

Servo Controlled Automatic Voltage Stabilizer with Higher & Lower Cut-Off

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Abstract: In this modernized world each & every industries contains a large machines, equipments, computers, communication equipments, process controllers, etc. To get the desired output this system should be stable. In large industries the small variation in input voltage can cause heavy loss which is very dangerous to operators and machinery & also results in heavy financial loss. May types of voltage stabilizers are available in market. In these stabilizers the output is changed manually with switch to maintain output voltage constant. But during peak period this manual operation of stabilizer has to be done frequently. This paper presents low cost servo controlled voltage stabilizer which rectifies the problem..

Keywords: servo controlled, stabilizer, servo controlled sensing card (PCB), variable transformer (variac), comparator circuit, autotransformer.

I. INTRODUCTION

A voltage stabilizer deliver the constant output voltage while load current and input voltage changes over time. The voltage stabilizer is an electronic device which is able to deliver the constant output voltage. The automatic voltage stabilizer are widely used in industrial application to obtain the stability and good regulation for the sophisticated electrical and electronic equipments such as communication equipments and systems, process controllers, computers, electro-medical equipments etc. In large industries small variation in the voltage causes heavy loss in terms of financial and operation.. This excessive variation in the input voltage can damage the operator & the machinery. The equipments used in this industrial & domestic applications requires specific constant stabilize voltage source for their desired operation at the output. For twenty four hours power plants, servo controlled voltage stabilizer are more suitable because the breakdown due to fluctuation of voltage results in heavy financial losses occurs. Servo controlled automatic regulator monitor, correct & maintain the desired output voltage by subtracting or adding the required amount of voltage to/ from their input voltage. The simple construction of servo controlled voltage stabilizer consists of AC motor, simple electronic sensing circuitry, relay, buck/boost transformer, variac and impulse transformer.

The power supply voltages should not drop or rise more than four percent as per the provision of Indian electricity act. Here we find fluctuation in the voltage taking the 230 Volts main supply, apply voltage to high as 270 volts or low as 170 volts occasionally. In this modernized world with the enormous increase in the loads connected to a distribution

transformer, it became very difficult to the supplier to maintain the voltage within the updated value because of the continuous fluctuation of load. So to overcome this problem the use of automatic voltage stabilizer is used. The TV sets, Refrigerators, Computers and Other expensive device needs a stabilizer before connecting to the power supply. there are various types of stabilizers available in market. This stabilizer has to be maintained manually with the help of switch. But this manual operation is very difficult to maintain during the peak period. So to overcome this difficulties we designed a low cost servo controlled voltage stabilizer which rectifies this problem.

II. LITERATURE SURVEY

The literature survey is carried out on voltage sag and swell, power quality issues and remedies, adjustable speed drives and the various sag and swell mitigation techniques. The power quality issue are due to voltage transient, voltage harmony, voltage unbalanced and power cut off. IEEE slandered 1100 defines power quality as “ **The concept of powering and grounding sensitive equipments in a matter that is suitable to the operation of that equipments**”. The power quality issues and remedies are due to increased use of non-liner load, power electronic devices and the unbalanced load in the power systems. The power quality problem are caused due to use of dynamic loan that caused voltage and current variations such as harmonic and harmonic resonance, oscillatory transients, fluctuations in the load, momentary interruptions in power supply, voltage dips. The voltage sag and swell are due to under voltage and sell are caused due to rise in voltage for

several seconds. They are generally caused in three phased system. The voltage sag are caused due to power failure, downed lines, utility reclosure operations and stromes. Mitigating the power quality problems there are may solution techniques are available for power quality at distribution systems such as using search arrestor, isolation transformer, uninterrupted pwoer supply (UPS), Active Power filter and static VAR compensator.

III. MOTIVATION

In domestic and industrial application the excessive increase or decrease in voltage cause the high financial loss. In large industries where the small fluctuation in the load causes heavy loss to the operator and the equipments. In these industries the small voltage variation is highly dangerous. So to overcome such problem we need to stabilize constant voltage source for the desired optimum operation. The small variation in the input voltage affects the equipments performance to some extend. But the large variation in the input voltage is highly dangerous. So to stabilize this voltage variation servo controlled automatic regulator is used. With this SCVR it is possible output voltage constant even if the main voltage goes to the maximum or minimum value. The SCVR provides complete protection to these sophisticated equipments against the variation of large voltage used in both electrical and electronics equipments. The SCVR monitor correct and maintain the desired output voltage by adding or subtracting to or from the input voltage. So far better stability we are implementing the SCVR.

IV. PROBLEM DEFINITION

With the increase in the loads connected to a distributor transformer, it became very difficult to maintain the voltage within the updated values by the electricity supplier. From the provision of Indian Electricity Act required that power supply voltage does not drop or rise more than four percent, we find voltage fluctuation taking the 230 V main supply, apply voltages to high as 270 V and low as 170 v occasionally. All the domestic and expensive equipments has the necessity to use automatic voltage stabilizer for almost every instrument. In early time stabilizer are connected to TV sets before connected to the power supply. With the use of switched mode power supplies, colour television sets have illuminated the use of voltage stabilizer. But it is preferable to employ one event for them for safeguard against momentary voltages above 270 V and below 170 V on the mains.

