

Design Of Backup Power Source Using Genset At Bogor Academy Of Technology

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ABSTRACT

The Design of Backup Power Sources Using Generators with a capacity of 3500 VA is operated as a backup of electrical energy in emergency conditions. The use of generators anticipates if there is a blackout of the main power supply (PLN). For electrical energy needs, a backup supply of electricity is needed in these conditions. The purpose of the study was to determine the design of a backup power source using a generator at the Bogor Academy of Technology. This design includes making circuit design drawings, determining and procuring components, installing and assembling processes, until the last stage is testing the function of the tool. The results of this study indicate that the design of the panel device made can operate properly and is in accordance with the plan. The results of testing the function of the panel device by manually operating and being able to divert electrical power from the main power source (PLN) to the generator within 5 seconds or according to the timer settings.

Keywords: design, generator set.

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History of Article: Received: July 2022. Revision: August 2022. Published: September 2022.

Introduction

When there is a sudden power outage or rolling blackouts from the local PLN, it will certainly cause problems for the surrounding community. The blackout can cause problems for someone or the local community. Both from office workers to housewives will have their activities or routines disrupted. They cannot do their usual work. These activities are due to power outages especially if the blackout lasts for days. However, in the era of globalization now the problem of power outages has a solution even though it is temporary. Technology has developed rapidly and helps humans now. Electricity is one of the sources of energy that is needed in human survival, and from this, humans always try to find out how to use it. From this, humans always try how to create this energy source.

The power outage can be overcome with other alternative technologies, for example generators. Utilization of generators as an alternative to electricity in the community is common, although only used by certain people or offices. Genset or generator set is a tool that converts mechanical energy from diesel engines and alternators into electrical energy with gasoline fuel. Seeing the condition of electricity in the Bogor Academy of Technology building which sometimes experiences sudden blackouts.

The formulation of the problem in this research is how to design a backup power source using a generator set at the Bogor Academy of Technology. The purpose of the study was to determine the design of backup power sources using generators at the Bogor Academy of Technology.

Design is a process for defining something that will be done using various techniques and involves a description of the architecture and details of the components and also the limitations that will be experienced in the process of working on it. Based on some of the above opinions, it can be concluded that design is the stage after system analysis whose purpose is to produce a design that meets the needs determined during the analysis stage.

Things that are considered in the Design of Genset Installation In the design of the generator installation at the Bogor Academy of Technology, it is necessary to consider the following things:

1. Frequent and sudden power outages
2. Actual Load Condition

3. Phase Load Balance (R,S,T) on the administration panel / office
4. Power required
5. Genset capacity that will be used to supply electricity
6. Planning the installation of handle cam switch / COS (change over switch)
7. Maintenance of electrical equipment

The working principle of the generator is in accordance with Lenz's law, namely the electric current given to the stator will cause an electromagnetic moment that is against the rotation of the rotor, causing EMF in the rotor coil. This EMF voltage will produce an anchor current. So the generator as a prime mover will rotate the generator rotor, then the rotor is given excitation to cause a magnetic field that intersects with the conductor on the stator and produces a voltage on the stator. Because there are two different poles, north and south, the voltage generated on the stator is alternating voltage.

Genset (Generator set) is a combination device between a power plant (generator) and a driving machine that is combined in one set of units to produce electric power. The driving engine in the generator set is generally an internal combustion engine in the form of a motor / diesel engine with diesel fuel and an engine with gasoline fuel. While the generator is a device that converts mechanical energy into electrical energy. The working principle of the generator uses the principle of Faraday's experiment, which is to rotate the magnet in the coil or vice versa, when the magnet is moved in the coil, there will be a change in magnetic force flux (change in the direction of distribution of the magnetic field) in the coil and penetrates perpendicular to the coil so as to cause a potential difference between the ends of the coil (which generates electricity).

The working principle of a generator is that a combustion engine (diesel engine or gasoline engine) will convert fuel energy into mechanical energy, then the mechanical energy is converted or converted by a generator to produce electrical power. Generators have two types, namely AC generators or commonly called alternators and DC generators. AC generators (alternators) are generators that produce alternating electric current (AC), while DC generators are generators that produce direct electric current (DC). Actually, AC generators have the same working system as DC generators, which produce electricity from electromagnetic induction, besides that both AC generators and DC generators actually basically produce alternating electric current.

However, AC generators and DC generators have differences in their construction design. DC generators use a split ring or what is commonly called a commutator that acts as a rectifier, so that the current produced by the DC generator is direct current (DC). Meanwhile, the AC generator (alternator) uses two slip rings to produce alternating current.

