

PID CONTROL DESIGN FOR TEMPERATURE STABILITY OF 3D PRINTER FILAMENT DRYER

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ABSTRACT

This study aims to implement the PID (Proportional-Integral-Derivative) control method to maintain the temperature stability of the 3D printer filament dryer. With the development of 3D printing technology, maintaining filament quality is important to reduce defects and improve print results. One of the main factors that affects filament quality is humidity, which can be overcome by using a filament dryer. The PID control method was chosen because of its ability to regulate temperature stably and responsively. This study includes the design of a PID control system, selection and integration of electronic components, and tuning PID parameters using manual tuning. The designed system was tested to ensure optimal temperature stability, which will help reduce filament humidity and improve 3D print quality. The results of this study are expected to provide practical guidance for the development of an efficient and reliable filament dryer system, as well as a basis for further research in optimizing temperature and humidity control in similar systems in the additive manufacturing industry. The results of the temperature sensor test showed that the percentage of error produced was 0.34% and the PID parameter values obtained were $K_p = 1.1$, $K_i = 0.3$ and $K_d = 2$ with an overshoot percentage of 14.1%, undershoot 2.04%, steady state error 0.042%, rise time (T_r) for 321 seconds, settling time (T_s) 951 seconds and delay time for 95 seconds

Keywords: *Dryer Filament, PID Control System*