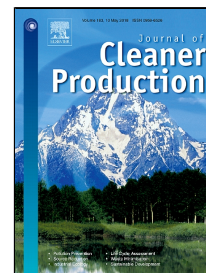


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Performance Investigation and Sustainability Evaluation of Multiple-Polymer Asphalt Mixtures in Airfield Pavement

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ABSTRACT: Increasing aircraft loads and landing frequency are becoming challenges to airfield pavement material design. The objective of this study was to give overall performances of multiple-polymer asphalt mixtures containing anti-rutting agent (ARA), polyethylene (PE) and styrene-butadiene-styrene (SBS). A series of binder and mixture tests were conducted to investigate mechanical performances, the life-cycle assessment (LCA) was used to evaluate environmental impacts. It was found that the addition of multiple-polymer resulted in excellent high temperature performance with high rutting factor and softening point, but it led to large energy consumption and GHG emission. Also, SMA-13 mixture had larger environmental impacts than AC-20 due to higher binder content. The radar chart and rheology-environment performance ratio (REPR) were proposed to compare rheological performances and environmental impacts with respect to polymer content and test temperatures. The field practice of HMA overlay selected 0.2% of ARA and 0.5% of PE by weight of asphalt mixture as the optimal polymer content. It was found that the multiple-polymer mixture had a great resistance to permanent deformation and enough resistances to moisture damage and low temperature cracking. However, the quality control of pavement construction was not effective because air voids of cored specimens exceeded the requirement even though other properties were satisfied with the requirements. In addition, compared with HMA, the WMA compacted at 155°C had lower air void and maximum bending strain. Therefore, the application of WMA additives in multiple-polymer modified asphalt mixture should be further studied.

Key word: PE, ARA, Rutting resistance, Moisture susceptibility, Quality control; LCA.

1. Introduction

Airport is one of the major infrastructures to attract investments from different sources in every country, and its pavement preservation and maintenance are

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