

# Formulation of Modified Bitumen Emulsions from Polymer Wastes and Used Motor Oil

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## **Abstract:**

Wastes made from used high density polyethylene (HDPE), scrap tyres, and waste oil imparted to a significant number of total waste disposal into environment. The materials exhibit detrimental effects on local environment if not properly disposed or repurposed. The study was conducted to formulate these wastes into a modifier and compatibilising agent for the modified bitumen. The process involved heating and mixing of a predetermined ratio of the wastes, neat bitumen and crude oil. About 20 wt. % of neat bitumen, and pre-determined ratios of HDPE waste, crumb rubber, crude oil, and used motor oil were used in the study for the formulation. The modified bitumen was further tested for the softening point and the penetration tests to evaluate the properties of the formulated bitumen. The modified bitumen was further processed into emulsified bitumen with the addition of polyethylenimine, 80% ethoxylated solution which is the novelty of this work. The result shows that the modified bitumen has the softening point of 33.85 and 41.70 °C, and the penetration value of 386.8 and 383 (1/10 mm) for Formulation 1 and Formulation 2, respectively. The best ratio of 20:2:39:39 (bitumen: HDPE: crude oil: used oil) was used for the emulsification process.

**Keywords:** Modified Bitumen; Bitumen Emulsion; Industrial Wastes; HDPE; Used Motor Oil

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