Enhancing Hot Mix Asphalt (HMA) Matrices With Basalt-Limestone Combinations and Evaluating the Impact of Waste Engine Oil Rejuvenation in High-Reclaimed Asphalt Pavement Mixtures

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The use of Hot Mix Asphalt (HMA) with Reclaimed Asphalt Pavement (RAP) and Waste Engine Oil (WEO) as a rejuvenator has gained popularity in sustainable pavement construction due to potential degradation of pavement performance. Basalt, due to its stiffness, has shown potential in pavements but has poor cohesive forces and moisture issues, making it unsuitable for use alone. The purpose of this study is to evaluate the impact of waste engine oil rejuvenation in highly reclaimed asphalt pavement mixes, considering different combinations of basalt and limestone. To meet the goals of the study, In the first two mixtures, 100% basalt and 100% limestone were employed, respectively. In the third mixture, 50% fine limestone was mixed with coarse basalt. The fourth mixture had 1% of the filler was hydrated limestone along with coarse basalt and fine limestone. In the fifth and sixth mixes, 25% limestone, 25% reclaimed asphalt pavement (RAP), and 5% waste engine oil (WEO) were used as a rejuvenator. In the sixth mix, 1% hydrated limestone was added. Laboratory tests were conducted on each component of the mixture, including performance tests on final samples prepared under Superpave specifications, including the Indirect Tensile Strength test (ITS) and the flow number test. Depending on the material, ITS tests showed notable performance differences. A mixture of 50% limestone and 1% hydrated limestone scored the highest dry score with a remarkable 1007. Where All the wet samples performed higher than the industry standard of 100% limestone, a TSR of 0.9 was achieved by the cheapest and most sustainable mixture containing RAP and WEO. As for the Flow number test, The mixture with the highest ITS also Achieved the highest rutting resistance with a value of 2557

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