LOAD BASED VOLTAGE STABILIZER USING RELAY

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Abstract*—This research aims at the designing and implementation of a load based voltage stabilizer using relay. AC power supplied by EB(Electrical Board) in Salzer Electronics Ltd Unit –II subjected to the rapid fluctuation. Moreover the supplied voltage remains lower or higher than specified. This cause a considerable threat to the manufacturing products and regularly manual power is required. So securing the input voltage to remain in a specified limit has become a necessity in that industry. Current system available in this industry use the auto transformer and manual power is required to adjust the voltage coming from the EB to the specified limit, which may cause damage to the manufacturing product in the absence of manual power. This research handles both the manual power and damage for manufacturing product in the range from 180V to 270V using six relays. To identify the working relay, 6 LED's are connected parallel to the relay. The manufacturing product is tested according to the working relay.*

Keywords— Load based voltage stabilizer, relays, fixed transformer, autotransformer, EB(Electrical Board), LED's

1. INTRODUCTION

Embedded system is one that has computer hardware and software embedded in it as one of components. An embedded system is a special purpose computer system design to perform certain dedicated function. The design engineer can optimize it to reduce the size and cost of the product and increase the reliability and performance.It is used in industrial machine, automobile, cameras, medical equipments, household appliances, airplanes, vending machines. Embedded systems that are programmable are provide with programming interface , and system that embeds programming is a specialized occupation.

In our practical life voltage may be high or low for purpose of electricity supply system or for the weekness of supply system or for other causes. for that reason, many important electric machine or electrical equipment may destroy. In order to save these we need to use the voltage stabilizer.Electrical gadgets like AC and computer uses a voltage stabilizer. where, a constant voltage current is feed to such electrical appliances, and protects them from damage due to voltage fluctuations . The transformer principle is used, where the primary windings is connected to the input and the secondary windings receives the output. Where the incoming voltage is dropped at that point, the electromagnetic relays is activated by this more number of turns in the secondary winding will act. Hence, loss in output voltage is compensated by this higher voltage created. Then the incoming voltage is rised, the reverse happens, and thus the voltage remains almost unchanged at the output.

The voltage stabilizer may be manually or automatically controlled. The voltage can be stabilized manually by tap changing switches, a variable auto transformer. The voltage can be stabilized automatically by using fixed transformer.

The large electric current will be turned ON or OFF by an electromagnetic switch which is operated by a small current called relay. Theelectromagnet is the heart of the relay (when electricity flow through it the temporary magnet is done using a coil of wire). The opening or closing of another circuit is caused by the current flow in one circuit. Relays are like switches and act like remote controller where, they are used in many applications because of their relative simplicity, long life and proven high reliability. A transformer is a static machine which transforming power from one circuit to another circuit without changing frequency.

2. LITERATURE SURVEY

Aims at the designing and performance of an Automatic Voltage Regulator(AVR) with high specification and hysteresis. AC power supplied by PDB(Power Development Board) in Bangladesh is subjected to changes from time to time. Moreover in countryside areas supplied voltage remains lower than specified. This cause a considerable threat to the citified electronic devices. So ensuring the input voltage to remain in a tolerable pre-specified limit has become a necessity in countryside as well as some inner city areas. This research handle both shortcomings and introduced in the tolerable range of 215-237V using several taps. Hysteresis has been introduced while changing from one level to another and thus oscillation is prevented.[1]

The design and implementation of a fuzzy logic controller for regulating the output voltage of a generator through its field current. An automated fuzzy logic based control system has been designed for controlling the generator voltage by changing the field current values. The fuzzy logic controller was controlling the difference between the immediate output voltage and the rate voltage of generator as error variable.[2]

Design and construction of a 5KVA automatic voltage stabilizer is presented in this project report. This project report serves to showup the method of integrating modular constructed units to target the stabilized output of between 220V and 240V without eliminating the impediments encountered to achieving it. It encapsulates the evolutionary trends involved since the first invention to this contemporary state of the art which is achieved through the harmonization of the desired properties of various circuit connected electronic components and also capture the design calculations involved in the components selections in line with achieving the goal of the design. A presentation of the results , the waveform from the test performed and finally proffering of suggestion for future advancement in improving the specification, efficiency and speed of the automatic voltage stabilizer was made.[3].

