Construction of Bituminous Pavement Using Waste Plastic at Parking Space of SMS college

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Abstract- **The increasing volume of plastic waste has become a global environmental issue, prompting research into sustainable solutions to mitigate its impact. One such approach is the utilization of waste plastic in road construction, specifically in bituminous pavements. This paper explores the potential benefits and applications of incorporating waste plastic in the construction of bituminous pavement for parking spaces. The study investigates the impact of different types of waste plastic, such as polyethylene and polypropylene, on the mechanical and thermal properties of the asphalt mixture.**

The research focuses on evaluating the strength, durability, and resistance to wear of the modified pavement compared to traditional bituminous pavements. The inclusion of plastic waste is expected to enhance the pavement's resistance to deformation, improve its water resistance, and extend its lifespan, thus offering a dual advantage of waste disposal and improved road infrastructure. A detailed analysis of the composition, mixing process, and performance characteristics is carried out, along with a cost-benefit analysis. The results suggest that the use of waste plastic in bituminous mixtures not only contributes to waste reduction but also enhances the overall performance of the pavement, making it a promising solution for sustainable infrastructure development in urban environments, particularly for parking spaces.

I. OBJECTIVE

- To determine the optimum bitumen content.
- To determine the optimum plastic content. To determine the effects on mechanical properties of a mix.
- To determine the physical properties of Aggregate, Bitumen, Filler.
- To evaluate and compare results of modified and conventional mixes.
- Stability comparison of conventional or plastic modified mix.
- Construction of Bituminous pavement using waste plastic is used to create a more durable, flexible and resilient infrastructure.
- The reduces the consumption of traditional construction materials like bitumen and aggregates.
- Transforms wastes into bitumen and a valuable resource can reduce the need for bitumen by around 10%.
- Roads are lower maintenance and absorb sound better by using recycled plastics, these roads help reduce the amount of plastic waste that ends up in landfills and oceans, contributing to environmental sustainability.
- The Production of plastic roads may require less energy than traditional materials, thereby lowering green house gas emissions also created with road construction.
- Overall, the development and implementation of plastic roads aim to create a more sustainable and efficient transportation infrastructure.

II. METHODOLOGY

The construction of bituminous pavement using waste plastic is an innovative approach to improve the properties of asphalt while simultaneously addressing the issue of plastic waste.

1. Literature Review: Start with a comprehensive review of existing research on the use of waste plastic in bituminous mixtures. This will help you understand the current

State of knowledge and identify gaps that your research could fill.

2. Material Selection:

- Waste Plastic: Collect different types of plastic waste such as polyethylene (PE). Ensure that the plastic is clean and free from contaminants.
- Bitumen: Use standard bitumen grades (e.g., 60/70) as a binder for the asphalt mixture.
- Aggregates: Select appropriate coarse and fine aggregates that conform to the relevant standards.

3. Plastic Processing:

- Shred the collected plastic waste into small pieces or granules to facilitate mixing with

bitumen.
- Optional: Melt the plastic at a controlled temperature to create a homogenous blend with the bitumen.

4. Mix Design:
- Determine the optimal percentage of plastic to be added to the bitumen. Common Conduct Marshall Mix Design or Super pave Mix Design to evaluate the performance characteristics of the mixtures.

5. Preparation of Samples:
- Prepare samples of bituminous mixtures with varying percentages of plastic for laboratory testing.
- Compact the samples using a Marshall compactor or any suitable method to achieve the desired density.

6. Testing:
- Perform various tests to evaluate the properties of the bituminous mixtures, including:
- Stability and flow tests (Marshall test)
- Indirect tensile strength test
- Moisture susceptibility test (e.g., Tensile Strength Ratio)
- Rutting resistance (using wheel tracking test)
- Low temperature cracking resistance (using bending beam rheometer)

7. Field Application:
- Select a suitable parking space for the application of the plastic-modified bituminous pavement.
- Prepare the site by ensuring proper drainage and subgrade preparation.
- Lay the plastic-modified asphalt mixture using standard paving techniques.

8. Monitoring and Evaluation:
- Monitor the performance of the pavement over time, assessing factors such as surface distresses, skid resistance, and overall durability.
- Compare the performance of the plastic-modified pavement with conventional bituminous pavement.

9. Data Analysis:
- Analyze the data collected from laboratory tests and field performance to draw conclusions about the effectiveness of using waste plastic in bituminous pavements.
- Discuss the environmental benefits and potential cost savings associated with this method.

III. CONCLUSION AND RECOMMENDATIONS

Summarize the findings of your research and provide recommendations for future studies and practical applications of waste plastic in pavement construction.

This methodology will provide a structured approach to your research on the construction of bituminous pavement using waste plastic

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Construction of bituminous pavement using waste plastic is an innovative approach that offers several advantages and limitations, especially in applications like parking spaces.

Advantages:
1. Environmental Benefits: Utilizing waste plastic helps in reducing plastic waste in landfills and the environment. It promotes recycling and helps in managing plastic pollution.
2. Improved Durability: Bituminous pavements made with waste plastic tend to have enhanced durability and resistance to cracking and deformation. The plastic can improve the binding properties of the asphalt.
3. Cost-Effectiveness: Incorporating waste plastic can potentially lower the cost of Materials, as it reduces the amount of virgin materials needed for asphalt production.
4. Enhanced Performance: The use of plastic can improve the performance of the pavement, such as increasing resistance to moisture damage and enhancing the overall lifespan of the pavement.
5. Reduced Temperature Sensitivity: Plastic-modified asphalt can have better

Performance in extreme temperatures, reducing the risk of softening in hot weather and brittleness in cold weather

Limitations:
1. Quality Control: The variability in the composition of waste plastics can lead to inconsistencies in the performance of the pavement if not properly managed.
2. Processing Challenges: The incorporation of plastic into asphalt requires specific Processing

techniques, which may require additional investment in equipment and technology.

3. Long-Term Performance Uncertainty: While initial studies show promise, the long-term performance and environmental impact of plastic-modified pavements are Still being researched.
4. Potential for Odor: The heating of plastics during the mixing process can sometimes release unpleasant odors, which may be a concern in urban areas.
5. Limited Awareness and Acceptance: There may be a lack of awareness or resistance from stakeholders in the construction industry regarding the use of waste plastics in pavement construction.

In conclusion, while the construction of bituminous pavement using waste plastic presents a sustainable option with numerous benefits, it also comes with challenges that need to be addressed for effective implementation.

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