# ABSTRACT


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Title : Electric muffle Furnace Temperature Control System Using a Type-K Thermocouple Sensor based on Arduino UNO Microcontroller


*This study discusses the high price of heating furnaces and the unstable high-temperature characteristics. The purpose of this research is to make heaters that are cheap, stable, and able to maintain the temperature at the desired temperature point. In this study the research method used was an experimental method, namely a method that aims to examine the effect of PID (Proportional Integral Derivative) on the stability of heating temperature. This method begins by finding the best PID value using the trial and error tuning method, the Kp, Ki, and Kd values are obtained by randomly experimenting with the PID parameter values in the form of Kp, Ki, and Kd until the best PID control performance is obtained. After getting the best PID value, a heater test is carried out without objects with small objects and also with large objects, this test is carried out by inserting an iron plate (small object) and an iron bar (large object) and then heating it to a peak temperature of 500 oC, this test is intended to determine the stability of temperature over time if the heater is not inserted into objects and if objects of large and small sizes are inserted, then after obtaining the value of temperature stability with heaters without objects, large objects, and small objects, then tests are carried out with different temperature set points, namely 100 $^{O}$C, 200 $^{O}$C 300 $^{O}$C and 400 $^{O}$C this test is intended to determine the stability of the temperature outside the peak temperature. The results obtained in this study were the best PID values, namely Kp (proportional constant) = 1.25, Ki (integral constant) = 0.67, and Kd (derivative constant) 0.75, the results of the Kp, Ki, and Kd values of temperature stability were obtained with an error rate of not more than 2%. Testing the system without objects, with small objects and large objects has a different time for each at the peak temperature (500 $^{o}$C), due to the presence of a heat-absorbing material which causes the time to temperature to look different. Then the results were obtained by testing the system with different temperatures, namely at 100 $^{O}$C, 200 $^{O}$C, 300 $^{O}$C, and also 400 $^{O}$C. The results from testing the temperature of 100 $^{O}$C, 200 $^{O}$C, 300 $^{O}$C, and also 400 $^{O}$C show that the 400 $^{O}$C set point looks smoother. It is shown from the test results that the error rate of increasing temperature is 0.0625% and the error rate of decreasing temperature is 0.5%..*



***Keywords:*** *temperature, heater, error rate, PID, Furnace*