Abstract

The present research investigated the fabrication method of wickless heat pipes in the laboratory with emphasis on one that would lend itself to mass production of wickless heat pipes. The developed method used an oil bath to provide heat to the wickless heat pipes. The wickless heat pipes were made of pyrex glass (inner and outer diameter 8 and 10 mm and length 37 cm +1 1 cm ). The working fluid was pure water, and the temperature of the oil bath was kept constant at 125 C. Two batches of heat pipes, totaling about 500, were manufactured. From the test results it was found that 70 % of the total number had acceptable performance. On the average it took about 3 man-hours to make one wickless heat pipe. In addition a preliminary performance test method was developed to classify the newly fabricated heat pipes. The method employed a constant-temperature oil bath at 90 C and measured the response time (heating time) of each heat pipe to reach 70 C with the aid of temperature-sensitive tapes.

In all two heat-pipe heat exchangers were designed and constructed. The first one had 27 heat pipes. After some design improvement, an actual proto type containing 240 heat pipes was constructed. In testing the performance of both heat-pipe heat exchangers, heat exchange between hot and cold fluids, both water, was carried out. In the performance test of the proto type, the tilt angle of the exchanger were varied (5, 25, 40, 70 and 90 degrees) and it was found that the 90 tilt angle yield the highest heat transfer rate. Furthermore, the flow rates of hot and cold water in the performance test were varied (4, 7, 10, 13 and 16 liters/min) and it was found that the higher the

flow rates, the better the observed heat transfer rate. The average values of UA obtained from the tests were approximately 0.12-0.43 Watt/ C/heat pipe and the average heat transfer rates were 3-16 Watt/heat pipe, which were considerably lower than the theorectical heat transfer limit of such wickless heat pipes.