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Potential of Rice Husk Ash as a Partial Cement Replacement in Concrete for Highways Application

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Abstract : The highway pavement is the biggest structural asset a government can construct and maintain. Concrete rigid pavements are used to carry traffic in large volumes across countries safely and efficiently. Pavement quality concrete mixes have high levels of cement which contribute to up to 10% of global CO_2 emissions. Currently the UK specifies (ground granulated blastfurnace slag) GGBS and (pulverised fuel ash) PFA to reduce the quantity of cement used in pavement construction. GGBS and PFA come from heavy industry that should not be relied upon to improve the sustainability of construction materials. This report shows that cement in pavement quality concrete can be replaced with rice husk ash (RHA) without causing adverse effects to the mechanical properties required for highways. RHA comes from the food production industry and is vital for the growing global population. It is thus a socially responsible objective to use a pozzolan in highway pavement construction that is sourced from an environmentally friendly industry. The report investigates the properties of RHA mixes and compares them to existing pavement quality mixes already used and specified. The report found that sieving RHA and not grinding it gives the best performance. Due to the low density of RHA the investigation found that replacing cement by volume rather than weight provided the best results. Findings showed that CEM II mixed with 20% RHA meets the required specification for pavement quality concrete and mitigates using the comparative CEM I. The investigation also notes that RHA is observed to be more reactive with CEM II rather than CEM I and suits early strength gains required for pavement construction. The report concludes that RHA is a sustainable material that reduces the embodied CO_2 of pavement quality concrete, which is well suited for UK highway specifications and has the potential to improve the lives of people living in the developing countries.

Keywords : pavement, pozzolan, rice husk ash, sustainable concrete
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