Genset function Genset (generator set) is commonly used to generate alternative electrical power, such as when the supply of electrical power supply from the power generation industry goes out / off, or circumstances where there is no power grid supply in the area, or also commonly used when additional electrical power is needed.

The work of installing the handle / COS panel can be carried out after the installation of the generator or the placement of the handle / COS panel can be installed adjacent to the generator (in R.Genset) this is to facilitate inspection and supervision in the implementation of the operation of the generator and the working system of the handle / COS panel.

While the SDP (Sub Distribution Panel) is installed adjacent / side by side with the main panel (LVMDP) for taking and transferring the distributed voltage from LVMDP with a connection system between the overall load served from PLN sources and loads that require backup energy where when the PLN power supply is off / interference, this load should not stop too long and is expected to operate continuously.

Research Method

The installation of components in this installation tool aims to place properly and proportionally the components in the panel. In addition, with various considerations the right installation becomes the main thing so that the panel components are more neatly arranged. In installing and assembling the panel device, the capacity of the engine (generator) that will be used in the system must be considered, so that the selection of components in the device can be done with technical considerations. components in the device can be done with technical and economic considerations tailored to the desired work specifications.

To run a genset there are several things that must be considered in determining the genset and as needed, as well as the place where the genset will be used. In this study, to design a generator installation device with a capacity of 1500 VA, it requires material components and supporting tools.

Testing was carried out in this study manually. Manually how to position it is in the manual position to find out whether the designed system can function optimally.

Testing is also done by calculating the out put capacitor of the generator for each part. Testing of this storage load can help to ensure that the generator can be fully utilized optimally and know the point of the generator power storage limit. While testing is required to gradually increase the KW load at each KW load, it is better to record it so that any damage or problems that occur can be identified.

The backup electrical installation circuit is made by connecting the generator to the PLN electrical panel. The storage position of the generator is at the back and the storage position of the PLN panel is at the front. This is quite difficult because the distance between the generator and the panel is quite far. For more details of the circuit used can be seen in the following figure

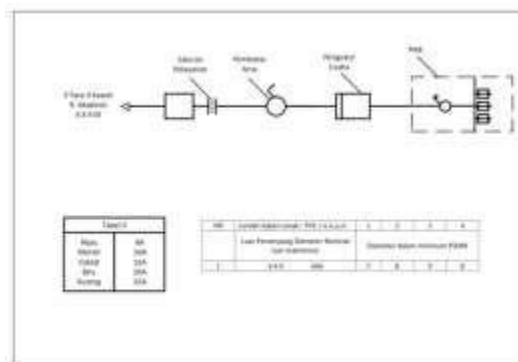


Figure 1. Electrical Circuit Wiring Diagram

In the condition of the electric power source from PLN working normally the electric power flows from the PLN source through MCB-PLN. In the condition of the electrical power source from PLN goes out will turn on the generator. In the condition of the electric power source from the Genset has been turned on then the PLN electricity is cut off. Electric power flows from the generator through the MCB-Genset activates to supply to the load. In the condition that the electrical power source from PLN turns on again, it is cut off and the generator turns off. Electrical circuitry is made by combining various tools such as:

1. Box Panel

Box Panel is the outer part of the panel that functions as a place of the panel circuits themselves. This Panel Box is made of metal, therefore in the panel circuit is given a ground to be safe for the user.

2. Push button

Push buttons or called ON / OFF switches are widely used as a means of connecting or disconnecting the control circuit. Has two contacts, namely NC and NO. This means that when the switch is not used one contact is connected Normally Close, and the other contact is Normally Open. When the contact is manually pressed the condition reverses position to NO and NC. Push buttons are the most common form of switches from manual controllers found in industry. The NO (Normally Open) push button connects the circuit when the button is pressed and returns to the disconnected position when the button is released. The NC (Normally Closed) push button will disconnect the circuit when the button is pressed and return to the connected position when the button is released.

The type of circuit used is 1 phase. With the type of electrical circuit used is a series circuit. The installation of components in this tool aims to place properly and proportionally the components in the panel. In addition, with various considerations the right installation becomes the main thing so that the panel components are more neatly arranged. In installing and assembling panel devices that must be considered the capacity of the engine (generator) that will be used in the system, so that further selection of components in the device aims to place properly and proportionally the components in the panel. In addition, with various considerations the right installation becomes

Result

The working principle of a generator set is that a combustion engine will convert fuel energy into mechanical energy, then the mechanical energy is converted or converted by a generator to produce electrical power.

