DESIGN AND CONSTRUCTION OF A MICROCONTROLLER-BASED RICE GRAIN DRYER PROTOTYPE WITH THE PROPORTIONAL INTEGRAL DERIVATIVE (PID) METHOD

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ABSTRACT

The drying process of rice grain is an important step to make rice grain ready for milling, where temperature and humidity must be controlled optimally. Manual drying is often inefficient and can reduce the quality of rice grain, so innovation is needed in a more efficient and effective drying method. This report discusses the design and implementation of a prototype of a microcontroller-based rice grain dryer with the Proportional Integral Derivative (PID) method to increase the efficiency of the drying process while maintaining the quality of rice grain. This research involves the design and testing of an automatic drying system equipped with SHT20 and DHT22 sensors for real-time temperature and humidity monitoring, as well as a 12V PTC heating element controlled using the PID method. Testing shows that the PID control system is able to maintain the temperature stability required to dry rice grain with a setpoint of 55oC. The results of the system test show that the DHT22 sensor has an accuracy of 94.27% in reading humidity and the SHT20 sensor in reading temperature of 97.27%. Tunning PID on the plant obtained the value of Kp = 60, Ki = 5, Kd = 0.2 with the characteristics of the control system graph with an Overshoot value of 1.65%, Undershoot 0.05%, Rise Time (Tr) 207 seconds, Settling Time (Ts) 350 seconds, Steady State Error 71 seconds, and Delay Time (Td) 0.12% for a setpoint of 55oC.

Keywords*: Rice grain dryer, Proportional Integral Derivative (PID), Tunning PID*