

ABSTRACT

Integrated solution heater and stirrer system based on hotplate and magnetic stirrer have been designed. The adjustment of stirrer rotation speed adjusted by changing pulsewidth of output (PWM), while the adjustment of heater temperature using automatic control techniques in closed system by PID with the parameters of $K_p=8$, $K_i=4.5$, and $K_d=5$ with trial and error approach. In this research, testing was carried out in accordance with the needs for polymeric materials. Because the polymer has a viscosity which tends to be high, the rotational speed of motor is made up to 5000 RPM by the conditions given the magnetic load. The giving of a magnetic load on a dc motor was tested in this research that the result is magnetic load could reduce the voltage value and the rotation speed of motor produced compared to the condition without the magnetic load. Furthermore, stability and endurancy are also tested because the use of devices in polymer solutions tends to require a long time (4-24 Hours). Stability testing was carried out for 24 hours using PEG solution (150 ml) at each temperature variation tested (80 °C, 100 °C, 120 °C, 140 °C, and 160 °C) while stirring at a constant speed (2500 RPM) and produced an error deviation <2% for heater and (\pm)8% for stirrer. At the end session of research, a test was also carried out related to the effect of constant stirring speed (2500 RPM) to the thickness (viscosity) of PVA 400 solution which varied by mass percent (5 Wt%, 10 Wt%, and 15 Wt%) at room temperature with the test results is a decrease in PVA 400 viscosity . Based on the three tests conducted, the result show that this Heater and Stirrer can be used for synthesis of PEG and PVA 400 polymer materials which are marked by viscosity reduced in both solutions.

Key words : Heater, Stirrer, PWM, PID, RPM, viscosity