ABSTRACT

This research aims to design and evaluate the performance of a cooking stove fueled by waste cooking oil, equipped with a pre-heating system, as an economical and environmentally friendly alternative energy solution. Waste cooking oil was selected due to its abundance and potential as a substitute liquid fuel, despite its relatively high viscosity and flash point compared to conventional fossil fuels. The pre-heating system was designed to heat the waste cooking oil before entering the combustion chamber, thereby reducing viscosity and improving atomization during combustion.

The experiment was conducted by monitoring the temperature rise in the combustion chamber and the time required to boil 2 liters of water from an initial temperature of 34°C to the boiling point of 100°C. The results indicated that the combustion chamber temperature rapidly increased and reached approximately 450°C within about 9 minutes when the pre-heater was active. After the pre-heater was switched off, the flame remained stable without significant temperature drop. The water boiling test recorded a total time of 21 minutes to reach the boiling point, demonstrating effective heat transfer from the combustion chamber to the heating medium.

Based on these findings, it can be concluded that the waste cooking oil stove with a pre-heating system delivers satisfactory performance, with good heat efficiency and high flame stability. This technology shows potential for household or small-scale business applications and supports the utilization of waste cooking oil as a renewable energy source.

Keywords: stove, waste cooking oil, pre-heating system, heat efficiency, alternative energy