

# Design of A Low Cost Servo Controlled Automatic Voltage Stabilizer Using the Electronic Control Circuitry

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**Abstract**— Servo control voltage stabilizer save the life of costly appliances. In this modernized world each and every industries contains the large CNC machines, Electrical Equipments, Communication Equipments, Process Controllers, Motors, Lab Equipments etc Where the small voltage fluctuation causes the heavy loss to the operator and the machinery Hence, it is necessary to stabilize the voltage fluctuation in the instrument and bringing and keeping it at the desired voltage level.

**Keywords**- Autotransformer, Comparator Circuit, Servo Controlled, Stabilizer, Servo Controlled Sensing Card (PCB), Variable Transformer (Variac).

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## I. INTRODUCTION

The servo control voltage stabilizer, stabilize the output voltage. The microprocessor chip technology and the power electronic devices in the control circuitry produce the high quality stable electric power supply in the event of continuous deviation of main voltage. In an electrical appliances which is designed to deliver a constant voltage at the output terminals regardless of the change in the input voltage supply. The stabilizer will protect the equipments from the over voltage, under voltage and other voltage surges etc. it became necessary to employ the voltage stabilizer for costly equipments to protect them from the harmful low/high voltage fluctuations. Some of these equipments are laboratory equipments, industrial machines, medical apparatus, offset punching machines, air conditioners etc. the stabilizer will regulate the fluctuating input voltage and make them to stabilize before fed into the load. In case of single phase supply the output voltage will stay in the range of 220V or 230V. There are many types of stabilizers available in the market. In this stabilizer the output is manually operated with switch but during the peak period the manual operation of stabilizer becomes difficult to operate. This paper present a low cost servo controlled voltage stabilizer which rectifies this problem.

## II. LITRATURE SURVEY

Power quality issues and remedies and lot of advanced researches are being carried out in the area and it has been found that the 50 % of the power quality issues are due to the ground current, neutral to ground voltages, grounding and other ground associated issues and also due to the increased use of power electronic devices, unbalance in the power systems, non-

linear loads and also the unbalanced in the power system. The use of the dynamic loads causes the power quality problems usually by current or voltage variations such as fluctuation, momentary interruption, oscillation transient, harmonic resonance, interruption swells, notching, noise, distortion, drop-out, flicker, over voltage, under voltage, THD, triplets, inter-harmonics, dirty power etc. The other issues in the power quality are due to the use of the new equipments which are very sensitive to the power quality variation , the use of the switched mode power supply and variable speed drops.

## III. PROBLEM DEFINATION

From the provision of the Indian electricity act required that power supply voltage does not drop or rise more than four percent, we find voltage fluctuation taking the 230V main supply, apply voltages to high as 270V and low as 170V occasionally. With the increase in the load connected to the distribution transformer it became very difficult to maintain the voltage level within the updated values to the distributor by the electric supplier. Now days for domestic and industrial purpose the stabilizers are very necessary. The voltage from the electrical supplier consists of various voltage surges, drifts and harmonics which cause the fluctuations of the voltage at the output. If the equipments connected to such electrical network it will get damage. If the equipments connected to the network are costlier it will lead to a heavy loss to the equipments and sometimes to the operator. Because of such problem it became necessary to employ Servo Controlled Automatic voltage Stabilizer which will rectifies this problem & it will safe guard the equipments against the momentary voltages above and below the prescribed values.

#### IV. MOTIVATION

The servo controlled voltage stabilizer provides the complete protection to the sensitive equipments connected in the electrical and electronic network. With this stabilizer it became possible to maintain, correct, and monitor the output voltage even if the main voltage goes to the maximum and minimum value. This stabilizer will add or subtract to or from the input voltage as per the requirement. With the increase or decrease in the voltage in the domestic and industrial application causes the heavy financial loss. In some large industrial application the small variation in the voltage causes the heavy loss and this small voltage can be very dangerous. This voltage can cause damage to the expensive apparatus connected in the electrical network and also sometimes to the operator also. So to overcome such problem it became necessary to stabilize the voltage source for the desired optimum operation. So for better stability we are implementing the servo controlled voltage stabilizer, and rms do not have to be defined. Do not use abbreviations in the title or heads unless they are unavoidable.

#### V. OBJECTIVE

The main objective of our project is to stabilize the voltage at the output terminal. With servo controlled voltage stabilizer it is possible to keep the output voltage constant even if the main voltage increases or decreases. There are many stabilizers available in markets which are manually operated with switch. This manual operation of stabilizer became difficult during the peak period. So to overcome such problem servo controlled voltage stabilizer is used which solves this problem more efficiently.

#### VI. WORKING PRINCIPAL

##### Triac Gate Control System:

The input 230 V is stepped down to 15V ac and rectified to pure DC using bridge rectifier. This DC power supply is given to all sections of control circuit. Two comparator IC's (Built in single package) are used to detect higher and lower voltage levels. Comparator 1 is provided with a reference voltage of 4.7V and comparator 2 is provided with reference voltage 7.3V. Two PNP transistors are provided for providing control voltage for triacs. Two 100K presets are provided for adjusting the reference voltage. This is to maintain higher cut off voltage of 280V, and to maintain lower cut off voltage of 180V.

#### VII. DESCRIPTION OF PROPOSED WORK

##### Hardware Circuit:



##### Implementation of Hardware :

This paper aims in maintaining a constant output voltage. The conventional voltage stabilizers are used for feeding controlled voltages to appliances. This voltage stabilizer normally uses one or two relays and voltages stabilised in two steps. The other type of stabilizers available in the market is manually operated. In such stabilizers the output is changed manually with switch to maintain the output voltage constant. During the peak period this manual operation of stabilizer has to be done frequently. This problem is solved by Servo Controlled voltage Stabilizer efficiently. With this circuit it is possible to keep output voltage constant even if the main voltage goes to a maximum or minimum value. The servo voltage stabilizer with isolation transformer employs an adjustable precision grade voltage regulator. With this circuit it is possible to get voltage regulation of +1 or -1 Volt. This circuit works for a voltage range of 170V to 270V. If the voltage is beyond these limit a protection circuit called under/over voltage protection to protect the main circuit from damages. In this circuit AC synchronous motor is used to drive handle of auto transformer, but high rating if AC synchronous motor a buck boost transformer can be used & therefore the output voltage is either bucked or boosted.

#### VIII. CONCLUSION

This is probably cheapest power conditioning product available. It gives reasonably good voltage regulation and is all right where voltage fluctuation are not considerable. This design stabilizes which constantly monitors the output voltage and controls the variations in the input voltage by movement of a motor. Thus, servo stabilizer can control all types of loads i.e. inductive, resistive & capacitive loads. Use of servo stabilizer is the only way to control erratic supply voltage conditions. This servo stabilizer can be used for balanced or for unbalanced input voltages. After determining input voltage band and load of customer we can design our servo stabilizer by taking care of the minimum and the maximum voltage fluctuations.

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