Genset (generator set) is commonly used to generate alternative electrical power, such as when the supply of electrical power supply from the power generation industry goes out / off, or circumstances where there is no electricity network supply in the area, or also commonly used when additional electrical power is needed.

Genset (Generator Set) is a backup power generation tool that uses kinetic energy. Generators are also usually used as a substitute for the main electric power in the event of a short circuit or power outage, the generator will help to turn on the electricity.

The design of tools and installations to determine whether or not it functions manually is tested. Testing is done by calculating the power capacitor and out put. Calculations are made at various points.

main thing so that the panel components are more neatly arranged. In installing and assembling panel devices;

1. Calculating the installed power capacitor Parking Installed Power Capacitor = 40 Watts X 14
= 560Watt

Genset Out Put Tolerance = 560 Watt/3200 X 100%
= 17.50 %

2. Calculating Room Capacitor Power Lt 1

Installed Power Capacitor = 40 Watt X 16
= 640 Watts

Genset Out Put Tolerance = 640 Watt/3200 X 100%
= 20.00 %

3. Calculating Hallway Capacitor Lt 1

Installed Power Capacitor = 40 Watt X 8
= 320 Watt

Genset Out Put Tolerance = 320 Watt/3200 X 100%
= 10.00 %

4. Calculating Lobby Capacity

Installed Power Capacitor = 40 Watt X 10
= 400 Watts

Genset Out Put Tolerance = 400 Watt/3200 X 100%
= 12.50 %

5. Calculating Director's Room Capacity

Installed Power Capacitor = 40 Watt X 4
 = 160 Watts
 Genset Out Put Tolerance = 160 Watt/3200 X 100%
 = 5 %

Based on the calculation results can be seen in the following table:

Table 1. Out Put Genset Tolerance Calculation Results

No	Room measured	Out Tolerance Value Genset (Percent)
1	Parking	17.50
2	1st Floor Room	20.00
3	1st Floor Hallway	10.00
4	Lobby	12.50
5	Director's Room	5.00
	Total	65.00

Means the use of electrical capacity 65.00% of the electrical capacity of the generator. With the assumption of not calculating existing losses.

Manual testing is done by positioning the selector switch operation mode manual (manual position). This test is conducted to determine the performance of manual operation on the ATS device. The test procedure in manual conditions is carried out in the following way: When the PLN power source is dead or disconnected, the things that must be done on the testing device are:

1. Position the Operation Mode Selector Switch in the ATS in the manual position.
2. Pressing the ON button to start the generator set manually 3. Positioning the Power Selector Switch in the Genset position
3. When the Power Selector Switch is in the Genset position, it is as if the ATS is supplying power from the Genset source through the "Genset Contactor" When the PLN power source is turned back on, the things that must be done on the testing device are
4. Pressing the test device button in the OFF position
5. Positioning the Power Selector Switch in the PLN position.

Based on the test results on the use of generators in the table above, the capacity of the new generator used as much as 65%, then the remaining percentage of unused generator use is $100\% - 65\% = 35\%$.

If the capacity is 3200 VA, then the new used $65\% \times 3200 \text{ VA} = 2,080$

VA.

The generator capacity load referred to the generator circuit is the load lighting in the parkir room, 1st floor, 1st floor hallway, lobby room and director's room. Overload safety equipment is briefly connected to the panel. Under normal conditions where the load gets a voltage supply from PLN, the NC contact (normally closed) contactor is in a closed / connected condition, while the NO contact (normally open) contactor is in an open / unconnected condition, because the separation of the installation between the PLN network and the generator set always occurs with the component. Based on the results of monitoring and observation, the electrical circuit system for 3500 Va generator runs well. This can be seen in the following observation data:

Table 2. Results of Observation of Electrical Circuit of Genset

System	Components	Current condition
Electrical system	Wiring	Functioning well
	Stater motor	Functioning well
	Altenator	Functioning well

Conclusion

Based on the above discussion, it can be concluded as follows: Genset (Generator Set) is a backup power generation tool that uses kinetic energy. The components that make up a system are connected in series. The capacity of the new generator used is 65%, then the remaining percentage of unused generator usage is $100\% - 65\% = 35\%$. Capacity 3200 VA, then the used $65\% \times 3200 \text{ VA} = 2,080 \text{ VA}$. Components and cables in the electrical system are damaged and disturbed and need to be checked and repaired.

Refrence

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