Environmental Engineering and Management Journal xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
http://www.eemj.icpm.tuiasi.ro/; http://www.eemj.eu

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CARBON FOOTPRINT ASSESSMENT FOR CLOTHING: A CASE STUDY OF AIR INFLATABLE SUIT

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Abstract

The textile and apparel industry, characterized by its long supply chain and energy-intensive production, is one of the most polluting industries in the world. Inflatable garment uses eco-friendly air as an insulating layer to replace traditional thermal insulating materials, which is an advanced effort to reduce carbon emissions. This paper aims to assess the environmental impact of carbon emissions from the production process of an inflatable garment product to understand the environmental impact of producing a newly developed apparel product. This study quantifies the carbon footprint of an inflatable garment using cradle to factory gate system boundaries (excluding transportation), revealing a mean value of 4.83 $kgCO_2e$ per garment from fiber production to final assembly. This study provides the first quantitative assessment of emission hotspots in inflatable garments, revealing a significantly lower cradle-to-gate carbon footprint compared to conventional thermal apparel benchmarks. Among the various stages of inflatable garment production, the carbon footprint of the yarn production stage accounted for the largest proportion. The carbon footprint at the use stage varies with different washing machines. To further reduce emissions, transitioning from coal-dominant electricity to renewable energy sources demonstrates significant potential benefits.

Key words: carbon footprint, environmental impact, inflatable garment, product manufacturing

Received: April, 2025; Revised final: August, 2025; Accepted: September, 2025

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