Global Scientific JOURNALS

GSJ: Volume 8, Issue 7, July 2020, Online: ISSN 2320-9186
www.globalscientificjournal.com

IMPORTANCE OF OVER BURNT BRICK IN ASPHALT CONCRETE BY USING PET BOOTLES.

Muhammad Azam[1], Muhammad Majid Naeem[2], Fazle Subhan[3], Muhammad Sulaiman[4]

[1] Master student at, Iqra National University, Peshawar
[2] Faculty Member, Iqra National University, Peshawar, Pakistan.
[3]Ph.D. student at Dalian University of Technology, Dalian, PR China.
[4]Research Scholar, University of Engineering and Technology, Peshawar
Muhammad.azam@kpezdmc.org.pk,majid@inu.edu.pk,
fsubhan@mail.dlut.edu.cn, Muhammadsulaiman909@gmail.com

Abstract
The property of coarse aggregate has great impact in the field of Civil engineering, their characteristics enhances the structure like roads, buildings etc.Due to base on workability and durability the demand of coarse aggregate in the structure are increasing day by day. As the plastic item are available in abundance in nature including the plastics PET bottle which are furthermore are used for land filling, causing environmental pollution and so is the case with over burnt bricks.
This paper deal with the over burnt brick coated with plastics are used to reduce the utilization of asphalt material, whose price are much more in Pakistan and all over the world. Coarse aggregate testingwas carried out according to ASTM, AASHTO and BS standards. The crushing test, shape test, impact test, specific gravity and water absorption of coarse aggregate were performed. The results were analyzed and conformed to the required flexible pavement standards.
The Coarse aggregate and Pieces of Over Burnt Brick for to obtaining the bituminous mix were heated at a temperature 150-170 ˚C Then After the cut up PET bottles of different percentage as 10%, 20% and 30 % are added and also the required percentage of bitumen is added to heated aggregates. The aggregate properties were evaluated by conducting different tests on aggregates and mix proportion using Marshall Mix Design methods. Specimen with 30% PET bottles gives the optimum bitumen content of 6.5% corresponding to maximum stability. The changes in the structural characteristics and morphology of required specimen were studied using X- ray diffraction (XRD) and scanning electron microscopy(SEM), respectively. The results indicates that the use of PET bottles and over burnt bricks in asphalt gives us safe and economic structure and an ecofriendly environment, hence sustainable construction is achieved.

Keywords–*Coarse Aggregate, PET Bottle, Over Burnt Brick.*

1. INTRODUCTION

Due to the inert properties and bond strength of coarse aggregate comparison to other material, their use in most of the engineering structures like roads, buildings, dams and bridges etc. due to which their demand is increasing day by day. As by increasing the demand of Coarse aggregate it will directly affect the sources which ultimately have significant influence on the construction industry Pakistan. Over Burnt Brick is a great idea in Asphalt Cement (AC) and in Flexible Pavement due to which it is about in 90% of aggregates, the Over Burnt Brick are used. The aggregate of over Burnt Brick are not only used in Asphalt Layer but it is significantly used in the foundation of road aggregate. An approximate amount of 12500 ton/km of virgin aggregates are consumed in pavements construction [1].

The availability of good quality coarse aggregate is rare because their demand is increasing day by day. With the increase of development industrial production, the natural resources are turned out to be decrease. Also, the industrial wastes and byproduct makes a big hazard to the environmental pollution. Researchers all over the world focus on the matter that how these industrial wastes can be utilized for beneficial purposes and how the environmental pollution can be reduced. Some industrial products like Fly ash, waste glass powder, waste plastic bottles and Rice husk ash etc. are now a days introduced in cement, bricks and concrete to enhance the engineering properties of the construction materials.

The over burnt brick whose shape are irregular and bad shape are rejected in the building construction. So such bricks are dumped in the outer area of the kiln which had a great impact on the environmental pollution and their hazard material during rain flow with water which had impact on animal life. The Purpose of over burnt brick in construction industry is that it is used only for boulder in the concrete work. Many researches has been carried out on the use of over burnt bricks as a partial replacement of coarse aggregate in concrete and the results proven that these materials can improve the engineering properties of concrete.

In Pakistan, about 15 billion bricks are produced annually according to SAARC energy report (2013). Many of these bricks are over burnt due to high temperature in the kiln. In this research program, an effort is made to use over burnt bricks aggregates in roads layers as a partial or fully replacement of coarse aggregates. This technique will enhance the development of ideas about over burnt bricks to be used where the coarse aggregate are uneconomical. Along with the above mentioned deficiencies, we have also faced some issues related to PET bottles due to it over usage in Pakistan. Now a days many factories manufactures PET bottles for all types of drinks like minerals water and soda water etc. and after using these drinks, people throw it in the dust bins and hence causes a lot of environmental problems due to low or even no biodegradation

1.1. PROBLEM STATEMENT

The Waste material due demolishing of buildings, Roads, Culvert etc. are increasing day by day due to lack of knowledge of properly handling it. Over burnt bricks normally produced with burnt bricks due to over burning of the bricks near to fire source are normally dumped at the adjacent areas of the brick kiln, because the over burnt bricks are also rejected in building construction due to its irregularities and bad shape which has the adverse effect on the environment. Such waste materials also consumed space in any congested or low space kiln, as a result of which the land near the kiln where the over burnt bricks are dumped are wasted and we cannot use that land for construction and for crops in future. Therefore, use of over burnt bricks aggregates instead of natural aggregates in these road networks will almost control the environmental pollution. Along with this, we also face many problems due to the waste PET bottles in the society that takes a lot of time to degrade and hence cause environmental problems.

