ISSN: 2347-6540
International Journal of Latest Research In Engineering and Computing (IJLREC)
Volume 5, Issue 3 , Page No. 41-43 May-June 2017
www.ijlrec.com

A REVIEW STUDY ON USE OF INDUSTRIAL WASTE IN BITUMINOUS MIXES

Sofi aanesah[1], Ar. Sukhmanjit[2]
M.Tech Scholar in GEC, Panipat,
Assistant Professor in Architecture Engineering, Chandigarh University

Abstract: India has a large network of industries which deals with variety of products among which many more are planned for distant future. Every year several million metric tons industrial waste is produced by these industries which have a major problem of pollution, safe and economic disposal. Extensive damage being caused to the environment due to accumulation of waste materials from industrial plants, power houses, colliery pits and demolition sites and it has become one of the major environmental, economical and social issues. Waste material is the material unused, unwanted and rejected as worthless into the environment in our society as whole. Waste materials coming out of industry nowadays is posing a great environmental problem in disposing them into the air, water and on the land. But, with proper utilization of these materials in construction industry as well as in making road pavements will greatly help the society to have a better and pleasant environment. Substitution of waste materials will conserve dwindling resources, Use of waste products is not only a partial solution to environmental and ecological problems and it significantly improves the microstructure, and consequently the properties of concrete. So, use of waste materials not only to make the bitumen mixes (generally used in all the construction activities) less expensive, but to provide a blend of tailored properties of waste materials. In this paper, a brief study is done on the researches done by various authors.
Keywords: Marshall's stability test, Fly ash. Waste materials.

1.0 INTRODUCTION

The specifications for pavement materials in various layers should be as economical as possible, consistent with the traffic expected to use the road and the climatic condition. In this angle, the local materials which are cheaper and involve minimum haulage should be used to maximum extent feasible. In present scenario safe disposal of different wastes produced from Industries is a great problem. These materials cause environmental pollution in the vicinity because many of them are non-biodegradable. In recent years, industrial wastes have been utilized in road construction in developing countries. The use of these materials in road making is based on technical, economic, and ecological criteria. The lack of traditional road materials and the protection of the environment make it imperative to investigate the possible use of these materials carefully. India has a large network of industries located in different parts of the country and many more are planned for the near future. Several million metric tons industrial wastes are produced in these establishments. Traditionally soil, stone aggregates, sand, bitumen, cement etc. are used for road construction. Natural materials being exhaustible in nature, its quantity is declining gradually. Also, cost of extracting good quality of natural material is increasing. Concerned about this, the scientists are looking for alternative materials for highway construction, and industrial wastes product is one such category. If these materials can be suitably utilized in highway construction, the pollution and disposal problems may be partly reduced. In the absence of other outlets, these solid wastes have occupied several acres of land around plants throughout the country. Keeping in mind the need for bulk use of these solid wastes in India, it was thought convenient to test these materials and to develop specifications to enhance the use of these industrial wastes in road making, in which higher rate of returns may be possible. The possible use of these materials should be developed for construction of low volume roads (Rural roads) in different parts of our country. The necessary specifications should be formulated and attempts are to be made to maximize the use of solid wastes in different layers of the road pavement. Post construction pavement performance studies are to be done for these waste materials for construction of low volume roads with twofold benefits:

(a) It will help clear valuable land of huge dumps of wastes;
(b) It will also help to preserve the natural reserves of aggregates, thus protecting the environment.
Materials such as fly-ash from thermal power plants and other coal fired industries, blast furnace slag from steel industries, cement kiln dust from cement related industries, phosphogypsum from phosphatic fertilizer industries, and many other solid wastes have already proved to be useful for road construction in many countries.

1.1 ECONOMY IN USE OF FLY ASH

Use of fly ash in National Highway road construction results in reduction in construction cost by about 10 to 20 per cent. Typically cost of borrow soil varies from about Rs.100 to 200 per cubic meter. Fly ash is available free of cost at the power plant and hence only transportation cost, laying and rolling cost are there in case of fly ash. Hence, when fly ash is used as a fill material, the economy achieved is directly related to transportation cost of fly ash. If the lead

distance is less, considerable savings in construction cost can be achieved. Similarly, the use of fly ash in pavement construction results in significant savings due to savings in cost of road aggregates. If environmental degradation costs due to use of precious top soil and aggregates from borrow areas quarry sources and loss of fertile agricultural land due to ash deposition etc. The actual savings achieved will be much higher and fly ash use will be justified even for lead distances up to say 100 km.

