

## Abstract

This thesis presents the design and construction of electrical- solar water heater prototype. The thermosyphon flat plate solar water was chosen for this prototype. Thermosyphon or free circulation system use some heat transfer oil for absorption heat from solar energy (for advantage in maintenance) and transferring heat to the water by heat exchanger. A prototype is one square meter flat plate. One set of experiment tested two factors that composed of number of glazing layer (single and double layer) and heat exchanger size (0.16 and 0.54 square meter) then experiment result was used to design the final prototype in order to produce the hot water of 15 litre per hour at 45-50 degree Celsius. There are two experiments which consist of the study of factor affected to ability of electrical-solar water heater, the number of glazing layer (single and double layer) and the heat exchanger size (0.16 and 0.54 square meter), then the test of electrical-solar water heater prototype with automatic control for producing the hot water of 15 litre per hour at 45-50 degree Celsius. The result of the experiment shows that the double glazing is yields better performance and the size of heat exchanger has no significant effect. Therefore, double glazing and 0.16 square meter heater exchanger were selected for the final prototype. The only solar water heater prototype gave average heating power of 5.02 mega joule per square meter per day or 1.4 kilowatt-hours per square meter per day. Then the electrical-solar water heater prototype was tested. It was found that the prototype could save electrical energy 0.17 kilowatt per square meter or 449 kilowatt-hours per square meter per year. (330 day per year). This test concluded from February,28 to April,2,2009. An engineering economic analysis reveals that for 1m.<sup>2</sup> flat plate, payback period is 25 years with 2.3% rate of return. And in case of 10 m.<sup>2</sup> flat plate, payback period will decrease to 9 years with the rate of return of 11.7%

Keywords Water Heater , Electrical-Solar Energy, Thermosyphon ,Heat Exchanger, Number of Glazing