



**PROCEEDINGS OF
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Volume - 1

**Electronics
Electrical Power
Information Technology
Engineering Physics**

**Sedona Hotel, Yangon, Myanmar
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ELECTRICAL POWER ENGINEERING

Design and Construction for Mini-Hydro Control System

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Abstract_ Hydro power plants are mostly used over the world for its bulk of resources. Hydro energy is the most reliable and cost effective renewable energy source. It is obviously that among all the renewable energies, hydropower occupies the first place in the world and it will keep that place for many years to come. And the control systems of the hydro power plants are very important. To control the speed of turbine and generator, voltage and frequency, different kinds of methods are used. Among them, using electronic load controller is very easy and also it has less maintenance than other systems. Another reason is its low life-cycle cost.

Most of the electricity generating plants requires various kinds of control systems. According to the size and use of generating technology, different kinds of controls are widely used. On the other hand, the technologies used in control systems become more and more complicated. As a result, the user became familiar with only black-box technology. So the technology are needed to be a simple and not too sophisticated for the users.

Keywords_ Electronic load controller (ELC), control system for mini-hydro power plant, electronic control, automatic control, SCR control, Triggering angle

I. INTRODUCTION

The control system of hydro-electric plants involves basically the same principles as the control systems of generation from any other form of prime mover but has certain special aspects of deriving from the essential simplicity of water turbines. Thus the rapid starting time and the absence of thermal restrictions on rate of loading permit the fullest and most advantageous exploitation of the stored energy. This fact, together with considerations of economics, encourages the development of water power on a low load factor basic, especially when thermal power resources are available to maintain the base loads. On the other hand, the countries with very limited coal supplies have to operate their hydro electric stations on both base load and peak load service, individual stations often having to assume other of these roles at different times. In both cases, therefore, the greatest flexibility of control facilities is desirable, and is readily attainable with normal plant.

The simplicity of the plant renders unnecessary the provision of a large operation staff and permits not only the combination of electrical and mechanical functions at a single location, but the concentration of those functions for a group of several related stations at a focal control point.

The some important control systems of a hydro-electric station are as follows:

1. Machine starting and stopping
2. Automatic starting methods
3. Machine loading and frequency control
4. Generator and system voltage control
5. Machine running supervision
6. Hydraulic control
7. Control-room layout
8. Using electronic load controller (ELC)

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The Electronic Load Controller control circuit has less sophisticated systems and use only available electronic parts. So the user can manage easily.

In the control technologies, electronic load controller is chosen for the following reasons:

- (a) Simplicity makes the difference
- (b) Simplicity means also low maintenance cost
- (c) Easy to install
- (d) Improves productivity
- (e) Low life cycle cost
- (f) Built tough

II. AIMS AND OBJECTIVES

The main aim of this project is to design and construct the electronic load controller for mini hydro power plant. The aims and objectives of this project are;

Firstly, by using the electronic load controller, the flow rate of the input water is no need to be regulated. And then, turbine and coupling generator can get the constant speed. Secondly, by using this, the components costs can be relatively reduced. As the third and last is to upgrade the technical know-how and skills for the dealers.

This electronic load controller can be used in the simplest way to control the out-put frequency of the hydro electric generators. The electronic load controller controls the load of the generator. By controlling the terminal loads, the speed and following frequency of the generator will be maintained at the controllable level.

