ABSTRACT

Plastic waste is a pressing global environmental problem due to its difficult-to-decompose nature and its ever-increasing accumulation. Furthermore, plastic waste contains high energy potential in the form of hydrocarbon chains that can be converted into liquid fuel through the pyrolysis process. This final project aims to design a small-scale plastic pyrolysis machine with a 10 kg reactor capacity equipped with a three-stage condenser system to increase the efficiency of pyrolysis oil recovery.The reactor design considers dimensions, high-temperature-resistant materials, and an optimal heating system for the thermal decomposition of plastic waste. The key innovation lies in the three-stage condenser system, designed to gradually cool the pyrolysis vapor, maximize condensation, and enable fractionation of hydrocarbon components based on their boiling points. The methodology used is an engineering design approach, including extensive literature review to understand the principles of pyrolysis, reactor types, and condensation mechanisms.The design results include detailed specifications for the pyrolysis reactor, along with the configuration and operational parameters of three condenser units. This design is projected to effectively convert plastic waste and is expected to increase the yield of economically valuable liquid pyrolysis oil, as well as contribute to sustainable plastic waste management solutions at the household and MSME level.

Keywords: *Plastic Waste, Pyrolysis Machine, Multistage Condenser, Bio-oil, Engineering Design.*