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APPLICATION OF LCA METHODOLOGY IN THE ASSESSMENT OF A PYROLYSIS PROCESS FOR TYRES RECYCLING

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Abstract

According to recent estimations, the total yearly amount of end-of-life tyres (ELTs) arising in Europe exceeds 3 million tons; more than 95% are managed through mechanical and thermal treatments because ELTs represent a useful resource both of materials and energy. For this purpose, the goal of the present work is the assessment of the environmental impacts of a novel pyrolysis process and the comparison with alternative ELTs valorisation or disposal scenarios. Life Cycle Analysis (LCA) methodology has been applied to determine the most critical stages of the process under study, assessing the environmental benefits arising from the recovery of material and energy and the impacts, compared to the technologies already on the market, taking into account treatment processes, materials recovery and disposal of wastewater/residues. The chosen functional unit (FU) is 1 ton of ELTs treated by the plant. The different scenarios investigated have been analyzed through ReCiPe impact assessment method. Considering the pre-treatment, the pyrolysis process results in a lower environmental impact compared to the others, with the 1/3, 1/10 and 1/20 of energy consumption compared to the alternatives considered. The analysis of pyrolysis process showed that the avoided impact due to the recovery of carbon black, steel, oil and syngas exceeds the impact generated by the process, related to the energy consumption and to the emissions into the atmosphere. Compared to other energy-recovery scenarios, a greater advantage results from the pyrolysis process, mostly due to the recovery of valuable materials. Then, comparing it to other material recovery scenarios, a variable influence is given by the different options of recovery, considering which materials could actually be replaced and the commercial value of the materials that is replaced.

Key words: energy, life cycle assessment, material, recovery, tyres

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