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RECYCLING POSSIBILITIES OF WOOD-CEMENT PARTICLE BOARD MANUFACTURING WASTE

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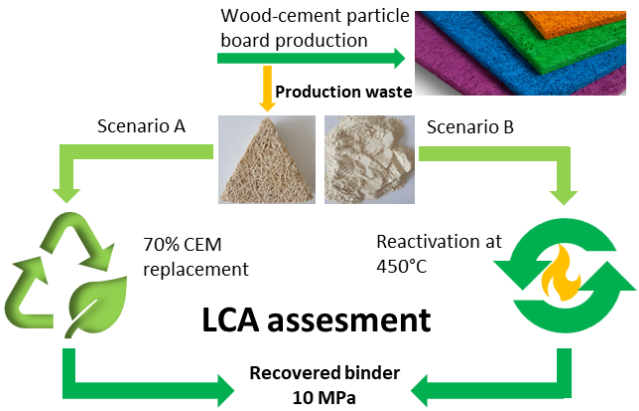
Abstract – Wood-cement particle boards are gaining popularity within construction materials as they combine natural fiber architectural value with Portland cement durability. The production of the material is associated with processing the produced fiberboards, which includes cutting, grinding, and polishing. The remaining wood-cement dust residues are classified as production waste, which is now deposited in the dump and gives extra expenditure for the enterprise. The utilization of wood-cement dust would also benefit the circular economy and reduce the environmental impact of the production process. Two scenarios are analysed in this research, and the life cycle assessment (LCA) tool with *SimaPro* software is compared. The first scenario is associated with the partial replacement of Portland cement with wood-cement dust powder. The second scenario offers re-activation of the wood-cement dust at 450 °C to obtain binder properties. Both materials' mechanical strength is comparable, reaching 10 MPa after 28 d curing. To maintain target strength, 70 % of Portland cement can be replaced. To produce 1 t of binder by heating at 450 °C, 1.2 t of wood-cement dust is needed as natural moisture evaporates, and wood dust particles go through pyrolysis, giving extra heat and CO_2 emissions as well. LCA results indicate that the 70 % replacement of Portland cement reduces CO_2 emissions from 597 kg of CO_2/ton of CEM II/A-LL 42.5 to 179 kg of CO_2/ton, while the second scenario is associated with high energy consumption during burning of the binder and increased CO_2 value due to fossil fuel consumption and CO_2 release from burning organic compounds in the material.

Keywords – Binder; circular economy; composite; life cycle assessment



LCA scenarios of wood-cement particle board production waste recovery.

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