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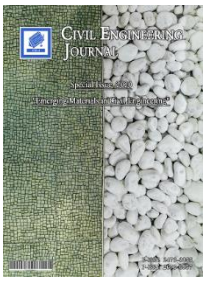

Review Article

A Review of the Utilisation of Recycled Waste Material as an Alternative Modifier in Asphalt Mixtures

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Abstract

The possibility of using waste materials in road construction is of great interest as their utilisation may contribute to reducing the problems of hazard and pollution and conserve natural resources. Thus, there is an urgent need to find a sustainable method for using waste materials as a substitute in the standard asphalt binders. There are several concerns about the physical and chemical properties and mechanical performance of asphalt pavements incorporated with waste material in the effort to reduce permanent deformation of the road surface. This review article presents a brief discussion of the asphalt mixtures modified with waste material, and the recycled materials used as a modifier in the asphalt mixture. The present paper summarises the use of crumb rubber, crushed concrete, steel slag, glass fibre and plastic waste in asphalt mixtures. The use of waste materials as a modifier in asphalt mixture resulted in improved asphalt pavement performance. Results advocate that rubberised asphalt mixture with desired properties can be designed as an additive with a friendly environmental approach in construction materials. The researches that adopted the influence of usage, recycle waste material to improve the performance of the asphalt of the road are still limited compared to other construction fields.

Keywords: Waste Materials; Properties; Asphalt Modifier; Asphalt Pavement; Recycling.

1. Introduction

In developed countries, the waste materials generated by the industries pose a serious environmental problem by manufacturers or individuals that lack any residual value is termed as waste [1, 2]. The feasibility engorging waste material used in the highways construction industry is playing a leading role worldwide as a green investment movement [3, 4]. In recent years researchers have been carried out to explore the possibility of using alternative waste material such as steel slag, plastic and scrap tires to construct Hot-Mix Asphalt (HMA) pavements to minimise the deterioration of road pavements [3]. In 2018, the total amount of waste generated, including those generated by households and economic activities in 28 European Union countries, exceed 2.5 billion tons. A total of 285 million tons of scrap tires are discarded in the USA yearly, as an example, as well as used in Portugal, China, Canada, and South Africa [5, 6]. Recycled scrap tires can be used as raw materials in the form or crumb rubber and powder rubber [7]. Research has shown that waste material such as rubber tires is suitable for incorporation in asphalt mixture since rubber tire can improve the performance of asphalt pavement and reduce the need to use new raw materials for the construction of road pavements [8-10]. Furthermore, the crushed concrete in several types of research confirmed that the recycled concrete aggregates (RCA) are applicable for reuse on the roads, concrete pavement when it is replaced

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