initial observations will be used to conduct further research by applying appropriate research methods.

Interviews or questions and answers with the company were also conducted to complement field study activities and identify general conditions that occur in machine maintenance activities as well as obtain other information. This effort was made in order to see the existing problems more clearly. The next activity is conducting a literature study that aims to find references as well as information and theories that can support the implementation of research. The formulation of the problem is based on a preliminary study of the object of research and a study of the literature on the problems encountered. Observations in the field and interviews with the company will obtain conditions that can identify the problem. The next step is to define the problem, namely determining the boundaries and assumptions of the problem.

Data Collection Stage

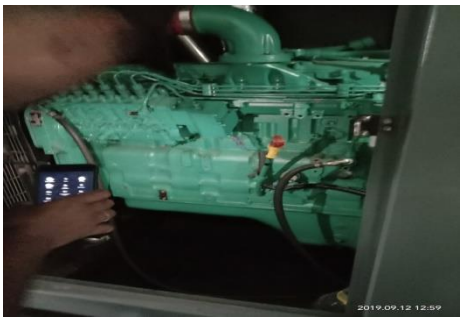
Data collection was carried out by observation and interview methods. Observation is a data collection activity by making regular direct observations to the Genset Simalungun City Hotel room.

The interview is a direct question and answer activity conducted by the researcher to the maintenance staff at Simalungun City Hotel regarding the object of research. Tools to support observation activities are observation data sheets, ballpoint pens.

In this study, researchers took primary data and secondary data from the company. Primary data is in the form of preventive maintenance work list data, number of technicians, number of machines, spare part data etc. Secondary data includes preventive maintenance schedule data, tables, work time, machine specifications etc.

RESULTS AND DISCUSSION

Genset at Simalungun City Hotel



Genset Visual Inspection

Visual maintenance will tell you about the general condition of the engine. This will help identify engine problems before engine damage occurs. The purpose of this visual inspection is to identify damage before it becomes more serious damage.

Generator Set Operation

Things to Pay Attention to in Genset Operations

Genset as an electric power generator has its own specifics in its operation. The generator should have been operated under ideal conditions so that the generator can operate normally and generate optimal electrical power. However, sometimes the generator operates in conditions that are less than ideal, such as the position or position that is unstable, the room does not have good ventilation, excessive load or anything else caused by circumstances or due to ignorance of the owner of the generator about important things that need to be known. and fulfilled in generator operation.

Genset Fuel Usage Efficiency at Simalungun City Hotel

From the table it can be seen that the total blackout period 08/07/2019 to 03/09/2019 was 10 hours. PLN's power outages are not every day, but only 21 days in that period. Then the use of diesel generators in Simalungun City Hotel according to the fuel consumption determination factor (Chapter II 2.11) is:

Average outage is 10 hours/21 days = 0.48 hours (28.8 minutes) a day

0.21 x 322 kVa x 0.48 = 32.5 liters /0.48 hours

For 1 hour of use requires:

0.21 x 322 kVa x 1 = 67.62 liters/hour

When compared with the Fuel Usage table (Chapter II 2.11) for generator engines up to full loading which requires 72.88 liters/hour, the Simalungun City Hotel Genset is in the efficient category.

CLOSING

Conclusion

Based on the results of the research and discussion conducted, several conclusions are obtained as follows:

1. Generator Set maintenance procedures at Simalungun City Hotel have been properly stated in the Genset maintenance SOP at Simalungun City Hotel. The SOP has been explained in the Discussion Chapter 4.1.4
2. Based on maintenance results data in table 4.3, the level of fuel use for generators at Simalungun City Hotel during the period 08/07/19 to 03/07/19 was 300 liters, the use per hour was 30 liters

   When compared from the efficiency table in chapter 2 the use of fuel is 68 liters/hour, the level of fuel use for generators in Simalungun City Hotel is in the very efficient category.

Suggestions and Acknowledgments

1. Generator damage/disturbance data history, operational data such as operating hours and refueling at Gensets in Simalungun City must be written down so that when outside researchers come, the required data can be obtained properly
2. For future researchers, it is not limited to maintaining efficiency values but can be further developed to cost efficiency and so on.

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