INFLUENCE OF LATHE WASTE IN FLEXIBLE PAVEMENT

Submitted by

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MASTERS OF TECHNOLOGY

IN

Transportation ENGINEERING

Under the guidance of

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DECLARATION

I hereby declare that the dissertation report titled "**INFLUENCE OF LATHE WASTE IN FLEXIBLE PAVEMENT**". It is an authentic record of my own research work carried out as a requirement for the preparation of M-Tech dissertation for the award of Masters of Technology Degree in transportation Engineering from Lovely Professional University, Phagwara, Punjab, under the guidance of Mr. D Sai Kiran Varma, during the period between January 2017 and May 2017. All the information furnished in this report is based upon my intensive work and is completely genuine to the best of my knowledge. And no part of the uncited work in this report has ever been published before in any journal or presented for the award of any degree or honour.

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CERTIFICATE

Certified that this project report entitled ***"INFLUENCE OF LATHE WASTE IN FLEXIBLE PAVEMENTS",*** submitted individually by **HARDEEP SINGH MUTREJA** student of Civil Engineering, Lovely professional University carried out the work under my supervision for the award of degree. This report has not been submitted to any other university/institution for the award of any degree.

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Hardeep Singh Mutreja

ABSTRACT

In India, The production rate of waste is very high. There are so many type of waste which cant able to utilize in any type of way like plastic waste, solid waste, steel waste etc.This research uses the steel industry waste i.e. produced after applying some operations in iron like drilling, cutting, boring etc. which is called as lathe waste material. The production of lathe waste material is very high and reusing it in steel industry is not economical. This type of waste also covers the large amount of land space. In this the lathe waste powder is used as filler material in Dense Bituminous Macadam for flexible pavements. This type of material can able to increase the stability of DBM. Because It was already taken in use for concrete and the results are more stable than the convectional mix. That's why in this paper the feasibility of lathe has checked either it can able to take in use or not. In this paper there are many consideration taken for lathe waste with normal filler material. The size that taken for filler is between 2.35 mm to 75 microns. In this study, checking of study is also done by using Marshall Stability Test.

Keywords - Lathe waste, Marshall Quotient, Dense Bituminous Macadam, Flexible Pavement.

Table of Contents

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

BACKGROUND

DENSE BITUMINOUS MACADAM (DBM)

Dense Bituminous Macadam (DBM) is a Mix of bitumen and different grading aggregate which is used as binder course used in road Construction work, this mix use to resist the more number of heavy commercial vehicles running in everyday life and it is a close-graded premix material which contains 5-10 percent voids. The Indian Roads Congress published the first specifications for Bituminous Macadam in the year 1967. This DBM mix is prepared by the ministry of surface transport (Roads wing). This DBM concept is discussed in the meeting on 12th December, 1985 and this meeting is held by Bituminous Pavement Committee. In that time the Governor of this committee is Prof. C.G. Swami Nathan.

This DBM specification was approved by the executive committee and finally taken this specification in use from date 19th September, 1986. IN 2001, the Indian Road congress again revise the specification by doing some changes in the technology and improvement in the procedures of construction procedure as well as quality control expectations, This revised specification work is completed by Shri R.K. Pandey.

Dense Bituminous Macadam is mostly used in the countries were the rainfall is heavy and surface water drain off is difficult. This layer is suitable for all pavement layers and for all traffic conditions. This layer gives a good quality smooth surface and it also improved skid resistance. For satisfying Design criteria given by Indian Road Congress (IRC), the mix of DBM shall consists of Coarse Aggregate, Fine Aggregate and filler in appropriate proportions with required binder content.

