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A REVIEW ON AUTOPHASE CHANGER

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ABSTRACT

A phase selector is a mechanism used to change or switch power phases in relation to the availability of power in one of the phases. For decades, phase failures in power supply phases were common, requiring manual switching of fuses from one phase to another. However, this paper focuses on the design of phase selectors that use an automatic switching mechanism. During operation in the event of a grid failure on power supply from the public grid, this diverts consumer loads to available power sources, automatically detects when power supply is restored during the failure phase, and restores load to this source. During the course of this construction, several tests were performed, including continuity testing of contactors and relay coils for low resistance, continuity testing of contacts of materials used for free current flow, conductivity testing of wires, and the overall system simulated. Using the electronic software Proteus.

Keywords: Conductivity, Power, Phase, Voltage.

I. INTRODUCTION

The goal of all utility companies is to ensure a continuous, efficient and reliable supply of energy to their consumers. If this target is not met, the electricity supply tends to be unstable, which is evident in underdeveloped and developing countries like Nigeria. These regions experience power fluctuations, phase interruptions and even complete failures, which adversely affect economic development. Most of the time, electrical equipment damage and downtime occurs in commercial and residential homes as a result of the epileptic nature of power supplies. However, the need to automate phase changes (in the event of a phase failure) between the main and alternate power sources to ensure safe operation of these devices, optimal system performance, and mains reliability and continuity. is rising. channel (power failure). Secure mains power. Electricity plays a very important role in the socio-economic and technological development of every country. According to [1], electricity demand in Nigeria far exceeds supply, and supply is epileptic in nature. The availability of a stable and stable electricity supply drives economic and infrastructure development, wealth creation, employment opportunities, and human/capital development in any country[2]. Its wide range of applications can be found in industrial, commercial, and domestic appliances such as water heaters, water pumps, radios, televisions, fans, etc., depending on the utility power supply where there are technical problems in generating, transmitting, or distributing electricity. You can According to [3], Nigeria's power supply is characterized by frequent blackouts and load shedding. 3-phase is not available or 3-phase power is not balanced (undervoltage or overvoltage). This has led Nigerians to look for alternatives to intermittent power sources to improve reliability and availability. , and began to buy inverters, increasing the number of power supply channels. The need to carefully and smoothly select a single channel at any given time to supply load without notice of failure is paramount. Therefore, an intelligent circuit is required. Many manufacturers that use single-phase equipment in their operations sometimes face problems with unbalanced voltages, overloads and undervoltages on the public power supply, thus wasting time in the switching process. Also, most homes, offices, churches, etc. that use single-phase power units from public distribution lines are often out of phase or undersupplied and the phase is manually changed. However, during such a phase change many inconveniences can occur, resulting in damage to equipment and system processes and procedures. With automatic phase selectors and switchers you can overcome all these limitations. With the above considerations in mind, this work used the characteristics of the microcontroller and other supporting components to design and

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implement an automatic phase selector and switch. The design is an efficient system that accurately selects the optimum voltage/phase based on programmed logic, so that the load is supplied with the healthiest phase available from the utility grid at all times, while alternate channels are occupied. done or just switched. load in the event of a complete blackout. The system provides single phase via relays from available channels. The logical heart of this circuit, the microcontroller, detects the three phases through the downlink network. Note that this programmed switching and phase selection completes in a few microseconds without blackout.

Objective

This is an Arduino controller-based unit, used with a 3-phase power supply. When power is lost on one or two phases of a three-phase line, the APS system automatically redistributes power from the active phases to the failed phases. This ensures continuous power delivery through all three phases even if one phase is active. The purpose of this project is to power a single-phase load from one of the active phases of a three-phase power supply. This project will improve reliability where continuous power supply is required.

Detailed methodology on how the project will be carried out

All domestic consumers are mainly connected to single phase power supply, and in the event of a blackout or failure, electricity will be available on the other two phases, but , cannot be used. The use of this electricity and its surrounding energy requires manual operation, is prone to fire hazards, and is unreliable. Therefore, we need automatic switching from one phase to another, made possible by this "AUTOMATIC PHASE CHANGER". As already mentioned, when switching from one phase to another, manual operation is not suitable as it is a 3-phase 415V power supply and may cause a fire. It is also not possible to manually change it at any time, as it is difficult to recognize the phases of the power outage. Therefore, instead of manual manipulation of phase change, automation performed by "AUTOMATIC PHASE CHANGER" is required. It will automatically switch to the phase where power is available. Our goal is therefore to design a circuit called an automatic phase changer or selector.

