

INSTANTANEOUS CONTROL OF MINI/MICRO HYDRO PLANTS GENERATED OUTPUT VOLTAGE UNDER VARYING LOAD CONDITIONS

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Abstract

In this study developed Electronic load controllers were used to instantaneously control the generated output terminal voltage using synchronous and asynchronous electrical machines in hydro schemes under varying load conditions. Jan Portegij's ELC/IGC final version was reviewed, designed for and developed using discrete and very high power electronic components. Proportional, integral and derivative (PID) control mode was adopted in this work. Reviewed works revealed that there are M.H schemes with most uses load connected permanently without an ELC, IGC or governor, but a flow control valve on the turbine is adjusted manually. In time of overload as experienced in Evboro II Village and Uwowo Community hydro schemes the ELC/IGC can only switch off dump loads completely; it cannot generate extra power to help coping with a too high demand. Also sensitive appliances that might get destroyed by large voltage or frequency variations could not be retained longer than necessary. The output waveforms from the tested modules matched perfectly with the work of Portegij's. The control of induction and synchronous generator's terminal voltage over a wide range increases the simplicity, reduced cost and reliability of modern – hydro power scheme in view of available spare parts. Comparing the cost of the locally developed Portegij's final version ELC/IGC circuit put at #18350 with ex-work prices for Niger Smith product of the same 8Kw rating sold for 1240Great Britain Pound as at 2005 buttresses the essence of such research.