Due to change in the present traffic many, it increases the heavy vehicle load tire pressure and traffic volume is also increases. The approximate weight of truck is 113.4 Ton. Tire pressures of 150 psi have been frequently reported. These changes represent a serious challenge to the

pavement layers as they have caused predatory occurrence of distresses, permanent deformation/rutting and fatigue failure. This deformation causes map cracking, chuck holes, settlement and undulations similar to those observed in some Egyptian roads. Certainly, accumulation of these deformations reduces the pavement life, increases the maintenance costs and may cause a complete failure of the pavement. Increasing the resistance of flexible pavement layers, against permanent deformation, definitely, will increase pavement life, decrease maintenance cost as well as prevent the early reconstruction. Researches on the available aggregates have shown that there is a general scarcity of good-quality aggregates since most of the available limestone aggregates are friable carbonates of sedimentary origin. According to IRC this type of mix basically used in National highways because it can able to resist the heavy wheel loads. The main property of DBM is that this layer create less noise pollution created by the heavy commercial vehicles and in rainy season due to presence of chamber it can easily drain out the water easily.

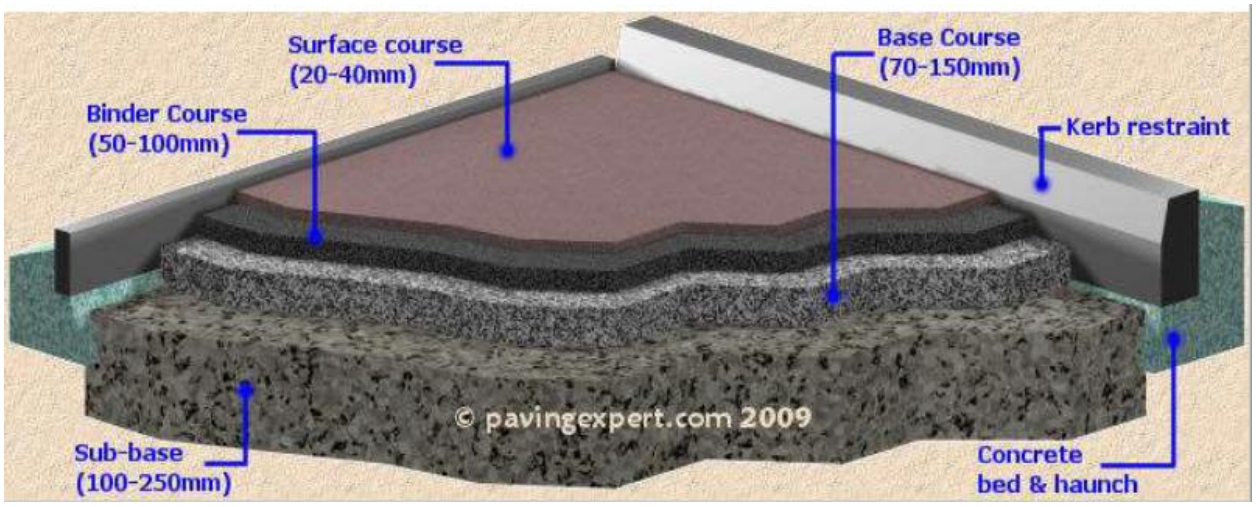


Fig 1.1: Laying Of Dense Bituminous Macadam (DBM)

The Specific gravity of this bituminous is 1.015, the ductility is 150cm and the softening point is 125°F. The minimum Marshall stability of Dense bituminous Macadam is 340kg. The Voids in Mineral Aggregate (VMA) that should be 5-10%, and the Voids filled with Bitumen (VFB) should be 55-75%. The Dense Bituminous Macadam contain 4.5-6.0 percentage of bitumen from the total weight of total mix. Several studies have been carried

out for increasing the mechanical properties of flexible pavement for the application to resist the heavy wheel loads and for increasing the strength of the road. For increasing the strength many test took place in DBM also like partial replacement of plastic with bitumen, filler material with natural aggregate dust etc. The focus of this research is not only increase the strength but it can also increase the life of the road. And there is also a possibility that it can able to reduce the construction cost.

In DBM the bond between Binder and aggregates plays an important role in strength, VFA and VFB, and durability of Dense Bituminous Macadam. In aggregate the quantity of filler fine aggregate and coarse aggregate is available as per IRC. In these research work we are replacing Filler by Iron Waste that gain after applying some operation in iron tools like drilling, cutting threading etc. by various proportion by total weight. These operations are done by using Lathe machine that's why this waste is also called as lathe waste. This lathe waste material is the waste materials that is available in a vast quantity which can increase the mechanical strength properties of bitumen mix and it can also decreases the cost of bitumen in flexible pavement.

