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ORIGINAL RESEARCH PAPER

Evaluation of Corn Cob Ash as Mineral Filler in Asphalt Mixture

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Abstract

Integrating waste materials in the highway sector, especially in asphaltic concrete mixture offers ecological and economic benefits. This study examines the effects of using corncob ash (CCA) as a replacement for the traditional stone dust filler in 5%, 10%, 15%, 20%, and 25%. Volumetric parameters including flow test, bulk density, air void, stability, and voids in mineral for obtained mix asphalt were determined. The optimum bitumen content (OBC) was determined using six replacement rates of 5.0 to 7.5% at intervals of 0.5% by weight. In addition, it was observed that 15% CCA filler replacement produced the best results for OBC at 6.3%, maximum stability at 14.4 KN, flow at 3.8 mm, void filled with bitumen (VFB) at 84.9%, bulk density at 2.55 g/cm^3, air void at 4.3%, and finally marshall quotient value at 3.8 KN/mm, which satisfied all requirements of the standard specification for medium traffic roads in asphalt mixture. The study's results also demonstrated that some of the stone dust fillers in hot mix asphalt may be effectively replaced by agricultural waste materials, potentially enabling the reuse of agricultural waste, optimizing construction costs, and reducing nuisance waste.

Keywords Asphalt · Corn cob Ash · OBC · Marshall Stability · Asphaltic Concrete

1 Introduction

Bitumen, granite, sand, and filler are common ingredients used in the creation of asphalt concrete in the road-building industry [1, 2]. The development of road paving systems in developing countries has been severely hampered by the expensive and continually rising cost of these materials [3, 4]. Most especially in rural parts of developing countries where the construction of sustainable roads has been significantly hindered by the rising cost of these naturally available materials [5]. The high raw material consumption of the construction sector also adds to the ongoing lack of building materials and materials for building roads, as well as to the resulting environmental impact [6]. Road paving professionals and transportation policymakers are becoming more concerned about the use of readily available to promote sustainable transportation, along with initiatives by the sector to mitigate the prevailing challenges [7]. Therefore, highway engineering must search locally for the development and usage of local raw materials that can either entirely or partially replace mineral fillers in road construction projects [3]. According to Krantz et al., [8], a practical alternative material should be available nearby, have stable raw material costs, be economical to convert, and be easy to understand

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