Waranyou Tuntanatewin 2010: Plastic Pyrolysis with Gas Recycling in a Fluidized Bed Reactor. Master of Engineering (Chemical Engineering), Major Field: Chemical Engineering, Department of Chemical Engineering. Thesis Advisor: Associate Professor Sunun Limtrakul, D.Sc. 164 pages.

A pyrolysis process is a thermal degradation in absence of oxygen/air. Plastic pyrolysis may be a process for disposal of plastic waste with recovery of valuable liquid fuel-range hydrocarbons. However, pyrolysis is a high endothermic reaction, which is required heat supply to the system. A partial oxidation is an exothermic reaction. Therefore, combining pyrolysis with partial oxidation reaction is one of the challenges for saving energy in a plastic pyrolysis process. Recycling of the product gas is proposed to reduce inert gas usage and energy requirement. In the experiments of a semi batch reactor, the results showed that the presence of partial oxidation and gas recycling increases the temperature rising of *5-30 ^{o}C* leading to reduction of liquid product by *5.80 %*. On the other hand, the yield of gasoline increases by *8.35 %*. A fluidized bed reactor was also introduced to test the applicability. The effects of LPG and air feed rates for combustion and plastic feed rate on the bed temperature were studied. Increasing of LPG and air feed rates increases the average reactor temperature. In addition, the effects of feed rate of secondary air for partial oxidation and feed rate of gas recycling on bed temperature profiles, production rate and product distribution were studied. Addition of partial oxidation has a significant effect on the reactor temperature and production rate. Increase of partial oxidation increases the system temperature in the range of *5-10 ^{o}C*. The present of partial oxidation can save energy of *0.70 %*. Gas recycling can reduce the inert gas usage of *34.28 %* and save the energy input of *5.47 %*.

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