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# The comparison of centralized and decentralized catalytic pyrolysis systems for comingled post-consumer waste plastic mixtures via LCA and economic analysis

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**ABSTRACT**

Waste, especially that of plastics, is a global problem that carries serious economic, social and, particularly, environmental impacts. Many studies and statistics have demonstrated the continuously accelerating trend in plastic production, and that plastic-associated problems are becoming increasingly worse due to its ubiquitous nature in human life. Also, issues associated with technological and economical limitations in waste sorting and recycling processes cannot effectively tackle the problem with recyclable plastics. In a reality, a huge amount of recyclable plastic ends up in landfills. One of the ways in which to reduce landfilled plastics, which is considered to be losing scarce resources, is to use plastic-to-energy technologies. Catalytic pyrolysis is a promising technology to treat plastics and produce valuable energy fuels. Despite a lack of studies in this area, catalytic pyrolysis has showed more advantages than many other plastic treatment technologies in terms of environmental and economic impacts. More research studies are needed to determine all the benefits, and indeed pitfalls, of using this technology. In our study, we compare centralized and decentralized catalytic pyrolysis systems for comingled post-consumer waste plastic mixtures via lifecycle assessment (LCA) and economic analysis. The novelty of this topic is that the comparison of centralized and decentralized catalytic pyrolysis systems has not been previously been considered, and the advantages and disadvantages of catalytic pyrolysis using comingled post-consumer waste plastic mixtures is not particularly well understood by other researchers. LCA can determine the global warming and eutrophication potential of centralized and decentralized catalytic pyrolysis systems that use plastics. Economic analysis can identify which of the two is more economically efficient by comparison of facility cost, maintenance and operating costs, and absolute revenues. Ultimately, social, economic, and environmental impacts can be interpreted based on LCA and economic analyses.

**Keywords:** pyrolysis, catalytic pyrolysis, plastics, LCA.

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