The Strength of lathe waste is higher as compared to the normal filler material so according this it can able to gives the strength more than the standard mix. In this research we will replace the iron with filler partially. So that we can able to check the change in strength while increasing the percentage of filler material with lathe waste by taking standard mix properties in main point of view.

Fig 1.2 Lathe waste

OBJECTIVES OF THE STUDY:

1. To investigate the use of steel scraps as steel fiber in flexible pavement.
2. To check the various physical and mechanical characteristics of the lathe waste fibers in Dense Bituminous Macadam of flexible pavements.
3. To perform the test on the material of DBM by mixing some of the lathe waste and also check the stability so that it can able to wear traffic load.
4. To Perform laboratory investigations in order to check the strength so that when material laid down on pavement and traffic load is take place so up to design life it should not deform.
5. To compare the characteristics of strength between Normal pavement material and this scrap used pavement material.

NEED OF THE STUDY:

The needs of this research are as under:

- Save Money: As per research the strength of dbm is increased by using the lathe waste material as a waste material, automatically cost of the project decreased which can able to save money of the project.
- Strength Properties: As the properties of the Strength improves with the help of adding Lathe waste in the mixture, the mechanical strength properties will be more for provide good strength
- Save Waste: Due to production of high percentage of lathe waste from big iron industries it also effects in human life. By giving it a application it can able to take in use so that it cannot give effect to this whole biodegradable society.
- Save Land Fill Taxes: If we not use this lathe waste in road work, this is to be stored in big containers or fill in land or pond and have to pay taxes to the government.so it can help to save the taxes also.
- Save Environment: Due the production of high percentage of lathe waste from iron industries it is polluting the rivers and land, if we use this lathe waste in road construction work it can able to take in use.
- Benefits to Factories: As we use this material in manufacturing of flexible pavements the company earn money from us it is good for both user and company.

SCOPE OF THE STUDY:

The scope of this research as under:

- To increase the strength of the road so that it can able to resist the heavy vehicle loads.
- It can able to fill the voids filled with aggregate in the dense bituminous macadam.
- It will help to increase the Marshall stability.
- It will help to make the strong bonding between binder and aggregate.
- It will help to improve the skid resistance on the flexible pavement.

CHAPTER-2

LITERATURE REVIEW

1. **"Evaluation Of Bituminous Concrete Mixtutre Properties With Steel Slag"Kavyashree L Magadi[1], Anirudh N[2], K M Mallesh[3] Department of Civil Engineering, Siddaganga Institute of Technology, Tumkur Transportation Research Procedia 17 (2016) 174 – 183**

This paper presents the usage of the steel slag which is replaced by coarse aggregates of different sizes (.e. 37.5mm down, 20mm down, 12.5mm down)for making the different bituminous mix by taking different percentage of replacements value at different percentages. For taking the specification of DBM grade-II the replacement took place. They perform the various test for steel slag, aggregate and bitumen so that the material which is using for this specification should be suitable for the further testing. The chemical tests for the steel slag showed good result, it is important because this will show the chemical stability for future. Bituminous mixtures of aggregates and replacement of steel slag were used to create the perfect Marshall Specimens as per the standard specification and to find the optimum bitumen content. To find the mechanical properties they performed the Marshall Stability and Indirect tensile strength tests. After performing the test they compared the value with the standard value. All mixture that we replaced with steel slag is satisfied with MoRT&H standards. After the observation of this test the steel slag used as a coarse aggregate which improved the mechanical properties of bituminous mixtures and thus resulting this steel slag is perfect for construction of roads.

