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Conversion of plastic waste to liquid fuel

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Plastic is a high molecular weight material. The term polymer means a molecule made up by repetition of the simple unit. From 2009 to 2010 the global production of plastic in the simple unit. 2009 to 2010 the global production of plastics increased by 15 million tonnes. Plastics can be classified on the basis of numerous criteria such as chemical composition, chemical structure, stiffness, type of application and processing method used. Pre-consumer plastic wastes are generated during the manufacture of virgin plastics from raw materials and from the conversion of plastics into plastic products. The amount of plastic waste collected daily at Khartoum is about 362 ton per day. This amount of is assumed to impact the environment severely, so this work was aimed to propose methods to utilize waste by converting it into useful and usable products (oil). The methodology followed comes in steps; firstly, to study the plastic properties and the possibility of converting it to hydrocarbons. Secondly, to study the previous processes adopted in converting plastic to oil. Thirdly, to modify and develop a chosen processes. Aspen Hysys program was used for the simulation of the modified process. The process can describe as Inlet stream mixture of polymers into the inter preheating unit then conversion reactor, the upper stream of the reactor goes to cooler and to condensate the vapor. The downstream is the residual which is transformed black into carbon (solid). After first cooling cycle, the stream enters a separator to separate the liquid (oil) from the vapor. The liquid goes to finish product tank. The vapor cooled down to produce more oil in the second cooler which condensate the vapor. Then separator to separate the liquid (oil) from the vapor. The oil goes to finish product tank. The uncondensed gases were used to heat the inlet stream in the preheating unit. The thermal decomposition of polymers (polystyrene, polyethylene and polypropylene) was change it to hydrocarbons at 425 result obtained polyethylene completely dissociated, polystyrene approximately dissociated and polypropylene partially dissociated. All the feed is reacted so there are no unreacted polymers. The amount of uncondensed gases is 4.6% and it reused and recycle as preheat the feed and reaction obtained perfect result and yield more than 95.2% of oil. There are excess in energy by 39%. In this work and according to the results considerable amount of energy per kg feed was produced in addition to the main product (oil). More studies may be needed to apply the simulation outcomes into real life results.

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