

A Review Paper on Characterization of Bituminous Concrete Mix using Reclaimed Asphalt Pavement

¹Alok Goyal, ²Prof. M.C. Paliwal and ³Rahul Sen,

¹M.Tech Scholar (Civil), ²Associate Professor, ³Assistant Professor,

^{1,2,3}Department of Civil and Environment Engineering, National Institute of Technical Teachers' Training and Research, Bhopal, India

Abstract - The reuse of reclaimed asphalt pavement (RA) in new asphalt pavements can provide important economical savings, while reducing the negative environmental impact. This paper deals with the literature review of various research papers of design of hot mix asphalts for the pavement. The different phases in the design process are described: the characterization of the reclaimed asphalt and the new material components, the volumetric mix design procedure and the laboratory study. Three types of mixes were considered: virgin aggregate asphalt mix, reclaimed asphalt concrete mix and combination of virgin aggregate asphalt and reclaimed asphalt concrete mix. The percentages of reclaimed asphalt in combination of both mixes were high up to 50% of reclaimed asphalt. The results of the performance tests show the feasibility to design and optimize good quality hot mix asphalts with a high percentage of reclaimed asphalt. Testing was carried out at concrete technology lab of NITTTTR Bhopal.

Keywords— Reclaimed asphalt, aggregates as per IRS code, Marshall Sample.

I. INTRODUVTION

Excellent network of road plays a vital road in linking different regions as also integrating people of different places and cultures. Further it helps to uplift the standard of living gives fillip to economy, industry trade and tourism. Over 60% of Indian highway and road are constructed with Hot Mix Asphalt (HMA). As the Indian Infrastructure ages, these highways and roads were maintained and established. The materials can be reused to repair, reconstruct and maintained the original highway. Hence appropriate recycling of aggregate and other highway materials make environmental, and economic.

Recycling hot mix asphalt is reusable mixture of aggregate and asphalt binder known as Reclaimed Asphalt Pavement. With increasing the demand of fresh aggregate and asphalt supply, a Reclaimed asphalt Pavement is a valuable material for Hot Mix Asphalt. Therefore increase the amount of Reclaimed asphalt pavement in bituminous concrete.

Recycled asphalt pavement is useful to avoid the use of fresh aggregate because it reduce the use of fresh aggregate and the amount of fresh asphalt binder required it production of hot mix asphalt. The use of reclaimed asphalt pavement with asphalt binder it conserves energy, lower transportation cost and preserves renewable and non renewable resources. Using Reclaimed asphalt pavement decrease the amount of waste material and the non renewable natural sources such as fresh aggregate and asphalt binder. Hence Reclaimed asphalt pavement creates a cycle that reduces the use of natural resources and builds the bituminous concrete pavement. This research is useful for engineers, contractors and other who are involved in the specification and construction of bituminous concrete pavement.

When the materials are removed from the existing flexible pavement, during resurfacing or reconstruction operations, then

the removed materials are known as Reclaimed asphalt pavement. It contains valuable asphalt binder and aggregate. From various researcher's, every year 80 percent of Reclaimed asphalt pavement was recycled. Therefore RAP is the most frequently used recycled material .RAP is used as an aggregate with the fresh asphalt binder in recycled asphalt pavement. It is not only used on surface course but also granular base and sub base course. It can be used in other construction application; hence RAP is a valuable, high quality material that can replace maximum amount of fresh aggregate binder.

II. LITERATURE SURVEY

Many studies are available on performance evaluation with conventional asphalt mixes. Among all the recycling techniques, hot mix recycling techniques have large number of advantage and are well suited for Indian conditions. Some studies indicates that utilization of certain percentage of RAP increase the performance properties of mixes.

SuoZhi et al (2012),Conclude that Fatigue crack has been recognized as one of the main forms for structural damage in asphalt concrete pavements. Under the action of repeated vehicular loading, deterioration of the asphalt concrete (AC) materials in pavements, caused by the accumulation and growth of micro and macro cracks, gradually takes place.

K. Aravind, Animesh Das conclude that Mix design for recycled asphalt mix has been performed through Marshall, creep and fatigue tests. The parameters obtained are used in pavement design and the economy in alternative designs has evaluated considering the material cost towards constituent proportion as well as design thickness. Thus, the paper has presented an integrated mix-design-structural-design system for hot recycled asphalt mix.

