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Design and Application of Portable Pyrolysis Unit to Convert Plastic Waste into Alternative Fuels

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Abstract

Conversion of plastic waste into oil fuel had drawn the attention of scientists for the removal of waste from environment as well energy recovery. Pyrolysis of plastic waste had become an important technique to produce plastic waste oil as new source of energy as well as an alternative to fossil fuel. This study aimed to design a portable pyrolysis unit for the conversion of plastic waste materials into useful fuel products from local facilities. Different horizontal and vertical vessels from local materials were designed and used to convert plastic waste such as HDPE and PP into the so called *plastic oil*. The vertical reactor given better performance than the horizontal for producing oil. Yield around 95% was achieved. A 5-liter portable pyrolysis unit based on vertical reactor was assembled and equipped with a condenser system, temperature control and collection jar. The unit was used to convert different plastic waste into oil. 500 ml of the resulting oil was used as fuel to replace the traditional fuel of a three wheels traditional motorcycle (Tuk Tuk). Fortunately, Tuk Tuk traveled distance 30% more than the distance travelled by same amount of traditional fuel. The designed unit is suitable to be used anywhere in rural area if water supply is available and can be heated by either electrical power or cooker gas. The prototype can be easily scaled up into suitable end use size based on the volume of the waste available. The design is open for more modification and future development.

Keywords: plastic waste, reactor design, plastic fuels, pyrolysis, plastic waste management