THE ELECTRONIC LOAD CONTROLLER (ELC) MODEL

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INTRODUCTION

- In all power generating schemes, voltage and frequency control and regulation systems/means perform a vital role. Without control, all the power generated goes to the user load. Uncontrolled flow of power can damage both the load and the generators.
- This is due to the unpredictable variations in the user load, which consequently lead to variations in key parameters such as the voltage, frequency and rotation speed of the generator.
- In Pico and Micro hydro power plants, the user load and the generation unit are connected directly with no transmission system, therefore, in both systems, the parameters such as voltage and frequency are directly reliant on each other.
- The Electronic Load Controller (ELC) is therefore installed to regulate the voltage and frequency of the system.

OBJECTIVES of the Project

- To carry out background research and system analysis on Micro-Hydro power.
- To carry out research on existing controller designs and their disadvantages.
- To carry out research on programming microcontrollers.
- To develop with a system model and circuit design for an electronic load controller.
- To carry out a simulation of the circuit design.
- Building and testing the prototype for illustrative purposes.

METHODOLOGY

<table>
<thead>
<tr>
<th>Objective</th>
<th>Activity</th>
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<tbody>
<tr>
<td>Research on:</td>
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<tr>
<td>Existing ELC Designs</td>
<td>Desk research, Analysis of an operational installed ELC at Suam MHP scheme (Eastern Uganda), Review of several programming materials and books about the microcontrollers.</td>
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<td>System analysis of MHP power</td>
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<td>Programming microcontrollers</td>
<td>Writing code for the microcontroller</td>
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<tr>
<td>Design and Simulation of the controller circuit</td>
<td>Simulation of the several circuit components of the ELC, Voltage Sensing circuit, Timer – dump load circuit, Power circuit for the microcontroller, Using Multisim and Proteus software</td>
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<td>Building and testing the prototype</td>
<td>Building the electronic load controller circuit based on the design, Setting up the control panel and connecting the loads, dump loads, motors and switches, Testing the circuit with the test bench to simulate the control mechanism</td>
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RESULTS

- Frequency and Voltage variation without ELC
- Frequency and Voltage variation with ELC connected

CONCLUSION

In Pico and Micro hydro-power plants, a simplified microprocessor based ELC can be installed to achieve optimal voltage and frequency regulation. The ELC model is a robust and relatively cheaper to make compared to already existing designs therefore reducing the cost of setting up such small power plants.