ABSTRACT

PROTOTYPE PROTON EXCHANGE MEMBRANE FUEL CELL (PEM FUEL CELL) SIMULATOR BASED ON BUCK CONVERTER AND ARDUINO MICROCONTROLLER

By

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Energy needs and environmental sustainability encourage the creation of alternative energy sources, one of which is a fuel cell (fuel cell). Fuel cell is a collection of cells that can generate electrical energy through redox reaction between a fuel (hydrogen) and oxygen which is continuous and low emissions. One type of fuel cell that is currently evolving in terms of technology and capacity is a Proton Exchange Membrane Fuel Cell (PEM Fuel Cell).

The purpose of this study was designing prototype PEM fuel cell simulator based Buck converter and the Arduino microcontroller. Before make PEM fuel cell simulator, modeling and simulation using Simulink Matlab program is doing. PEM fuel cell simulator is programmed to follow the mathematical model of PEM fuel cell with reference to the reference product PEM fuel cell stack Horizon H-100. Mathematical model of PEM Fuel Cell is acting as a point of reference for the PID controller that generates pulse width (duty cycle) variable as appropriate. With pulse width modulation techniques (PWM) to regulate the voltage Buck converter in a closed loop system it will produce a voltage corresponding to the characteristics of PEM fuel cells .

From the test results PEM fuel cell simulator made inferred based on the effective value and the form of graphs that PEM fuel cell simulator is made have the same characteristics as the reference product PEM fuel cell stack Horizon H-100 and has a high degree of similarity to the results of modeling and simulation. Then from the results of testing variation operating variables such as pressure, temperature, number of cells and the amount of fuel flow is obtained in accordance with the theory of relationships that support.

Keywords:, PEM fuel cell simulator, Microcontroler, Buck converter, PID kontroler, PWM, PEM fuel cell stack Horizon H-100.