

ABSTRACT

Household waste management is an urgent issue, particularly because traditional handling methods often have significant environmental impacts. One common solution is waste incineration; however, this method frequently leads to air pollution and the emission of harmful gases. Therefore, a more environmentally friendly and efficient approach is required.

This study develops a temperature control system for a small-scale incinerator using an on/off control method to replace manual operation. The system is designed to regulate the combustion chamber temperature of the incinerator by controlling the fuel gas supply through a solenoid valve, which is automatically managed by an Arduino Mega microcontroller. A type-K thermocouple sensor is employed, capable of measuring high temperatures and providing real-time feedback.

The temperature data from the sensor are processed by the microcontroller to automatically regulate the opening and closing of the solenoid valve, ensuring stable combustion within the desired range. An igniter and relay system are used as additional actuators during the initial ignition process. Experimental results show that the system is able to maintain the combustion chamber temperature within the range of 600–730 °C with reasonable fluctuations, while preserving temperature measurement accuracy after calibration with an error of ± 0.42 °C (99.38% accuracy). Furthermore, the system can incinerate 1 kg of organic waste into ash within approximately 14 minutes. This performance demonstrates that on/off control provides more stable and efficient results compared to manual operation. The system also has potential for further development toward artificial intelligence integration.

Keywords: household waste management, incinerator, environmentally friendly, temperature sensor, real-time monitoring.