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LIFE CYCLE ANALYSIS OF MATERIAL AND ENERGY RECOVERY FROM WIRE DRAWING LUBRICANT WASTE

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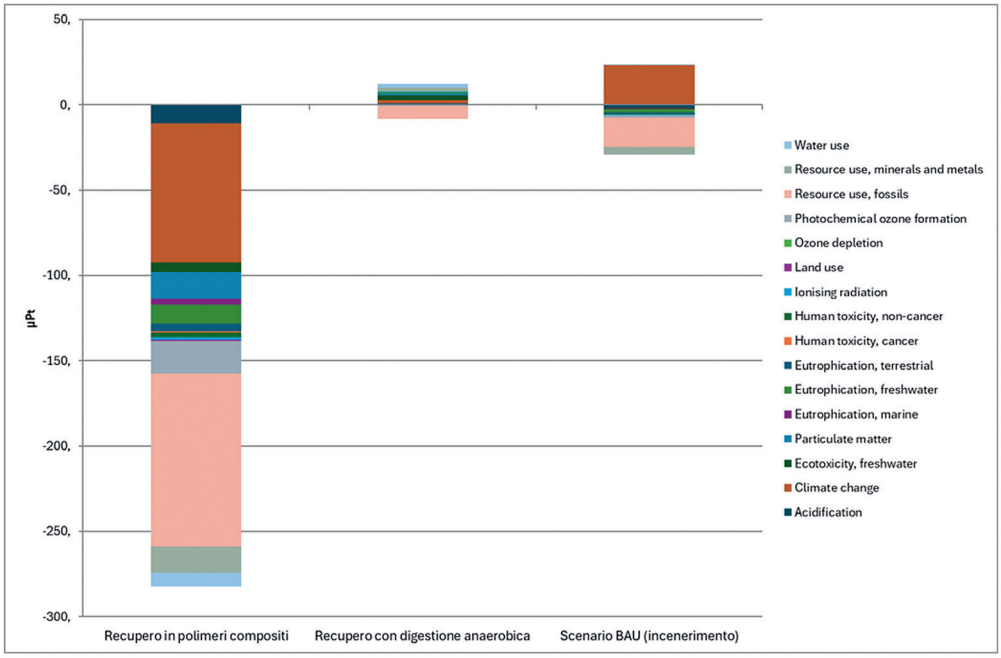
Abstract – In the framework of the STAR project, the valorisation of stearate based solid lubricant waste from wire drawing process was investigated with respect to material recovery (addition in polymeric matrices) or energy recovery (anaerobic digestion with biomethane production). The aim of the present study is to compare different scenarios for the treatment or recovery of wire drawing lubricant waste (WDW) in order to identify the best option from an environmental point of view. The study was conducted using the Life Cycle Assessment (LCA) methodology. The functional unit considered was "treatment or recovery of 1 kg of WDW". The impacts of three scenarios were compared: 1. Business As Usual (BAU): WDW incineration with energy recovery; 2. Material recovery in the production of LDPE-based composite polymers; 3. Anaerobic digestion of WDW, with biogas production and its conversion to biomethane. In all scenarios, the process that generated the waste was excluded, while credits associated with avoided products were included. The Life Cycle Inventory model was created in the Simapro 10.2 software. The impact calculation was carried out using the EF 3.1 method. The scenario that guarantees the greatest benefit in terms of avoided impacts is scenario 2 (–282.22 µPt) (figure). The other two scenarios have much lower values: –5.58 µPt for the BAU scenario and 4.37 µPt for the anaerobic digestion scenario. This result strongly depends on the assumptions regarding the polymer substitution rate (1 kg of LDPE avoided for every kg of WDW recovered) and methane production rate (0.22 m^3 of fossil methane avoided for every kg of WDW recovered) and may vary, in case more specific values become available in the future.

Keywords – Anaerobic digestion; environmental footprint; wire drawing lubricant; waste recovery



Comparison between the analyzed scenarios (results of the weighing phase)

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