2. LITERATURE REVIEW

The paper studied about the construction of roads by using waste PET bottles is looking a great and new ideas firstly the land fill which occupied by waste material are free from it and secondly the strength and viscosity of asphalt does not affecttoo much. That the recycled plastic either replace the aggregate up to some extent or it is behave like modified binder [2].

The PET Bottles after grinding in the grinding machine will have the property and have the possibilities in asphalt road construction. The Binding capacity in PET bottles is very small (4-11%) by the amount of asphalt the function of less amount of binding materials specially in road construction is to increase the stability, Strength, fatigue life etc of any suitable road.[3]. Many researcher had studied the waste plastic and PET Bottles with bituminous asphalt mix is directly related with the durability and fatigue controlling action. [4]. As the Cost of Bituminous mix is much high in a country like Pakistan and also the Waste material like PET bottles had also same properties like Bituminous mix which may lead to the reduction of bitumen consumption. So overall cost of project also reduced [5]. The Life Span of road is linked with bituminous quality so by using waste material no possible impact at road life services[6].

In India the national highways and rural roads, the waste plastic material mixed with bituminous mix which are further more used for its construction [7].

Sometime the bond between aggregates and bitumen are not appropriate that there is major defects arise on the road surface by making a standard road construction whereas by using waste plastic material such defect are less as compared to standard road construction, but the binding between wasre plastic material is much stronger then standard technique [8]. The waste plastic material which are recycled by Ghana company, NelPlast Ghana Ltd, from which the company produces pavement blocks from waste plastic. These pavement blocks have been approved by Ghana's Ministry of Environment, Science, Technology and Innovation, and have been used to construct a road in Accra [9].

3. MEHODOLOGY:

To achieve the study objectives, the following methodology is adopted.

Test Conducted for Coarse aggregate which are used in Asphalt Pavement.

- The sieve analysis for 20-10mm size particles, 10-5mm size particles and 5-0mm size particles were performed.
- Calculate the bulk density for the rodded coarse aggregate. The bulk density determined by this test method is for aggregate in an oven-dry condition.
- Conduct a test for coarse aggregate in Los Abrasion apparatus.

Test done for PET Bottles.

- Pet bottles were collected from various sources such as like general stores, from University cafeterias, Hotels, Restaurants and Broker (of waste materials).
- After sample collection the PET bottles is then crushed in a crusher machine.
- The specific gravity of shredded PET bottles was find out by using simple techniques as used for coarse aggregates.
- Marshal Mix design was used to determine the optimum Asphalt cement. To find the optimum content, an increase of 0.5% was used for tests. For each asphalt cement contents, different asphalt cement concrete specimens were prepared in sequence.
- All the specimens were heated to a temperature of 60℃, then specimens are placed in special tests head and load is applied at a constant rate of 2in/minutes.

- At the point of load failure, the obtained value of deformation was recorded in unit of 0.25 mm. This obtained value is called Marshal Flow value. Tests were repeated till the optimum value for the normal and over burnt aggregate was determined.

4. RESULT AND CONCLUSION:

The Conclusion of this Research paper can be summarized as

- The use of natural resource i-e bitumen is minimized, which is of high priced now a day in Pakistan, by partially replacing it with PET bottles, so we obtain an economical structure.
- The modified asphalt gives us maximum stability for 30% PET bottles at optimum bitumen content of 6.5 %.
- The waste material such as PET bottles and over-burnt bricks are utilized in pavement construction, hence reducing pollution and to have an ecofriendly environment.
- SEM images shows that the modified asphalt sample is more compacted as compared to the unmodified asphalt.
- The use of PET bottles and over burnt bricks in asphalt gives us a sustainable construction by reducing the waste materials.

5. RECOMMENDATION:

Based on the outcomes of the study it is strongly recommended to

- Detail cost analysis of the project, estimating the cost that is reduced by replacing bitumen and aggregate with PET bottles and over burnt bricks respectively.
- As mentioned above that aggregates containing high levels of quartz offer poorer resistance therefore it is suggested that aggregates containing lower level of quartz will offer better fire resistance and will be stable at high temperature, so light weight aggregates or aggregates containing limestone may be used.
- Thermal coefficient of expansion can be determined using strain gauges and a temperature controlled cabinet. As aggregates, containing high levels of quartz offer

poor heat or fire resistance because quartz undergoes an expansive solid phase change at high temperature.

6. REFRENCES

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