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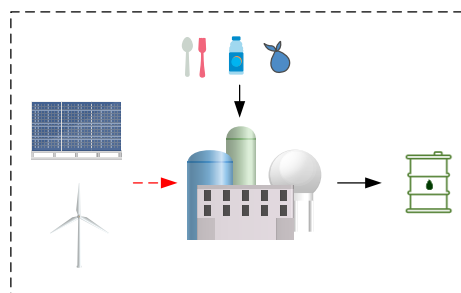
Process simulation and life cycle assessment of mixed plastic waste pyrolysis heated by renewable power at different locations in EU

Aim

This master thesis aims to investigate the technical performance of the mixed plastic waste pyrolysis process and its environmental impact compared with the current plastic treatment system.

Justification

Plastic waste has caused serious environmental problems in the world, including the CO₂ emissions from its fossil-fuel-based production and discarding into nature without well-treatment. European Union has taken active actions to increase the reusing and recycling of plastic waste to create a circular economy and carbon neutrality. Pyrolysis is an effective route to deal with mixed plastic waste by producing high-added-value chemicals. Since the pyrolysis process requires heat, the heat will be produced from renewable electricity such as solar and wind power to avoid CO₂ emissions by energy supply. It is necessary to investigate the environmental impact of this integration since power-to-heat needs large land areas due to the low conversion efficiency. Meanwhile, the weather conditions also play an important role, so various locations should be compared to study the transferability of the technology in different countries in the EU. This research will provide reliable results to understand the technical and environmental performance of the process, which will benefit the scaling up and commercialisation in the future.



Program

1. Literature review of mixed plastic waste pyrolysis simulation and its LCA, pointing out the problems of available research.
2. Building the process model in Aspen Plus based on the experimental results from RQChem, obtaining the required energy input for solar panel and wind turbine fields
3. Taking Finland, Belgium, and Italy as examples, calculate and compare the environmental impacts of the process at different locations in the EU via SimaPro.
4. Write a report.