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Optimizing System Efficiency: Exploring User-Driven Generator Load Moderation for Academic Inquiry

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Abstract— Now a days demand of power supply increasing day by day. In our college, Generator supply the power in the absence of power from grid or electricity board. due to increasing load demand, generator is not able to operate efficiently so the need of load management accomplished by disconnecting heavy loads.

In our project we are use solid state relay (SSR) to optimize the heavy load only when grid power available. Even when grid power, heavy loads can be disconnected by toggle switch manually based on the load consumption and demand. To energize the SSR, the dc supply from SMPS sent through telephone wire which has 7 port, 1 common port, to connect more number of loads

So through this project, giving solution for the above discussed load problem while using generator, and also able to increase life and efficiency of generator and utilizes load efficiency in grid power supply also.

Keywords—SSR, Generator Load, Load Management

I. Introduction

In this project we sharing the load on grid power by this project model. To reduce the maximum demand of the college. In coming chapters, the various types of electric component discussed for the load management like. SMPS, Toggle switch, SSR, Thermal paste, LED to make this project of load management.

The SMPS for converting the incoming 1-PHASE 230 V, 50HZ supply that is coming to the grid to the 12 V dc power to give the dc supply to the SSR. And the toggle switch in between the SMPS to SSR used for the operating the heavy load by manually.

Then, telephone wire to connect the SMPS output port to SSR input port that's carrying DC supply. Finally, SSR connected after these components to run the heavy load only on the grid power. The SSR will be block the generator power it only allows the grid power to the load.

The coming chapters deals the estimate of the project, working and future scope etc. economically also beneficial and can be used malls, complex, restaurants etc.

II Proposed Model

Figure.1: proposed model

III Block Diagram

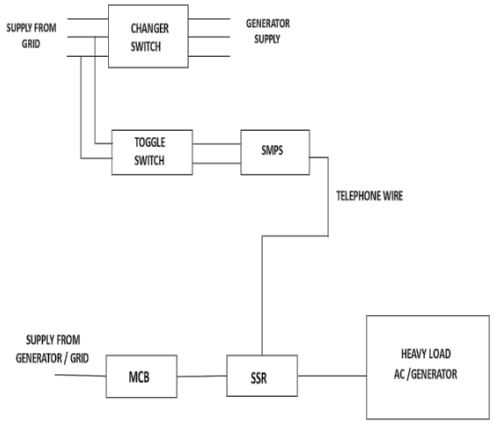

Figure.2: Block Diagram

The block diagram explains the overall process and connection. The heavy load operated only through the Grid power not by the generator power using the solid state relay (SSR) which is connected through SMPS to grid before change over switch. Toggle switch helps the manual operation of SSR in the time of needs to run the load even using power from the generator. The SMPS and SSR connected through telephone wire for multiple inputs purpose.

IV Material Costing & Estimation

The materials for this project are listed below.

S.NO	MATERIAL	QUANTITY
1	SSR90A	1
2	SSR50A+SMPS	1
3	Thermal paste	1
4	Toggle switch	1
5	Heat sinks	2
6	Telephone wire	-
7	LED	2
8	Wire	-

MATERIAL	COST (in Rupees)
1. SSR90A	1140
2. SSR50A+SMPS	1063
3. Thermal paste	175
4. Toggle switch	133
5. Heat sinks	598
Total cost	3109

V Components Used in Project

5.1 SSR90A & SSR50A

A solid-state relay (SSR) is an electronic switching device that switches on or off when an external voltage (AC or DC) is applied across its control terminals. A Solid-State Relay (SSR) is a relay that does not have a moving contact. In terms of operation, SSRs are not very different from mechanical relays that have moving contacts. SSRs, however, employ semiconductor switching elements, such as thyristors, trials, diodes, and transistors.

SSRs turn ON/OFF signal, currents, or voltages electronically by the operation of these electronic circuits. Mechanical relays have contacts and use electromagnetic force to

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mechanically open and close the contacts to turn ON/OFF signals, currents, or voltages.

Figure.3: SSR Module

5.2 SMPS

SMPS (Switched-Mode Power Supply) transfers power from a source — usually an AC outlet — to a DC device. What sets the SMPS apart is its ability to regulate the output voltage. It can increase or decrease the output voltage to maintain a constant output regardless of changes in load.

Figure.4: SMPS

5.3 THERMAL PASTE

Thermal Paste is a silvery-gray substance that you apply to a processor before installing a cooling solution. It allows for an efficient transfer of heat from the IHS of the processor to the base plate or water block of the CPU cooler that is designed to dissipate that heat.

Figure.5: Thermal paste

5.4 TOGGLE SWITCH

A toggle switch is designed to provide a path for current to flow through, either turning on or turning off (breaking or making a circuit). Toggle switches are operated by hand, usually, a small lever flicked up or down, left or right.

Figure.6: Toggle switch

5.5 HEATSINKS

A heat sink is a passive heat exchanger that transfers the heat generated by an electronic or a mechanical device to a fluid medium, often air or a liquid coolant, where it is dissipated away from the device, thereby allowing regulation of the device's temperature.

In computers, heat sinks are used to cool CPUs, GPUs, and some chipsets and RAM modules. Heat sinks are used with high-power semiconductor devices such as power transistors and optoelectronics such as lasers and light-emitting diodes (LEDs), where the heat dissipation ability of the component itself is insufficient to moderate its temperature.

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Figure.7: Heatsink

5.6 TELEPHONE WIRE

Most telephone wire are one or more twisted pairs of copper wire. The most common type is the 4-strand (2 twisted pair). This consists of red and green wires, which makes a pair, and yellow and black wires, which makes the other pair.

Figure.8: Telephone Wire

5.7 LED

A light-emitting diode is a semiconductor device that emits light when current flows through it. Electrons in the semiconductor recombine with electron holes, releasing energy in the form of photons. The color of the light is determined by the energy required for electrons to cross the band gap of the semiconductor.

Figure.9: LED

VI Advantages

It gives you access to generator control functions and operational data and helps to manage your generator(s) efficiently. This system also helps you to efficiently allocate resources for refueling and maintenance of generator(s). This reduces costs and prevents network downtime. If you have an engine problem, your internal engine light comes on to warn you that there is a problem, so you can be proactive in fixing it. For the same reason, being pro-active, is why you need to have your system monitored.

It ensures maximum reliability for you, your company and your customers. Generator maintenance is essential to the proper functioning of a system, while also minimizing the risk for accidents, damage, and more costly repairs down the line. Additionally, routine maintenance helps to ensure that your generator will run smoothly and efficiently during a power failure.

VI Conclusion and Future scope

This project deals a method to handle the time of peak load which parallel affecting generator and grid power quality. By using SSR the disconnecting and operating based on the need and load demand while power supplied by generator.

The manual operation in time of grid supply done by toggle switch, if any special case to consider toggle switch can be utilized additionally for the special purpose.

The telephone cable making no of connection increasing, will reduce the no of conductor usage and capable to operate in the case of SSR. For extension the flexibility can be given domestic or commercial purposes.

However in our campus, one of the main load AC now tested to manage the load to increase the life time and efficiency of generator. Meanwhile to reduce the consumption and utilize the grid power without exceeding the fixed usage limit

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