

# AUTOMATION OF HYDRO POWER PLANT BY USING PLC-SCADA

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## ABSTRACT

*This project presents the development to turbine control system for small Hydroelectric power generation with Kaplan turbine type. The proposed system is a pilot project of modernization of power plant control system prepared for sup plantation of worn electronic equipment or analog technology. The proposed system is implemented for Mae-Ngat hydro-power plant, under responsibility of Electricity Generating Authority of Thailand, as a test system. The mentioned system consists of two main parts; governor control and operation control. The governor control part composing of speed, power and position control mode actuating to guide vane are designed and implemented. In addition to guide vane control function, the runner blade control function is completely fulfilled. In the operation control part, all control sequence with Human Machine Interface (HMI) for configuration modification, parameters setting, and indications are developed. The operation of the turbine control system is verified and confirmed by simulation and severe tests, respectively. The results of test indicated that the proposed turbine control system can work proper.*

**Keyword:** - PLC, HPP, HMI, SCADA.

## 1. INTRODUCTION

The satisfactory operation of a power system requires a frequency control that keeps it within acceptable limits when the system is submitted to significant load variation. As the electric network frequency is common to all the system, a change on the active power at one point will be reflected on the net as a frequency variation. The design of proper control systems for hydraulic turbines remains a challenging and important problem due to the nonlinear plant characteristics, increasing number of interconnections, development of large generating units and big load changes and disturbances. A PLC is a digitally operated electronic system, designed for use in an industrial environment. It uses programmable memory for internal storage for user oriented instructions for implementing specific functions such as logic, sequencing, timing, arithmetic and control through digital or Analog inputs of various machines or processes. In simple terms PLC is a solid state, digital, industrial computer. Power plants have particular control systems to ensure stable operation.

## 2. OPERATION

A PLC is a device invented to replace sequential relay circuits for machine control. The PLC works by looking at its inputs and depending upon their state turning ON/OFF its outputs. The user enters a program via software, that give desired results. PLC used in many real world applications which involves machining, packaging, material handling, automated assembly.

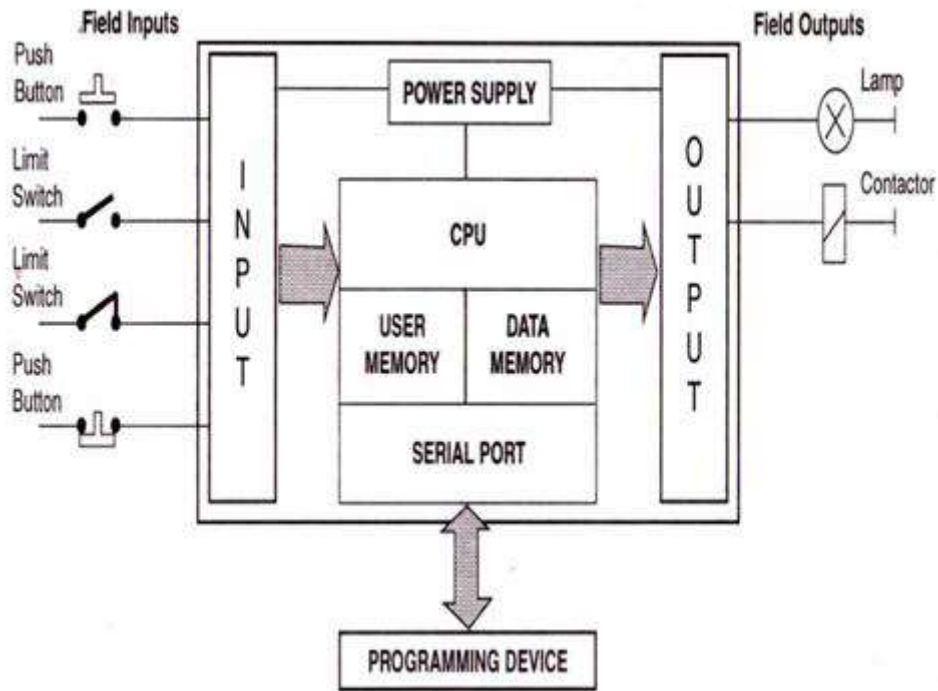


Fig.1. PLC Block Diagram

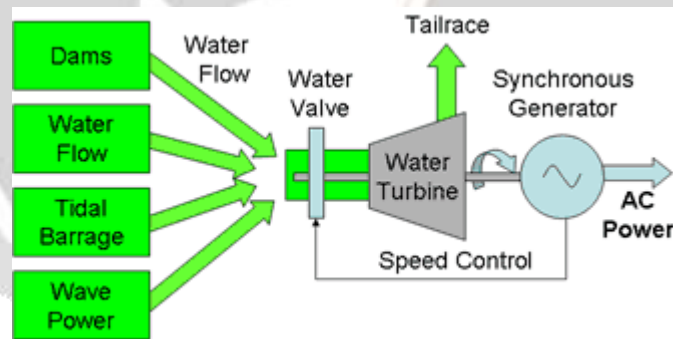


Fig.2. HPP Block Diagram

PLC broadly consists of :-

- \* I/O interface
- \* Processor
- \* Memory
- \* Power supply & Programmable devices

In Vaitarana Hydro Power Plant, all operations are done manually because of that lot of problems were faced by engineers. These problems are overcome by using PLC-SCADA.

By implementing this, turbine speed, winding temperature, water level, penstock leakage, grid voltage and current all these parameters are displayed on LCD, SCADA software. Also indication of buzzer is given. It gives better process control, flexibility, implementing changes and correcting error with visual operations. Owing to this, system saves energy, gives strong degree of automation, high accuracy of monitoring and person can easily use it.

### 3. RESULT

All the parameters of Vaitarana hydro power plant like speed, temperature, water level, water leakage, grid voltage, current are sensed, displayed and controlled automatically because of this accuracy of plant has improved and time required for finding and clearing the fault has been reduced.

### 4. ACKNOWLEDGMENT

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