V. OBJECTIVE(S)

This project aims in maintaining a constant output voltage by using the servo controlled automatic regulator (SCVR). In market varies types of stabilizer are available. This

stabilizer consists of a switch which has to be operated manually. But during the peak period this manual operation has to be done frequently depend upon the service conditions. So it became very difficult to operate such stabilizer manually during the peak period. One or two relays are normally used in voltage stabilizers and voltages are stabilized in two steps. The problem of manual operation of the stabilizer are solved by the using servo controlled voltage stabilizer more efficiently. With this SVCR circuit it is possible to keep the output voltage constant even if the main voltage increase or decrease.

VI. DESCRIPTION OF THE PROPOSED WORK

TECHNICAL SPECIFICATIONS:

Domain :Electrical – Control System & Power Electronics

Core components :Servomotor,dimmer stat.

Higher Cut-off :270V

Lower cut-off :170V

Op-Amp :LM324

Regulator :LM723

Traic(2) :BT136

Servo Motor Torque :3 kg-cm

Servo Motor Speed :60 rpm

Servo Motor HP :0.003hp

Servo Motor Line Current :0.125A

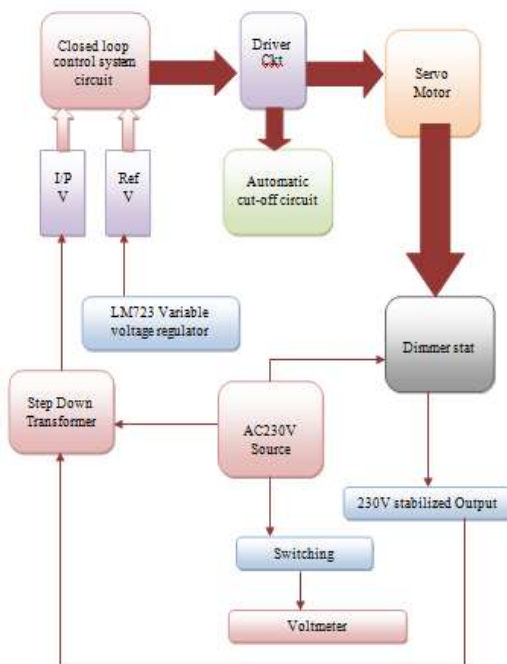
Voltmeter :0-300V

Servo Stabilizers can be for balanced or for unbalanced input voltages. Servo Stabilizer has four major components
Driver Unit

Motorized variable voltage auto transformer Double-wound
Buck Boost / Series transformer Servo controlled sensing card (PCB) After determining Input voltage band and load of customer we design our servo stabilizer to take care of the minimum and maximum voltage fluctuations. In servo stabilizer determine output is determined voltage and the same is set by means of servo controlled sensing card (PCB). Whenever change in output voltage which occurs due to change in Input voltage, the servo controlled sensing card (PCB) gives signal to the motor fitted on variable voltage auto transformer to either increase or decrease the output voltage to achieve the predetermined output voltage. If primary supplied at high voltage, then an open circuit in the common winding would result in the appearance of dangerously high voltages on the persons working there. Thus a suitable protection must be provided against such an occurrence. If the ratio transformation k differs far from unity, the economic advantages of auto transformer over two winding transformer decreases. The disadvantage of using autotransformer lays in the direct electrical connection between the low tension and high tension sides. The servo controlled voltage stabilizer employs a adjustable precision

grade voltage regulator LM723. With this circuit it is possible to get a voltage regulation of +1 or -1 volt .This circuit works for a voltage range of 170 to 250 volts. If the voltage is beyond these limits a protection circuit called under/over voltage protection is provided to protect the main circuit from damages.

BLOCK DIAGRAM



VII. CONCLUSION

Servo controlled voltage stabilizer is very cost effective as it below Rs.2500 which is lowest in the market. It works between the voltage range of 170 to 250 volts efficiently. For higher rated servo motors, a buck boost transformer can be used and in accordance the output voltage is either increased or decreased.

REFERENCES

- [1] A Text Book of Design of Electrical Installations, V K Jain, Amitabh Bajaj.
- [2] P. Eswaran, "Design of fuzzy logic controller for customized servo voltage stabilizer", 2nd International Conference on Electronics and Communication Systems, 26-27 February 2015, pages 103 – 106
- [3] Instruction manual for servo-controlled stabilizer, Servel Electronics Private Limited.
- [4] Yin Pyone, "Design of Transformers for 60 KVA Automatic Voltage Stabilizer", International Conference on Computer and Automation Engineering, 8th to 10th march 2009, pages 318 - 322.
- [5] Servo controlled voltage stabilizer introduction, amjadeeseminars blogspot, 1st December 2012.