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# **ELECTRICAL POWER ENGINEERING**

# Design and Construction of 20 kVA Automatic Voltage Stabilizer Control System

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**Abstract**—Automatic voltage stabilizer is essential needed for industries in Myanmar. Both single-phase and three-phase are available. In this research paper, automatic voltage stabilizer intends to three-phase unbalanced loads because most of the industries used in unbalanced load. Automatic voltage stabilizer consists of two units; measuring unit and regulating unit. In this automatic voltage stabilizer, variable autotransformer is used for the regulating unit and electronic control circuit is used for sensing unit. The main purpose of this research is the design and construction of servo control circuit.

In this paper, control circuit for automatic voltage stabilizer provides voltage comparators, relays, presets and servomotor that compare instantaneous input and output voltage. This value can be adjusted in the electronic control circuit until the desired voltage is reached. At that time, the output of measuring unit is zero. Servo motor is attached to rotate the brush arm of the variable autotransformer until the output voltage is stable.

The electronic control circuit will operate within the fluctuation range from 130 V to 250 V and 20 kVA (single-phase) is designed. The output sensitivity is  $\pm 1\%$ . Its frequency range is 50 Hz. The feature of this stabilizer is the input wave form equal to the output wave form. As a phase loss sensing, phase sensing bridges are used. If the input voltage is lower than 130 V or higher than 250 V, the system will be automatic shutdown.

**Keywords**— voltage comparators, relays, presets, servo motor, step down transformers

## I. INTRODUCTION

The problem of the maintenance of constant voltage covers an extremely large field, from the control of the bus bar voltage of a power station to the supply of constant voltage to small electronic instruments. In the former the power may be in hundred of megawatts, while in the later case it is only a few watts or even a fraction of a watt. According to the nature of electricity, voltage fluctuation is common in any electrical supply system. Continuous variation of loads and extension of power lines are the main factors which contribute to the above problem.

In general, most electrical or electronic equipment are designed to operate within a voltage fluctuation of  $\pm 10\%$  of its rated supply. Automatic voltage stabilizes using servo systems are quite common. Anywhere that there is an electric motor there will be a servo control system to control it. Servo control is very important. The economy of the world depends

upon servo control. Manufacturing industries would cease without servo system because factory production lines could not be controlled, transportation would halt because electric traction units would fail, computers would cease because disk drives would not work properly and communications networks would fail because network servers use hard disk drives. So, servo control systems are that it is vital to know about them. This servo control system is also used in AVS.

Both single phase and three phase types are available. The rating of this type of stabilizer is quite high and is more economical for high power rating. Servo control automatic voltage stabilizer provides a continuous monitoring of the output voltage by means of an electronic control circuit that compares the instantaneous output voltage with the set value. When changes are detected due to fluctuation of supply voltage or sudden changes in load, an electrical signal will be transmitted to the servo motor which is coupled onto the brush gear of the variable transformer, which causes the brush gear to rotate until the appropriate voltage is restored. This method of stabilization does not create interference nor harmonics in the supply system.

## II. SERVO SYSTEM AUTOMATIC VOLTAGE STABILIZER

The automatic voltage stabilizer consists essentially of two main parts: 1. regulating unit and 2. measuring unit

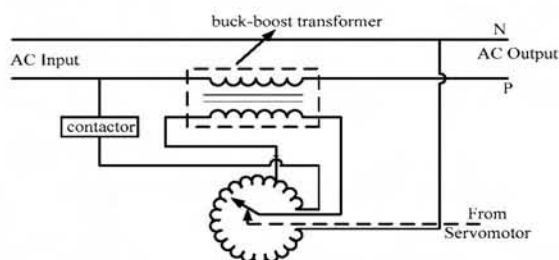


Fig. 1 Block Diagram of Regulating Unit for 20 kVA, Single-phase AVS

The regulating unit consists the buck-boost transformer and variable autotransformer. 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 predetermined value. In some cases, a unit is required to control the