II. LITERATURE SURVEY

In most of the applications, if low voltage is available in any one or two phase and you want your equipment to work on normal voltage, this circuit will solve your problem. The automatic phase changer was made from electronic components which includes; microcontroller, buzzer, resistor, 16X2 LCD, relays, bridge rectifier, crystal oscillator, capacitors, transformers. Results obtained during the test shows that , whenever the system senses a higher voltage across the three inputs and then engages the load .there are many designs and prototype systems that can perform almost similar functions like, single phase changeover switches two phase automatic transfer switch ,three phase automatic change over switch ,but this prototype is about an automatic phase switch over (phase selector) which is designed for only three phase A.C input power to single phase output application . The system is high complexity in “automatic voltage regulator” using ac voltage.

Su Chen, GCza Jobs [1] The growing concerns regarding electric power quality and availability have lead to the investigation of solutions to eliminate or mitigate the problems created on critical loads by faults in distribution systems. Series and shunt inverters have been proposed and used for this purpose. This document describes and compares the potential of D-STATCOMs and DVRs to provide these features. It introduces a compensator rating factor that defines the compensator's ability to support the load voltage in the presence of single-phase and three-phase faults. The algorithms necessary to implement voltage hold are derived, and alternatives including the use of sequenced components and direct voltage regulation are described.

Anu P, Divya R, Dr. Manjula G Nair [2] Most of these loads consume more reactive power, which increases feed-in losses and reduces the effective power flow capability of the system. To do. This document presents a STATCOM-based controller for a three-phase system feeding a single-phase load. The goals of the controller in the system are to compensate for inductive loads to achieve a near unity power factor, to cancel the effects of unbalanced loads to balance the source current, and to reject load harmonic currents to eliminate sinusoidal to form the supply current. A simulation model of the system is developed in MATLAB SIMULINK and tested with linear and nonlinear loads under balanced and unbalanced conditions.

Ezema, BU Peter, O.O. Harris [3] The electricity supply in Nigeria and most of the developing world is far from stable. have a negative impact on devices that This white paper presents an automatic switchover mechanism

that switches consumer loads from generators to power sources in the event of a utility grid outage. It automatically detects when mains power is restored and returns the load to that supply while removing power from the generator set. This mechanism has been tested with excellent results. It is therefore the key to providing continuous power, with near-seamless switching between mains power and alternative standby power sources such as generators.

Ahmed, MS, Mohammed, A.S., Agusiovo, O.B. [4] A phase selector is a mechanism used when changing or switching between power phases in relation to power availability in one of the phases. For decades, phase failures in power supply phases were common, requiring manual switching of fuses from one phase to another. However, this paper focuses on the design of phase selectors that use an automatic switching mechanism. During operation, if there is a power failure in the power source from the public grid, this will switch the consumer load to an available power source, the return of the failed phase will be automatically recognized and the load will return to this power source. To do. During the course of this construction, several tests were performed, including continuity testing of contactors and relay coils for low resistance, continuity testing of contacts of materials used for free current flow, conductivity testing of wires, and the overall system simulated. Using the electronic software Proteus.

Ayan Ghosh et al. [5] stated in their article "Designing an Automatic Phase Selector from Available Three-Phase Sources" that power outages are a common problem. It hinders industrial production, construction of new factories and buildings. This can be done using emergency power. B. A generator to overcome. The main purpose of this document is to present the practical idea of a 220V or 240V AC automatic phase switch.

There are many designs that can perform very similar functions, such as those designed specifically for three-phase AC input power to single-phase output applications.]

Nirbhay Singh, N.K. (2017) [6]. Automatic active phase selector for single-phase loads from three-phase sources. The project is designed to provide uninterruptible AC power, i.e. 230 volts for single phase loads. This is achieved by automatically switching the load from the missing phase to the next available phase in a 3-phase system. Current interruptions in distribution systems are often around 70% for single phase faults while the other two phases are in normal condition.

F. U. Nweke et al. [7] The article "Design and Construction of an Automatic Three-Phase Power System Selector" states that an automatic three-phase power system selector was designed and built.

This device automatically switches to alternating phases carrying power without power interruption in the event of a power outage or very low current on the phase to which the load is connected. A selector switch connects the load and the other phases, and a relay switch allows the remaining phase to be used in the event of a mains failure without disturbing or interrupting the load. It keeps the power supply constant to the load by automatically activating phases as needed. This protects the electronic system from damage and burnout as a result of voltage instability, faults and persistent disturbances. This is most important in developing and underdeveloped countries.

