

# Recycling of Asphalt Pavements

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**Abstract** - Now a days because of good infrastructure and their good facilities in roadway structures, the demand of aggregate is increased and because of limited aggregate the Recycling of Asphalt Pavement is the best option to give good result with benefits. While a number of factors drive the use of Recycling asphalt pavements, the primary factors are economic savings and environmental benefits. Aggregates form a bulk of the material required for bituminous concrete pavements. Aggregate being a natural material is being fast consumed and is causing a shortage of resources required for rapid infrastructure development. Also on the other side with the new trends in construction industry there is a generation of solid waste in the form of demolished structures. Today, science and technology has a responsibility of innovating new trends which are both economical and eco-friendly. Recycling reduces the amount of construction debris going into landfills. With the help of recycling asphalt it uses the natural resources and sustains the asphalt pavement. Old demolished concrete structures can be recycled to obtain recycled aggregate (RA). This can be used along with the natural aggregates effectively in various infrastructure need so that we attain a balance between demand and supply of construction material thereby reducing the impact on nature. The present investigation aims in the strength variation of bituminous concrete surface course in which recycled aggregates are used in partial or full replacement of natural aggregates.

**Key Words:** AsphPalt Recycling, Pavement Recycling Methods, Hot Mix Plants, Wet Mixed Macadam, Gradation Test

## 1. INTRODUCTION

While most of the developed nations have standardized the procedures and have made significant advancements in the bituminous pavement recycling techniques and in utilization of recycled materials in pavement construction to reduce the carbon footprints and to promote sustainability in pavement construction, we in India are yet to make any significant advancement and here pavement recycling is still in nascent stage. Although, in India, more than 90 percent of the pavements are bituminous pavements yet during their rehabilitation and maintenance, either the old pavement materials are being removed and dumped in a landfill or a new layer is paved on top of the existing pavement thereby, resulting in burial of the limited non-renewal resources. India with its 33 lakh kilometers of road network is the second largest in the world. Nearly 60 percent of freight traffic and 88 percent passenger traffic is carried by the roads and annual growth is projected at 12-15 percent for

passenger traffic and 15-18 percent for cargo traffic. Government of India has also set an ambitious target of achieving 30 kilometer length of road construction per day. Apart from the investments in developing new roads, state transport agencies spend rupees worth thousands of crores annually to maintain and rehabilitate existing pavements. Pavement recycling is a logical and practical way to conserve our diminishing supply of construction materials and to reduce the cost preserving our existing pavement network. Recycling of pavements by re-using the existing materials will protect natural resources for future generation. Thus, the significance of adopting bituminous pavement recycling techniques for road construction in India cannot be overemphasized.

### 1.1 NEED OF STUDY

The demand of aggregate to construct pavement is more & more so to recover it and for the optimization of natural resources.

To overcome the problem related to dumped materials, and recycle of dumped material and conserve the natural resources.

To minimize the adverse effects on environment.

### 1.2 OBJECTIVES

To use the Recycled material as filling material without doing any analysed and test in low lying areas.

To use the Recycled material as WMM after investigating and then adding the missing sieve size material.

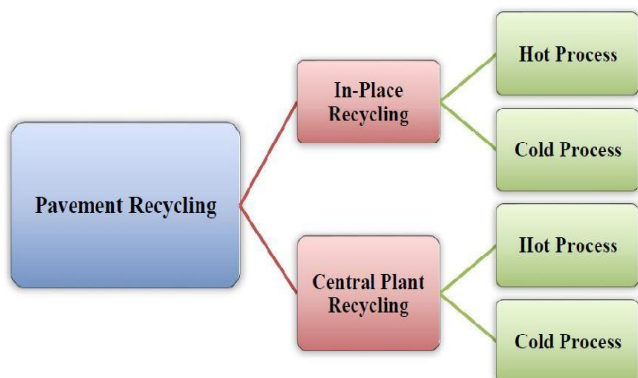
To investigate the Recycled material and after carrying out Marshall Tests.

