

Plastic to Petrochemicals – Recycling of Pyrolyzed Municipal Plastic Waste by FCC Co-Processing

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Abstract

Since the first commercially relevant fluid catalytic cracking (FCC) units started production in the 1940s, a lot has changed. Today's FCC units not only produce a significant amount of gasoline, but also high yields of basic chemicals for the petrochemical industry, such as ethene, propene, butene and BTX aromatics. Current research focuses on gaining valuable products from heavier, more complex and recycled feedstocks. The processing of pyrolysis oils, made from highly problematic municipal plastic waste that accumulates in the environment, is thus the next logical step.

The joint research of TU Wien and ILF Consulting Engineers investigates the use of syncrude, obtained by pyrolyzation of municipal plastic waste, as co-feed in a continuously operating FCC pilot plant located at TU Wien. For the experimental work, vacuum gas oil (VGO) with variable admixtures of syncrude was fed into the pilot plant.

The syncrude used in the experiments consisted of approx. 60 % polyethylene, approx. 20 % polypropylene, approx. 10 % polystyrene and approx. 10 % contaminants such as polyvinylchloride, polyethylene terephthalate, pulp, composite plastics, rubber, diapers, food residues and inorganics.

To investigate syncrude's suitability for co-processing and to determine the resulting product yields, test runs were carried out using 0, 5, 10 and 20 % syncrude admixtures, and the results compared. The products were classified into gaseous products, gasoline, light cycle oils, residues, coke and water. Through further examination of the gaseous products, the produced olefin yields were determined in order to assess the extent to which co-processing of municipal plastic waste in a FCC unit can contribute to the implementation of a circular economy.