Sangita, TabrezAlam Khan, Sabina, D.K. Sharma; conclude that Waste polymer modified bituminous concrete mix show better performance than conventional mix and also find out We use nitrile rubber and polyethylene mix (in 1:4 ratio) as waste polymer modifier (WPM) for bituminous concrete mix.

S.N. Suresha, George Varghese, A.U. Ravi Shankar conclude that This paper summarises the details of laboratory investigation on the characterization of PFC mixes corresponding to four different gradations and two binder contents, for three levels of the Marshall compaction.

Kevin C Foye, has given a case study of Reclaimed Asphalt pavement with ground improvement. A number of laboratory RAP studies have considered the mechanical properties of RAP bases in order to support pavement designs incorporating RAP. These studies have revealed a number of interesting relationships between RAP moisture content, compaction, and stiffness.

T.AnilPradyumna et al (2013) Laboratory studies have been carried out by them on asphalt mixes with RAP material and rejuvenating agent and their performance has been compared

with virgin asphalt mixes. Various performance tests such as Retained Stability, Indirect Tensile Strength (ITS), Creep test, beam fatigue test, resilient modulus and wheel tracking test has been carried out to compare the performance properties.

Imad L. Al-Qadi et al (2007) Hence, They have developed an idea for understanding of the interaction between aged and virgin asphalt binders in RAP. Based on this understanding, this study will determine the appropriate level of contribution that should be given to the residual asphalt binder in RAP. The level of interaction between aged and virgin binders will then be used to investigate the influence on the performance and the durability of the mixtures as compared to virgin HMA.

F. Perez et al (2004), The European research project PARAMIX aims to improve the techniques for hot mix recycling in plant and cold mix in situ recycling, so as to increase the amount of reclaimed asphalt and develop competitive road pavement rehabilitation techniques.

Arshad Hussain et al (2013), they have used conventional and super pave methods were used to determine the virgin and residual binder properties. The residual binders obtained from two RAP sources using solvent extraction and abson recovery methods were blended with a virgin binder in different proportions. Penetration, ductility, dynamic modulus, stiffness and viscosity of the different blends were compared. Penetration, viscosity and PG grading blending charts were developed based on the corresponding test data.

Montepara A. et al (2012), shows the first results of a research activity undertaken on a test track specifically constructed with the aim to analyze the effect on pavement performance of a sub-base layer mixture with 50% of natural aggregates and 50% of RAP. The investigation is based on LWD and FWD analysis, comparing results with those obtained on the subsequent section of the test track made by only natural aggregates.

Arshad Hussain et al (2012), presents an experimental study to evaluate the effect of various types and percentages of RAP on the properties of asphalt mixtures. Four mixtures, which were the combination of two different virgin aggregates (Limestone and Quartzite) and two different RAP sources were studied in this research. The mixtures were designed by Marshall method at a wide range of 0 to 100% RAP blends to handle low, medium and high traffic loads.

Rajeev Chandra et al (2012) , They have evaluated the use of two mix design procedures for designing bituminous pavement mixes with foamed bitumen. Mix design was carried out following the South African and Caltrans guidelines. The RAP materials used for mix design were collected from the NH-5, Chennai-Tada section. Using foamed bitumen produced from Wirtgen WLB 10 foaming equipment, a mix with RAP material, virgin aggregate and active filler were produced in the pug mill mixer. Marshall Compaction effort was used for fabricating the samples. Using the indirect tensile strength test on dry and wet specimens, the optimum binder content was determined. It was seen that the two mix design procedure adopted showed different mix constituents despite using the same RAP source.

Kevin C. Foye (2011) , They discussed the experiences of a design-build contractor integrating a geosynthetic ground

improvement program with a RAP base during the reconstruction of a 1.95 ha asphalt parking lot. Field observations of base course construction with RAP explore some of the implications of laboratory findings. A number of interesting observations on the technical, construction, and economic issues resulting from the project challenges and the use of RAP are presented

CONCLUSION

There are various methods of bitumen mix design for flexible pavement. Every method has its own specified criteria to perform it. Reclaimed asphalt is a waste bituminous material and they can be reused for the design of flexible pavement design in some extent. RAP has losses their strength after used as a pavement material. Various theoretical and experimental methods of fresh bituminous concrete are discussed earlier, but use of reclaimed asphalt which will be used in earlier stage cannot be detected by these methods. Reclaimed asphalt is used as waste material and replace the quantity of fresh bitumen and aggregate.

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