Reprocess the Recycled material to certain percentage of mixing with fresh aggregate and virgin bitumen.

## 2. PAVEMENT RECYCLING METHODS

Based on the process adopted in recycling the bituminous mix, it can be classified as central plant recycling and in-situ recycling. In-situ recycling process the Recycled Asphalt modified in place, where from it is available. Further, the Asphalt could be heated to condition it. If heat is given then the process is known as hot mix recycling. In case of cold mix recycling old materials are conditioned using the

recycling agent (like, low viscosity emulsion) without application of heat. The categorization system is presented schematically in Figure.



Another way of classification could be based on depth of the old pavement removed. If the apex layers of pavement fail, then the upper layers are removed and laid again. This process is identified as surface recycling. However, if base failure occurs then the pavement layers up to base layer is separate and constructed again. This process is known as full depth retrieval.

**2.1 HOT MIX RECYCLING:**

Hot mix recycling is a method in which the old Asphalt is combined with new aggregate and an asphalt cement or recycling agent to produce hot mix asphalt (HMA). Both batch and drum type hot mix plants are used to produce recycled mix. The Asphalt is obtained from pavement milling with a rotary drum cold planning machine and may be further processed by ripping and crushing operations, if needed. The mix laydown and compaction equipment and procedures are same as for conventional HMA. The ratio of old Asphalt to new aggregates depends on the mix design, on the type of hot mix asphalt plants, and on the quality of stack emission generated. The use of microwave technology has allowed the use of a higher amount of Asphalt, because the Asphalt can be preheated. The advantages of hot mix recycling are as follows.

1. Additional right-of-way is not needed.
2. Surface and base distortion problems can be corrected
3. Performance of recycled mix is as good as conventional HMA mix.
4. Disposal problem inherent in conventional methods are eliminated.
5. Conservation of non-renewable resources.
6. Economic savings are achieved.

**3. LABORATORY INVESTIGATION**

As per availability of material, it were collected from site to find technical viability of using this layer into WMM layer in the new pavement. As very less research work has been done for recycled material and the behavior of recycled material is unknown hence all the experiment for testing the suitability of recycled material needs to be done. Thus the study involved the laboratory test for aggregate specification to confirm whether the recycled material complies with the established standards or not. The Physical Requirements of coarse aggregates for WMM for base courses is given below as per MoRTH. The Aggregate shall confirm to the physical requirements set forth in table.

Sr. No.	Test	Test Method	Requirements
1	Los Angeles Abrasion Value	IS:2386 (Part-4)	40%(Max)
	Aggregate Impact Value	IS:2386 (Part-4) or IS:5640	30%(Max)
2	Combined Flakiness and Elongation indices	IS:2386 (Part-1)	30%(Max)

**Table 6.1** Physical requirement of coarse aggregates for WMM for Sub-base/base courses.

(Source: "Specification For Road & Bridge Works" (Fourth Revision) (MOSR&TH), Published By "Indian Road Congress", New Delhi - 2001.)

**3. FUTURE OUTCOME**

In this review paper the study is to find out the effects of Recycled Asphalt Material, and compare it with the virgin concrete pavement. Evaluate the effects of Old Asphalt Material on environment, their sustainability, cost ratio etc. For proportion of virgin mix, different tests are conducted and from the results we find out the proportion of virgin concrete and natural asphalt.

**4. CONCLUSION**

Recycling Asphalt is a new technology with the help of which bituminous pavements can be constructed at a reduced cost as it involves the usage of old bituminous pavement materials. Also it ensures optimization of resources and supports sustainable development. Optimal percentage of material depends upon the composition of bituminous material and type of layer in which it is to be used Numerous

transportation agencies have been recycling Asphalt in unbound base and sub-base layers for many years. There is a general lack of uniformity among the Asphalt use specifications adopted by various transportation agencies. Old Asphalt for use in base and sub-base layers can be characterized by performance-related parameters and properties including those needed for pavement design, such as grading, shear strength beneath static tri-axial loading and permanent deformation under repeated tri-axial loading.

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