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SUSTAINABLE END-OF-LIFE TYRE MANAGEMENT: A COMPREHENSIVE ANALYSIS OF ENVIRONMENTAL IMPACTS AND CRUMB RUBBER INTEGRATION IN COMPOSITE CONCRETES

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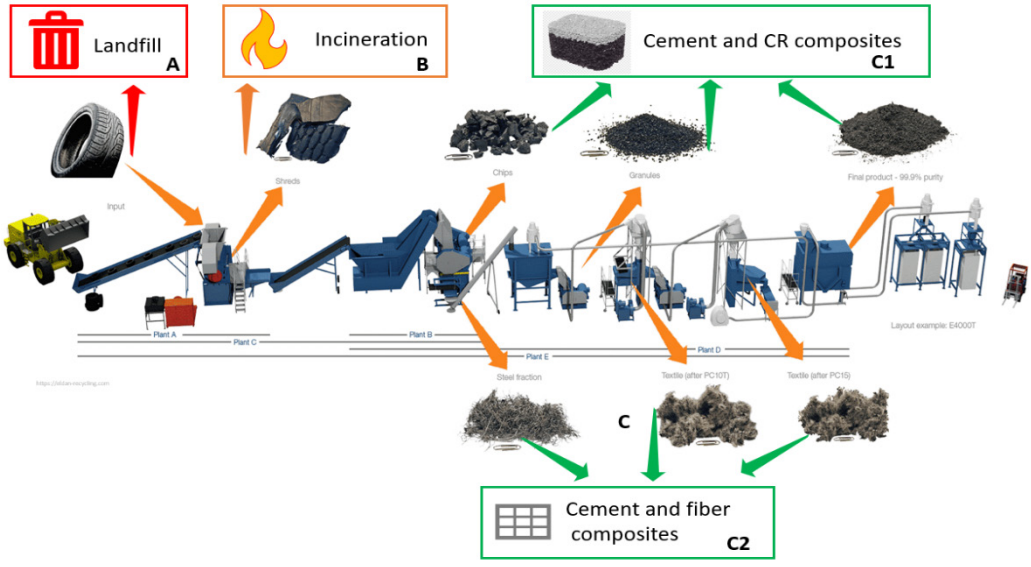
Abstract **–** The research explores pollution prevention strategies associated with end-of-life tyres (ELTs) through sustainable practices, focusing on repurposing ELTs into crumb rubber (CR) for use in composite concretes for civil engineering applications. Three disposal approaches are considered: recycling into crumb rubber for use in cement composites to enhance acoustic properties, incineration for cement production, and landfill disposal. The study aims to assess the environmental impact of each method, particularly in terms of carbon dioxide (CO_2) emissions during the recycling phase, utilizing the OpenLCA program for a comprehensive life cycle analysis. The primary objective is to provide insights into the sustainability of incorporating recycled rubber in concrete mixes as fine aggregate to improve concrete acoustic and shock absorbance properties. The research also gathers data on CO_2 emissions from ELT incineration for cement production and the environmental implications of ELT's landfill disposal. By comparing these three strategies, the study offers a holistic perspective on the environmental ramifications of ELT management. Notably, a recent study highlights the energy recovery and CO_2 emissions from ELT incineration, demonstrating the potential benefits of recycling. The research identifies a gap in existing studies, emphasizing the need to consider the entire life cycle, including the transportation and use stages.



End-of-life tyre recycling process diagram with obtained products.