In very high speed, the usage of electrical and electronic appliances is increased. To provide power supply, the Indian power sector faces the crisis of bridgingthe gap between the demand and supply of power. The unstable power supply so produced has lead to loss in industrial equipments. To combat the problems of the unstable power , industries depend on servo voltage stabilizers to stabilize the power supply connected to their expensive machineries. The article focus us on electrical hazards, consequences of electrical hazards, symptoms of electrical hazards, analysis of the situation in industries, types of stabilizers, servo voltage stabilizer. With the increasing growth of the consumer electronic/electrical products, the need for servo stabilizers is rising rapidly. even in the future years the servo voltage stabilizer will continue to be an essential product used in industries.[4].

The design of voltage stabilizing circuit of temperature survey for RF(Radio Frequency) and we analysis the circuit construction and the design parameter of the circuit, then we carry on various analog simulation conformation in CSMC 0.5um double poly mix under the process with H-spice.[5]

The design and implementation of a single-phase automatic voltage regulator(AVR) based on microcontroller. The basic building blocks for this design include a PIC 16f 628 microcontroller, a TRIAC (Triode For Alternating Current), a transformer of step-up, a circuitry with zero crossing and a load voltage sensing circuitry. The phase control ofAC voltage using a TRIAC principle is used in this design. To provide the desired regulator terminal voltage, the trigger pulse for the TRIAC is delayed using microcontroller . This voltage is always sensed and fed back to the microcontroller via a measuring unit to get a continuous control system. One of the intensions to develop this AVR is to use it in domestic heating and lighting control. It can also be used as an adjustable voltage source by adjusting a variable resistor in the voltage sensing circuitry. It is also intended to introduce a compact AVR and to demonstrate the usefulness of the PIC microcontroller in power control field.[6]

3. EXISITING METHOD

The power from the EB(Electric Board) is directed to the auto transformer and the power is manually varied according to the required voltage limit. The adjust voltage is then directed to the manufacturing product(transformer).

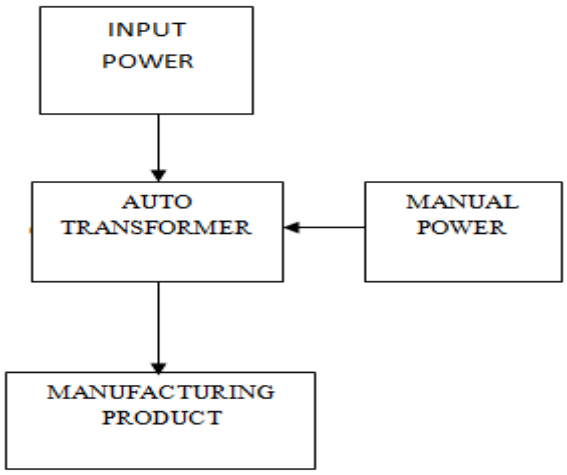

Fig (1). Block diagram of existing method

According to this method manual operation is necessary. Based on this design the manufacturing product(transformer) gets uneven load due to the absence of manual power. This uneven load makes fault in the test piece. Hence time consumption is high in this method.

IV. PROPOSED METHOD

This method will operate in the voltage between 180V to 270V. The power from the EB (Electric Board) is directed to the fixed transformer and the power is automatically controlled by the load based voltage stabilizer using relays. The voltage from EB (Electric Board) is transferred to the fixed transformer and given to the load based voltage stabilizer.The stabilizer stables the input.

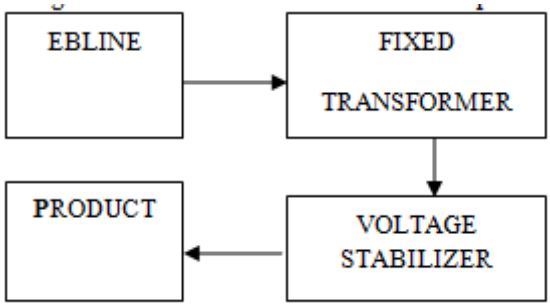

Fig (2). Block diagram of proposed method

This part of the circuit is built around the pic controller. The 5v power supply for a micro controller is derived from a small iron core mains step down transformer having 12-0-12v, 4 diodes(1N4007) under 1000uf and resistors (1k and 470 ohms) and rectifier. The current from the power supply is given to the controller.

