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Voltage Regulation Using AC Servo Motor

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Abstract

This article is a study of servo controlled voltage stabilizer in an industrial project.In India all the electrical equipment are rated at 400/415 volts three phase and 220/230 volts single phase. In ac motors under voltage it reduces the capacity of the motor thereby raising the temperature of the motor and reduction in motor life. Also rpm of motor is reduces thereby decreasing the production efficiency and over voltage it results in additional power consumption, premature failure of windings, increased losses of cables, switches, transformer and other associated equipment Also a very low voltage can force the system to shut. Servo voltage controlled stabilizer is an electrical system. This is used for domestic and industrial purposes for removing surge and fluctuation and protect from coming high voltage and low voltage. Servo is use Voltage increases and decrease by variac is also called as autotransformer. Automatic voltage stabilizer using servo system are quite common. To remove these problems, we use voltage stabilizer before the equipment for protection problems are overcome with voltage range (230+1%) and power capacity up to 1000 KVA.

Keywords-- **AC supply, Stabilizer, AC motors, Servo Motors.**

INTRODUCTION

In this section some of the most commonly used ac voltage regulator circuits have been discussed. The Servo Stabilizers uses an advanced electronic servo-motor concept to control a motorized variable transformer. Because of the motorization, there is a small delay in voltage correction. However, output voltage accuracy is usually ± 1% with input voltage changes up to ± 50%. These machines are not affected unduly by power factor or frequency Variation.Since the voltage fluctuation comes in the power system, there are many problems developed in the line voltage like distortion, fluctuation, heating, noising Due to these problems, daily use equipment are at risk like fan, laptop, cooler, and

refrigerator. To remove these problems, we use voltage stabilizer before the equipment for protection. Mainly two types of stabilizers are present in the market world, one is automatic/line voltage stabilizer and other is (analog and digital) servo voltage controlled stabilizer/regulator. In case of servo stabilizers, different types of power problems are overcome.

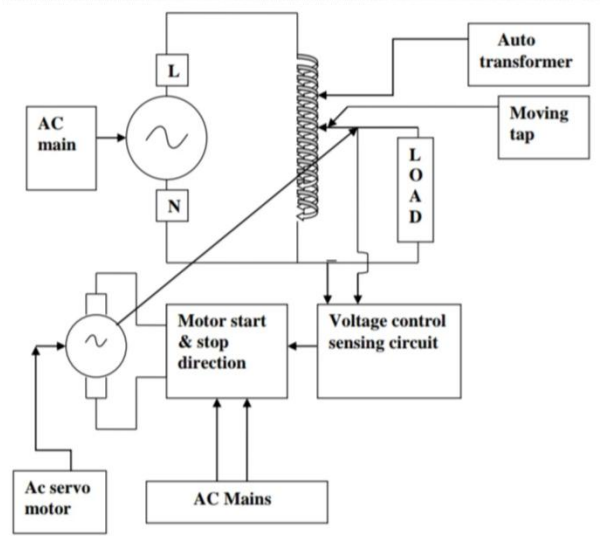
Proposed work

True automatic voltage stabilizers essentially consist of two units, called the measuring unit and the regulating unit. The function of the measuring unit is that of detecting a change in the input or output voltage of the automatic voltage stabilizer and producing a signal to operate the regulating unit. The purpose of the regulating unit is that of acting, under the signal from the measuring unit, in such a manner as to correct the output voltage of the stabilizer, as near as possible, a constant or a predetermined value

Components of Proposed System

Servo control motor 230 V,Variac 1 KVA, Transformer, Transformer 230v AC/ 18v output, Limit cut out operating PCB and limit switches, Control Circuit, Variable Auto Transformer.

The block diagram is shown in given figure



Variable Auto Transformer

It is also known as variac. At the heart of a variable autotransformer is a toroidal (doughnut-shaped) magnet steel core

Control Circuit

It is used to control the regulating unit as a controlling unit

Servo Motor

It is coupled to the variable autotransformer through the shaft and rotate it according to signal received from control circuit

Our work consists of following sections

Mains Conditioning In situations where the mains supply voltage fluctuates beyond the normally accepted tolerance limits, problems can arise with the reliability, operational function and life expectancy of equipment. Steady volt Servo Stabilizers are designed to overcome these problems by providing a stable supply for trouble free operation of electrical equipment

Process Control

Steady volt units can also be used to provide stable voltages where the normal fluctuations in mains tolerance are not considered operationally acceptable, such as for long term testing of electrical goods at specific voltages

WORKING PRINCIPLE

The Voltage Stabilizer works on a simple principle of adding and subtracting a voltage to supply in appropriate quantity to correct it to the required level. This voltage to be adding subtracting is obtained from the main itself. Using a continues variable Auto transformer driven by a Servo motor under a

control of voltage sensing relay. This relay sense the output voltage continuously, compare with a highly stable reference and direct the drive motor to correct the output voltage to a set value. The Servo controlled Voltage Stabilizer utilizes a motor driven variable Auto transformer. Which is connected between the incoming phase supply & The load is connected to the continuously Variable Auto Transformer in such a way that One lead of the winding is connected to a predetermined tap point of the auto transformer, depending on the position of the variable brush arm with respect to the fixed point the voltage applied to the primary winding has addition or subtraction on the supply voltage available on the secondary side.

Reading

Sr.no	I/P Voltage	Variation	O/P Voltage
1	170	60	230
2	190	40	230
3	200	30	230
4	210	20	230
5	220	10	230

Result

Output voltage is maintained constant irrespective to variable input voltage.

CONCLUSION

It's one of India's most prominent stabilizers. It's an excellent product, required by today's industry and residents. The stabilizer is prominently used for feeding the stable voltage to a number of appliances. It helps protect equipment from the fluctuations in voltage

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