2.0 LITERATURE REVIEW

S.D.Katara et al studied the Influence of Modify Bituminous Mix with Fly Ash. Fly ash is the main solid waste discharged by coal-fired power plant. In India, the annual emission of fly ash is more than 0.3 billion tons, and it is one of the main industrial waste residue. The use of four wheeler, two wheeler vehicles etc. is increasing day by day. As a result amount of waste tyres also increasing. Waste tyres in India are categorized as solid or hazardous waste. It is estimated that about 60 per cent of waste tyres are disposed via unknown routes in the urban as well as rural areas. This leads to various environmental problems which include air pollution associated with open burning of tyres and aesthetic pollution. Therefore, it is necessary to utilize the wastes effectively with technical development in each field. A good design of Modify bituminous mix is expected to result in a mix which is adequately strong, durable and resistive to fatigue and permanent deformation and at the same time environment friendly and economical. A mix designer tries to achieve these requirements through a number of tests on the mix with varied proportions of material combinations and finalizes the best one. The research result shows that the Marshal method of bituminous mix design was carried out for varying percentages of Fly ash to determine the different mix design characteristics.

M. Abukhettala studied the Use of Recycled Materials in Road Construction. Several waste by-products and materials have been investigated, assessed, evaluated for utilizations and practiced in the field. Depending on the attributes of the characteristics of the recycled material, the inclusion varies. Some recycled materials have been proven to possess preferable properties over the other and have performed satisfactorily in the field. However, there are numerous concerns regarding such incorporation based on both laboratory experimental, and field observations which have turned out to be of the essence for further in-depth studies. Reclaimed asphalt pavement, recycled concrete aggregates, plastic wastes, scrap tires, mine wastes, recycled crushed glass, foundry sand, coal combustion products as fly ash, bottom ash, and pond ash, steel slag, oil sand, oil shale sand, lateritic soil, are amidst the long list. It is believed that magnificent preservation of natural and precious resources would be attained from the inclusion of secondary and tertiary materials in road construction. Nonetheless, without rigorous cooperation between the academia and the industry and educating people who are in routinely interact with paving activities, several performance-related issues would not be resolved and would remain in existence. This paper present a literature review report on the most viable recycled materials currently in practice by the industry and it aims towards developing a noble idea on better inclusion of a recycled material in the road industry.

Debashish Kar et al studied the influence of fly-ash as filler in bituminous mixes. A bituminous paving mixture is a mixture of coarse aggregate, fine aggregate and bitumen mixed in suitable proportion to result strong and durable mix to withstand traffic load. In this paving mix, normally cement and stone dust are used as filler material. A study has been carried out in this study to explore the use of fly ash, a by-product of a coal based thermal power plant in bituminous paving mixes. For comparison, control mixes with cement and stone dust have also been considered. Marshall Test has been considered for the purpose of mix design as well as evaluation of paving mixes. Other performance tests such as indirect tensile strength and retained stability have also been carried out. It is observed that the mixes with fly ash as filler exhibit marginally inferior properties compared to control mixes and satisfy desired criteria specified by a much higher margin. Hence, it has been recommended to utilize fly ash wherever available, not only reducing the cost of execution, but also partly solve the fly ash utilization and disposal problems.

Poorna Prajna.S et al studied the Marshall Test Properties of Bituminous Concrete Mixes Using Fly Ash Modified Bitumen. Flexible pavement with bituminous surfacing is used in India. Distress symptoms, such as cracking, rutting, etc., are being in-creasingly caused earlier by high traffic intensity, over loading of vehicles and significant variations in daily and seasonal temperature of the pavement. Investigations have revealed that modifiers can be used to improve rheological properties of bitumen and bituminous mixes to make it more suitable for road construction. Also there are many materials that may be tried as modifiers in bitumen. This paper reports an investigation carried on bituminous concrete mixes corresponding to grade-1, prepared at mid-point gradation using Fly Ash as modifier. The conventional Marshall Stability test was conducted on the specimens as per ASTM D 1559. The present investigation comprises of de-termining the Marshall test properties of Bituminous Concrete Mixes Using 60/70 penetration grade bitumen modified with Fly Ash as Modifier. The results such as stability, flow, volume of air voids, voids in mineral aggregates, voids filled with bitumen, bulk density etc was de-termined. The study helps to ascertain the suitability of Fly Ash as modifier.