2. **Utilization of Industrial Waste in Flexible Pavement Construction Dr. D S V Prasad (Professor, B V C Engineering College, Odalarevu), Dr. G V R Prasada Raju (Professor, J N TU College of Engineering, Kakinada), M Anjan Kumar (Associate Professor, GIET, Rajahmundry)**

According to its extremely adaptability and flexibility nature the Reinforced earth method has been achieving fame in the branch of civil engineering. For construction of retaining

walls, embankments, earth dams, foundation beds for heavyweight constructions on soft grounds, viaduct bridges and other applications it has been taken in use. With the new invention of geo-synthetics in the branch of civil engineering, the reinforced earth technique having many possibilities to upgrade this field. There are so many improvement in geo-synthetics and after using this type of material it is making the construction very simple. Thus we are takin this material in use in wider percentage in many observation of engineering, the use of this type of material in construction of roads is very limited. Though, the coating of geo-synthetic mainly used in a subgrade pavement interface as separator, so that it can able to stop the access of materials used in pavement in the subgrade coarse or in the material of subgrade into the pavement materials. The steps for these test are made to find the stabilization process with model test tracks over sand soil subgrade. To check the performance by using different types of reinforcement materials place like waste plastics and waste tyre rubber in murrum / flyash subbase course, there are many test that were take place, which is then placed on sand subgrade that is done by Cyclic plate load tests. The results of the tests shows that the maximum load carrying capacity related with minimum value of rebound deflection is mainly got for murrum reinforced subbase as equated to fly ash reinforced subbase.

3. EXPERIMENTAL STUDY ON FIBER REINFORCED CONCRETE USING LATHE SCRAP FIBER Sheetal Chinnu James1, Dr. Mini Mathew2, Ms. Anitta Jose3

The Fiber reinforced concrete is a concrete which contain fibrous materials that are consistently distributed and randomly arranged. Steel fiber, glass fiber, natural fiber and synthetic fiber is comes under fibrous material. Removal of lathe wastes in the desolate soil contaminates the soil and ground water, which helps to make an undesirable environment. In this project for checking the fresh and hardened properties this thesis check the stability of concrete by using lathe waste. There are so many test performed for checking the stability of concrete, they were slump test, compressive strength test, split tensile strength test and flexural strength test. For testing the stability of concrete the

concrete cubes, beams and cylinders were casted and cured and after casting they performed various tests were done at 7th day and 28th day. After these observation it is concluded that the addition of 1% of lathe scrap in mixture improves the strength of fiber reinforced concrete, the compressive strength increases to 16.904% in 28 days and it increases 20.171 at 7 days when compared to control specimen. And also we get the strength in 56 days to 17.12% after adding the 1% of fiber content.

4. Use of Waste Materials in Highway Construction: State of the Practice and Evaluation of the Selected Waste Products

In this study, the researcher shows the use of different types of waste material in road construction in United States. In this study they took the data of many types of material like Crumb rubber, waste plastic, solid waste etc. In this study they see many research papers and according to that they find that this type of material can able to take in use which can give the better properties over the convectional mix. They studied this type of material for using it in bitumen mix. After this they concluded that the crumb rubber and plastic increases the strength of bitumen mix over the convectional mix. And also these type of material can able to increasing the stability and life of the roads. The value they got that for these material i.e. crumb rubber can use 3-5% in the bitumen mix and for waste plastic the value is between 6-8%.

5. Study on Marshall Stability Properties of BC Mix Used In Road Construction by Adding Waste Plastic Bottles: Shiva Prasad K, Manjunath K. R, K. V R Prasad

In this study, they gave importance for adding the waste plastic bottles to bituminous concrete (BC) mix and to calculate the various mix properties like Marshall Stability, flow, bulk density, voids in the mix and VFB. After testing the indirect tensile strength was mainly calculated for OBC and 8% plastic coated on aggregates which had given the

maximum marshal stability. For both 60/70 and 80/100 grade bitumen with optimum plastic content 8%, the maximum stability they got in 80/100 grade bitumen. Due to very high melting point in plastic wet process of blending is not took place. After adding waste plastic to the mix in 60/70 and 80/100 grade bitumen the stability is rise up to 15% and 10% respectively. Soaked specimens showed the fall in stability value as compared to not soaked specimens. For better performance of the traffic this material can be take in use because this material have highest stability which can give the long use for the roads.

