

ABSTRACT

Plastic waste has become an increasingly urgent environmental issue due to its rising volume and resistance to natural degradation. One promising solution is pyrolysis technology—a thermal decomposition process conducted in the absence of oxygen that converts plastic waste into alternative fuels such as pyrolysis oil (oil), gas, and solid residue. This study aims to design and fabricate a small-scale pyrolysis machine with a 10 kg capacity, equipped with three condenser units to improve cooling efficiency and maximize oil yield.

The machine development process includes technical design, material selection, welding technique, assembly, and initial testing. Shielded Metal Arc Welding (SMAW) with E6013 electrodes was selected due to its compatibility with medium-carbon steel and structural simplicity. Preliminary inspections were conducted through leak testing, heating system evaluation, and verification of instruments such as thermometers and pressure gauges. The test results indicate that the machine operates stably and safely as intended.

With its simple yet effective design approach, this pyrolysis machine is expected to serve as an appropriate technological solution for small-scale plastic waste treatment. In addition to promoting alternative energy use, it also holds potential as an educational tool and for community-based waste management empowerment.

Keywords: Pyrolysis, Plastic Waste, Condenser, Small-Scale Machine, SMAW Welding, Oil, Alternative Energy.