

Influence of Using White Cement Kiln Dust as Mineral Filler on Hot Asphalt Concrete Mixture Properties

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ABSTRACT

The White Cement Kiln Dust (WCKD) is a byproduct material, formed in cement factory during the operation of cement production. In highway construction, the WCKD can be used in different ways such as stabilizing the subgrade of highway embankment and as mineral filler in Hot Mix Asphalt (HMA); the latter usage will give clean and healthy environment in addition to more economy. In Iraq, there are two common types of fillers, Portland cement and lime stone powder. In this research, WCKD taken from Fallujah cement plant used as mineral filler in addition to two common types. Various percentages, such as 100%WCKD, 50%WCKD + 50%Cement(C), 100%C, 50%WCKD+50%Limestone (L), and 100% L, were used to prepare asphaltic concrete mixes. In general, five tests were used to evaluate the performance of these mixes. Standard Marshall Test procedure was applied under three different conditions, two of them at two temperatures at 60 °C and 70 °C and in the third one it was used to test samples immersed in water, at room temperature (24 °C), for four days. Indirect Tensile Strength Test (ITST) was used to evaluate conditioning and un-conditioning samples. All test results, when compared with controlled asphalt concrete sample (Sample contained 100% limestone as filler), were acceptable and within the AASHTO and Iraqi Standard Specifications of Roads & Bridges 2003. Stability values, at standard condition test, of samples containing 100% WCKD, 50%WCKD+50%C, and 50%WCKD+50%L are 11.9kN, 13.2kN, and 14.0kN respectively, while for controlled sample was 9.0kN. The Marshall stiffness values showed similar trends, for samples having 100% WCKD, 50%WCKD+50%C, and 50%WCKD+50%L giving 3.22kN/mm, 3.38kN/mm, 3.5kN/mm respectively but for controlled sample was 2.43 kN/mm. Same trends of results gained in ITST. The results showed the beneficial using of WCKD as filler that will conserve the environment and encourage the HMA producers to use this inexpensive material in their works.