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WASTE TO RESOURCE: A PRELIMINARY APPROACH TOWARDS END-OF-LIFE INVESTIGATION OF DEFENSE USED BOOT OF BANGLADESH FOR A SUSTAINABLE ENVIRONMENT

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Abstract

Bangladesh consumes around 14 million pairs of defense boots annually and after a certain period or End-of-life, they turn into waste when their expediency expires. The assessment of used defense boots, which has not been the topic of any previous research in Bangladesh, is the main goal in this study. An investigation is performed on various components from the defense-used boots using different physical and chemical techniques. This study also examines sustainable pathways for managing solid waste from used boots from the defense. Analysis of four pairs of collected boots identified key materials such as leather, thermoplastic rubber (TPR), laces, and metal components. Observations showed extensive wear degradation of 92 – 96 % after six months of use, when leather tensile strength decreased to an average of 14.6 N/mm², mentioning significant material deterioration. Fourier-transform infrared spectroscopy (FTIR) of the boot leather detected amide and protein peaks, while the sole was confirmed as TPR. Chromium content in the leather was measured at 2.41% (w/w), posing environmental hazards if improperly managed. To address this, a 4R's waste management framework: reuse, recycle, recovery, and reduce was proposed, based on the properties of the different boot components. This integrated approach aims to limit emissions of greenhouse gases, heavy metals, dyes, and other pollutants, thereby mitigating health risks, environmental pollution, and climate change impacts. Additionally, this work explores critical processing methods, including mechanical, thermochemical, and chemical treatments, for effectively repurposing post-consumer boot materials.

Key words: 4R's waste management, defense used boot, environmental pollution, leather waste, SWOT analysis

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