## ABSTRAC

Pyrolysis is a thermochemical process that effectively converts plastic waste into liquid fuel through thermal decomposition in the absence of oxygen. This study aims to analyze the performance of a pyrolysis machine equipped with three-stage condensers in a 10 kg capacity reactor, focusing on the variation in oil characteristics produced at each condensation stage.

The pyrolysis process was carried out using indirect heating with an LPG stove, reaching operating temperatures close to 400°C. The multi-stage condenser system was designed to separate hydrocarbon fractions based on differences in boiling points, yielding three types of bio-oil: light fraction (C5–C10), medium fraction (C11–C15), and heavy fraction (>C15). Parameters measured included yield, density, viscosity, pH, calorific value, and combustion time.

The results showed that the light fraction had the lowest density (0.75–0.80 g/mL) and was highly flammable, while the heavy fraction had the highest density (>0.90 g/mL) and burned for a longer duration. The second condenser produced the highest yield, while the heavy fraction demonstrated potential for diesel engine applications after purification. These findings support the theory that fraction separation based on boiling point through multi-stage condensation can enhance the selectivity and quality of the resulting bio-oil.



**Keywords:** pyrolysis, oil, multi-stage condenser, hydrocarbon fraction, plastic waste.