Giaccio GM et.al concluded that high-volume fly ash concrete had excellent mechanical properties and satisfactory resistance to repeated cycles of freezing and thawing. The use of ASTM Type in cement appeared to be essential when high strengths at early ages were required. For concretes made with ASTM Type I cement, the use of beneficiated fly ash and condensed silica fume, did little to enhance the properties of concrete compared with “as received” fly ash. For

concrete made with ASTM Type DI cement, the benefits of using beneficiated Class F fly ash and condensed silica fume were not clear.

Aires Camoes, et al determined the Compressive strength and diffusion coefficient of concretes replacing 0%, 20%, 40%, and 60% of Portland cement by 'as received' fly ash, and 20% and 40% replacement by 'enhanced' fly ash. Comparing the results obtained, it was found that High Performance Concrete (HPC) with up to 65 MPa can be made by replacing up to 40% of cement by 'as received' and 'enhanced' fly ash and using the crushed granite aggregates. It was possible to produce low cost HPC, with 90 day strength in the range of 70 MPa, using low quality fly ash and crushed sand. It was possible to replace up to 40% of cement by low quality fly ash with carbon content up to slightly higher than 7%.

Ujjwal Bhattacharjee et.al said that a simple framework for estimation of fly ash utilization potential in India has been developed. Fly ash utilization in cement production, construction of road embankments and manufacture of bricks has been considered. The results obtained for the projected levels of fly ash utilization clearly show that in spite of assuming quite optimistic levels of fly ash use in the three applications, the overall fly ash utilization was less than 25% of the total fly ash produced. Therefore, either a much more aggressive fly ash utilization strategy has to be developed and executed or the extent of the fly ash utilization target (or the year of achieving a specified target) should be reviewed by MOEF.

CONCLUSION

After reviewing the various studies, Following conclusions are drawn:

1. The increase of the optimum moisture content contributes to the increase of the stabilized soil's capability.
2. These mixes were seen to display higher air voids than required for normal mixes.
3. Higher bitumen content is required in order to satisfy the design criteria and to get usual trends.
4. Further modification in design mixes can result in utilization of fly ash as fillers in bituminous pavement thus partially solving the disposal of industrial and construction wastes respectively.
5. It is evident that with further tests fly ash generated as waste materials can be utilized effectively in the making of bitumen concrete mixes for paving purposes.

REFERENCES

1. Dr. Kadiyali L.R., Dr.Lal N.B., (2006), "Principles and Practices of Highway Engineering", Khanna Publishers Delhi-6.
2. D S V Prasad, M. Anjan Kumar, G V R Prasada Raju, V. Kondayya "A Study on Flexible Pavement Performance with Reinforced Fly ash Sub base" International Journal of Earth Sciences and Engineering 4ISSN 0974-5904, Volume 04, No 06 SPL, October, pp. 403-408(2011).
3. Henning, N. E. (1974). "Evaluation of lignite fly ash as mineral filler in asphaltic concrete." Report No. Item (2)-73, Twin City Testing and Engineering Laboratory, St. Paul, Minn.
4. Jianhong Dia, Zhanliang Liu, "Influence of Fly Ash Substitution for Mineral Powder on High Temperature Stability of Bituminous Mixture" International Conference on Future Energy, Environment, and Materials 2012.
5. J. Mater. "Coal Ash Utilization In Asphalt Concrete Mixtures" Civ. Eng. 11, 295 (1999)
6. Robin L. Schroeder "The Use of Recycled Materials in Highway Construction" Autumn 1994 Vol. 58 · No. 2
7. Rosner. J. C., Chehovits, J. G., and Morris, G. R. (1982). "Fly ash as a mineral filler and anti strip agent for asphalt concrete." Challenge ofchange-6th Int. Ash Utilization Symp. Proc., U.S. Dept. of Energy, Morgan town
8. M. Abukhettala, " Use of Recycled Materials in Road Construction", International Conference on Civil, Structural and Transportation Engineering (ICCSTE'16) Ottawa, Canada – May 5 – 6, 2016 Paper No. 138
9. M. Tuncan, A. Tuncan, & A. Cetin, "The use of waste materials in asphalt concrete mixtures," Waste management & research, vol. 21, no. 2, pp. 83-92, 2003.
10. H. Akbulut & C. Gürer, "Use of aggregates produced from marble quarry waste in asphalt pavements," Building and Environment, vol. 42, no. 5, pp. 1921-1930, 2007.
11. Athanasopoulou & G. Kollaros, "Fly ash exploited in pavement layers in environmentally friendly ways," Toxicological & Environmental Chemistry, vol. 97, no. 1, pp. 43-50, 2015.