This voltage stabilizer is designed by PIC controllerPIC16F877A. It is one of the most popular controller and it's easy to see why it comes in a 40pin out and it has many internal peripherals. The controller will accept only 5v supply.

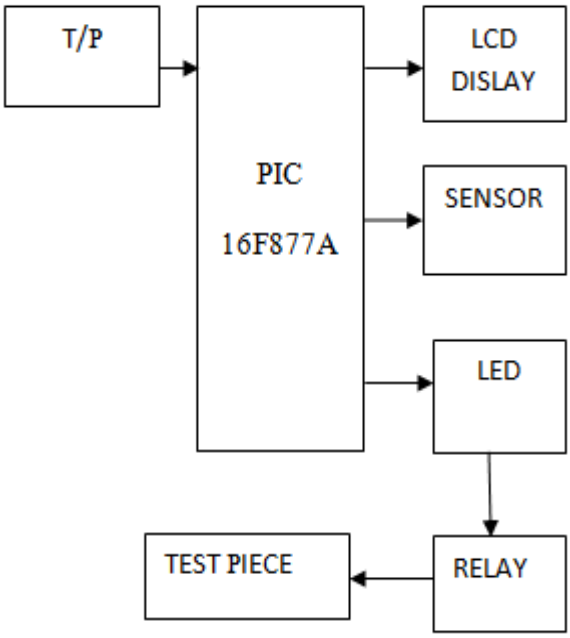

Fig (3) Block diagram of proposed method

T/P –Transformer

The controller has a input ADC(analog to digital converter). As the input voltage ranges from 180 to 270v and a Vout value is generated by ADC. This voltage is sub divided into 6 parts where each part contains 15V in it. If generated Vout range lies in the 1stpart then the first LED will glow and simultaneously relay works. According to the working relay the manufacturing product is tested. Thermo sensor and gas sensor are additionally added to sense temperature and the gas. The value of incoming voltage, temperature range and gas range are displayed using LCD.

4. SIMULATION

We implemented this design practically for getting a clear performance after the completion of the design. We affirm with proof that the automatic voltage stabilizer turned on and stabilized any variable input voltage within a prescribed range 180v to 270v.

Table.1

Generated Vout value and corresponding ADC value

S.No	Input Voltage	ADC Value
1.	180 -195	511-553
2.	196 -210	556-596
3.	211-225	599-638
4.	226-240	641-681
5.	241-255	684- 725
6.	256-270	728-767

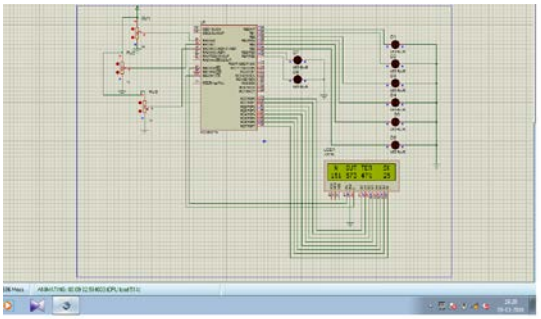

Fig (4) Simulated output

5. RESULT &CONCLUSION

We have used a custom designed fixed transformer and it was costly but other circuit components was cheap enough that the total system costs low or inexpensive. This paper is designed and implemented by microcontroller based automatic voltage stabilizer. Although this is available, we hope it's new to the company, they will appreciate it. The uniqueness of the design is that no moving part is present as a result, no maintenance is required. Moreover, lack of manual power is required , it reduce the fault of manufacturing product and reduce the time consumption required. Here this design ensures to regulates voltage between 180v to 270v AC and the voltage range above 270v and below 180v are not stabilized in this circuit. The use of thermo sensor will prevent the stabilizer from high temperature by glow of LED. Similarly if gas is sensed it is indicated by LED glow.

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