

Coach Dr. Ir. Bhargav Baruah	Supervisor(s) Prof. Kevin Van Geem	Funding Electro
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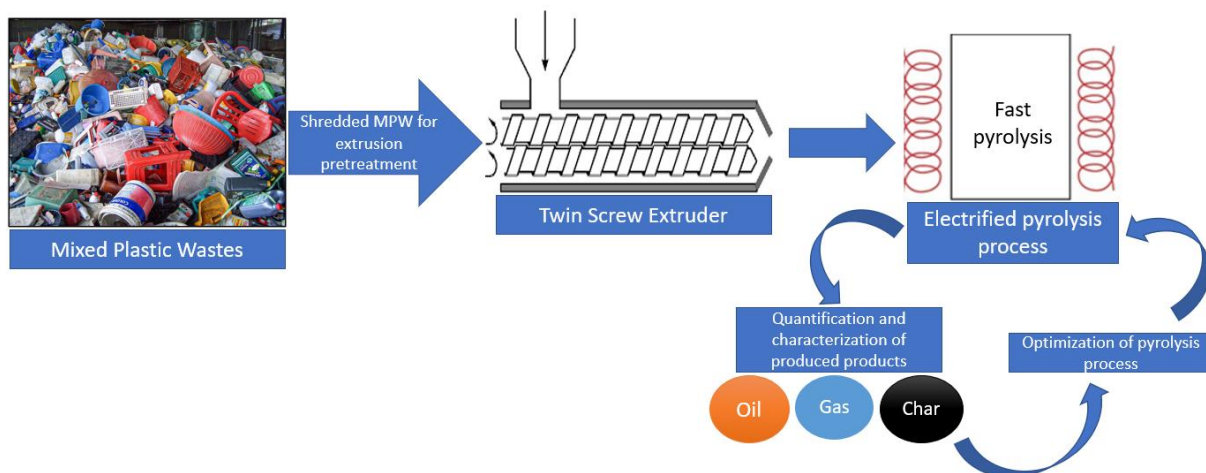
Investigation of the effect of pyrolysis parameters and feed on production of naphtha grade hydrocarbons from pyrolysis of waste plastics

Aim

The objective of this master's thesis is to investigate, and optimise the pyrolysis process of mixed waste plastics in an industrial-scale plastic pyrolysis pilot plant to produce naphtha grade product as a viable feed for steam cracking. The project will be in collaboration with the R&D centre of Pyrme Cleantech.

Justification

Plastic is an integral commodity in the day-to-day life of humans. Sustainable and economic recycling of waste plastics has emerged as a major challenge for researchers around the world. Recycling of plastic waste has the potential reduce the production of virgin plastics from petroleum products, thus reducing the energy utilization, and emission of greenhouse gases, and minimising the overall impact on the environment over the life cycle of the product. Therefore, clean, sustainable and economic recycling of plastic waste has gained significant interest in recent times. Plastic recycling is performed by different techniques, such as, incineration, mechanical recycling, chemical recycling by depolymerization, and thermochemical recycling (viz, pyrolysis, and gasification).



Pyrolysis has emerged as a recognized technology for conversion of plastic wastes into smaller molecules thus converting them into useful chemical building blocks. Pyrolysis of waste plastics in combination with steam cracking has the advantage of reprocessing of waste plastics to virgin plastics. Pyrolysis of plastics occurs in the range of 300°C to 700 °C in an inert environment to produce liquid, gas, and char. The yield and composition of the produced oil and gaseous products during pyrolysis are influenced by the type of reactor, reactor temperature, heating rate, and retention time. Therefore, the optimization of the above stated parameters is of critical importance.

Program

- Literature survey on pyrolysis studies of different types of plastics, challenges in plastic pyrolysis, use of extruder in pyrolysis experiments, and upgradation of pyrolytic oils produced from mixed plastic wastes.
- Investigate and optimise the effect of pyrolysis temperature and feed on yield of oil, gas and char for industrial upgradation.
- Investigate and analyse the causes, effect, and mitigation of coking during pyrolysis process.
- Compositional analysis of produced oil, gas, and char samples.