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Use of waste plastic bags to enhance the asphalt mix properties

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Increase in road traffic during the last two decades in combination with an insufficient degree of maintenance due to shortage in funds, has caused an accelerated and continuous deterioration of the road network in Pakistan. To alleviate this process, several measures may be effective, such as, securing additional funds for maintenance, improved and innovative roadway design, use of better quality of materials and the use of cost-effective construction methods. With this perspective, this research aimed at exploring the potential prospects of waste polyethylene bags (shopping bags) made of "Low Density Polyethylene (LDPE)" to enhance asphalt mix properties as a polymer. Objectives of this research also included determining the best method of adding polymer/LDPE in asphalt mix. LDPE was added to coat the aggregate (dry mix method) and as a modifier in bitumen (wet process). A comparative analysis was carried out to identify the best method for utilization of polyethylene in asphalt mix in Pakistani environments. Marshall mix design method was used to determine the optimum bitumen content

and then modified mix properties were tested. The research results indicate that dry mix method yields better asphalt mix properties. The optimum content of polymer was found to be 8% by the weight of bitumen. Addition of LDPE in asphalt mix is found to increase the stability, rutting resistance, and load bearing capacity of asphalt mix in comparison to conventional (unmodified) asphalt mix. Benefits of using polyethylene modified asphalt mix include; safe, efficient and environment friendly disposal of waste plastics/waste management, long lasting roads withstanding heavy traffic loads and cost-effectiveness in road construction. Economic analysis showed that addition of waste polyethylene in asphalt mix lead to a saving of Rs. 100,000 per lane km in comparison to using conventional (unmodified) asphalt mix in road construction. The analysis and results of this research can effectively be used to greatly improve and economize the road construction and to improve the waste management in Pakistan.

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