

Bachelor / Master Thesis

Fractionation of plastic pyrolysis oils for optimal reintegration into the petrochemical industry

Background:

The increasing production and use of plastics are leading to steadily growing volumes of waste worldwide. Mixed waste, in particular, poses a challenge for mechanical recycling due to its heterogeneous composition. Chemical recycling methods such as pyrolysis offer great potential for recycling this waste as well. In this process, the polymer chains of the plastics are thermally broken down, yielding, among other products, pyrolysis oil. Depending on the characteristics of the waste, this oil consists of a broad range of different hydrocarbons, which often need upgrading before they can be reused to produce new plastics.

Description of Task:

Since petrochemical processes, such as the steam cracker, are optimized for a specific distillation profile of the conventional crude oil feed, the pyrolysis oils cannot always be processed optimally by these processes or may even cause problems in stable plant operation. To ensure optimal reintegration into existing plants, the pyrolysis oil is to be separated by distillation into several fractions that better match the design specifications of the petrochemical plants. Subsequently, the reintegration of the boiling ranges will be evaluated. The work is divided into four steps:

- Literature review on the modeling of distillation separation processes
 - Supervision and analysis of experiments conducted on a pilot distillation plant
 - Development of a simulation for the distillation separation of pyrolysis oils in Aspen based on the experimental results
 - Evaluation of potential downstream processes for the various pyrolysis oil fractions using existing models
- **What We Offer:**
- Continuous and close supervision
 - The opportunity to work at the interface of process development, process modeling, and process evaluation
- **Your Profile:**
- Student in Chemical Engineering, Process Engineering, Industrial Engineering, or a related field
 - Independent, structured work style
 - Solid knowledge of mass and material balances
 - Optional: Experience in Python or Life Cycle Assessment

Start: August 2026 or later

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