Oduobuk, E.J. et al. The article "Design and implementation of an automatic 3-phase changer using the LM324 Quad Integrated Circuit" in [8] states that the design and implementation of the automatic 3-phase changer was done using the LM324 Quad Integrated Circuit. The system was designed and simulated in (Multisim). The circuit components were implemented on the Vero board. In addition to other passive components, LM324 integrated circuits (comparators) and 2N2222 transistors were used as active components. The result was that when his 3-phase AC input of red phase (), yellow phase (), and blue phase () was supplied to the system from the utility, the system compared the phase imbalance input to the input is shown. The highest voltage will appear at the output. It also switches from one phase to another as soon as the circuit detects another phase imbalance.

Oduobuk (2014) [9] designed and built an autonomous three-phase changer using the LM324 Quad Integrated Circuit.

When a 3-phase AC input (red, yellow, blue phases) from a utility power supply was applied to the system, the system compared the phase imbalance of the inputs and the highest voltage input appeared at the output. The

system was designed and simulated using a program (Multisim) and the results were presented. It also switches from one phase to another as soon as the circuit detects a new phase imbalance.

2017 (Ofualagba G.) [10] designed and imitated automatic phase selectors and switches for three-phase power supplies. This provides a way for him to switch from one phase of his AC mains to another if the current phase fails, and also provides a generator supply if all three phases of his AC mains fail. provided a way to switch to The circuit also detects the return of any of the three main power and transfer phases without prior warning of power loss. I created a system using one of four analog multiplexers (CD4052), an analog-to-digital converter (ADC0804), an AT89C51 microcontroller, and a relay switch.

(Iwu, 2015) designed and built an automatic three-phase power system selector that works in the event of a blackout or very low current in the phase to which the load is connected. Stationary On – The current automatically alternates to AC phase. If the main power fails, the selector switch connects the load to the other phase and the relay switch allows the other phase to be used without disturbing or stopping the load. It keeps power delivery to the load constant by automatically triggering phases as needed. This protects electronic systems from damage and burnout caused by voltage instability, collapse, and persistent disturbances. All of these are significant issues in emerging and developing countries.

(Bhambulkar, A.V. ,2011;Ganorkar R. A. et al. ,2014; Rahul Mishra et al.,2013;John, B., 2012) Creating conversion system with low cost strategy This study analyzes techniques for setting up switching systems using solid-state relays (SSRs) that completely eliminate the noise, warpage, and wear associated with electromechanical relays, resulting in better, more cost-effective provided a solution. Microcontrollers and digital integrated circuits were used to increase the speed of the system while reducing the number of components. Among other desirable features, the system includes an easy-to-use liquid crystal display (LCD), a generator failure warning system, an automatic phase selector that selects the optimum phase, and over- and under-voltage level monitoring.

Ezilim et al. (2015) [11] developed an automatic phase selector using a single contact relay capable of carrying 5 amps of current at 240 volts at 50 Hz and his 3-pole contactors rated at 50 Hz and 240 volts respectively. Did. The voltages present on these phases were not considered when designing the phase selector system. Rather, it was all about phase availability. It does not fix the phase drop problem as it continues to provide low phase even in the presence of high phase. Instead of a microcontroller, this system relied on logic gates.

A three-phase automatic selector with improved power factor was proposed by his Ajith et al. Built. [12] This technique was developed to serve as a tool to assess how efficiently electricity is being used in automated phase selectors and power systems. The system did not have a fixed switching range, so the best phase was used for selection. One of these voltages is selected and supplied to the load when the 3-phase voltage is below the voltage required by the load. This can damage electrical equipment.

III. CONCLUSION

Automatic phase Changeover is highly of great importance in Africa, to aid the automatic switching over from Generator to public power source. Changeover of this kind makes it easy for such switching to take place, and with the added advantage of being able to select between phases, Coupled to its flexibility it can be adopted in any automatic changeover circuit with ease, it is also less expensive and easily available. The most important feature of this design is that, electricity consumers in the developing countries, who suffer the challenges of power supply. especially in Nigeria where the power phase are often incomplete have the advantage of selecting between phases for their power consumption without really doing the changing manually, as have been the normal practice.it saves the stress and time, it also provides better protection as compared to the manual practice because of the use of overload is the changeover system. However, this design can for future work be improved on by incorporating Programmable Logic Circuit.

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