

Project ChemCycling™

Environmental Evaluation based on Life Cycle Assessment (LCA)

Executive Summary

Life Cycle Assessment (LCA) is a broadly accepted tool (ISO 14040/44) to evaluate the environmental impacts (e.g. CO₂ emissions) of products and technologies. The critic third-party reviewed LCA study for ChemCycling™ arrives at the following conclusions:

- Pyrolysis of mixed plastic waste emits 50 percent less CO₂ than incineration of mixed plastic waste.
- CO₂ emissions are saved when products are manufactured based on pyrolysis oil (as secondary raw material under a mass balance approach) instead of naphtha (primary fossil raw material). The lower emissions result from voiding the incineration of mixed plastic waste.
- Manufacturing of plastics via either chemical recycling (pyrolysis) or mechanical recycling of mixed plastic waste results in similar CO₂ emissions. It was taken into account that the quality of chemically recycled products is similar to that of virgin material and that usually less input material is sorted out than with mechanical recycling.

Methodological approach

- The study compares pyrolysis, as the thermal cracking of polymeric chains into a mixture of short-chain hydrocarbons, versus competing end-of-life options (mechanical recycling and incineration). Moreover, it compares the production of chemically recycled plastics to the production of conventional plastics made from primary fossil resources (naphtha).
- Real process data were used for the pyrolysis process. Common practices of waste treatment were taken as basis for incineration and mechanical recycling.
- The LCA study was commissioned by BASF, performed by a third party (Sphera) according to ISO 14040/44 and reviewed by three independent recognized experts¹

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