6. Study of Addition of Waste Plastic in Dense Bituminous Macadam with Stone Dust and Bagasse Ash as Filler Priyadarshini.H.P1, Dr. Lekha.B.M21P G Student, 2Prof. Dept. Civil Engg, K.V.G.C.E, Sullia

In this thesis waste plastic coated with aluminium layer with stone dust and bagasse ash as fillers as taken in use. In this research they used 5-15% of plastic with 2.5% of bitumen in DBM. They tested by these material by using Marshall Stability test. The OBC was 5.4% and OPC was 12.5% in DBM, In that it concluded the maximum stability with plastic and bagasse ash is 22.4 KN which is more as compared to bitumen with plastic and dust as filler with stability 21.75 KN. It is concluded that addition of plastic improves the stability of DBM mix which increases the stability of road.

7. Reuse of Lathe Waste Steel Scrap in Concrete Pavements

Pooja Shrivastavaa, Dr.Y.p. Joshib (ISSN : 2248-9622, Vol. 4, Issue 12(Part 4), December 2014, pp.45-54)

In this paper they used lathe waste in concrete for study the mechanical strength and workability of concrete they give a term to this type of concrete as steel scrap fiber concrete (SSFRC) or steel fiber reinforced concrete. The properties that they tested after comparing this type of concrete with standard concrete the mechanical properties i.e. compressive strength, flexural strength, impact strength, fatigue strength and split tensile strength were increased. It were rise but only in one condition if the scrap content value is between 0.5-2%. In this type of concrete they got the result that after adding this type of scrap the flexural strength will increase by 40%, there is a considerable increase in tensile and

compressive strength. This will also increases the cracking resistance i.e. preventing crack propagation and modulus of elasticity and there is a reduction in shrinkage. The main target of this research was to improvement in fatigue life of concrete by using steel scrap material in concrete. They concluded that this type of is more cost effective and ecofriendly sustainably SFRC pavements.

8. **EFFECT OF FILLERS ON BITUMINOUS PAVING MIXES: Ravindra Tomar1, R K Jain1 and M K Kostha (ISSN 2319-5991 www.ijerst.com Vol. 2, No. 4, November 2013 © *2013IJERST*)**

In this world every construction have huge investment needs. For this type of work the precise engineering needs which saves money and gives the valuable service. For designing any type of road there are two things which have major role and they are pavement design and the mix design. This plan considered the mix design. For considering the plan of mixes they took both aspect that the prepared mix should stable as standard mix and it should be eco-friendly. After performing the test the mix designer tries to improve the requirements by keeping in mind that the proportion of material should be same as standard mix and after this finalizing the best one as per requirement, this often involves a balance between mutually conflicting parameters. The basic needs of Bitumen mix design is a perfect balance between the proportions of various aggregate sizes and bitumen content. In bitumen mix design the filler is also having an important role. Basically in standard bitumen mix design stone dust, cement and lime are used as fillers. This research gave the cause for the use for filler like brick dust and silica fumes in bitumen mix design. It has been observed as a result of this project that bituminous mixes with these non-conventional fillers result in satisfactory Marshall Properties though requiring a bit higher bitumen content, thus substantiating the need for its use. In the bitumen mix the fillers which is taken in use for this investigation are likely to make a part for disposing the solid waste of The environment, which can affect the environment.

9. Use of steel slag in construction of flexible pavement Sandip.S.Patil, S.S.Bachhav,. D.Y.Kshirsagar (International Journal of Engineering and Innovative Technology (IJEIT) Volume 5, Issue 11, May 2016)

In our country murrum soil has been use for subgrade in all types of categories of roads and also murrum is a good construction material because it is having higher finer fraction and excessive plasticity index. In this paper they partially replaced steel slag with murrum soil as we know that te steel slag is a waste material which we get from the steel industries. From the report (Ref.Report.CRRI-2010), there is total production of steel slag is around 24 lac ton per year from different steel industries in the India and this type of waste has no applications. In this research, they collected steel slag from an M/s Jindal Steel industry Pvt.Ltd Sinnar MIDC, (M.S) in India and after collection of the material they check the feasibility of material so that it can able to take in use for different layers of road construction. After this testing they analyzed that we can replace 5- 25% of steel slag from murrum soil which can able to develop the stability of soil. In this proportion there is a improvement in plasticity index, flexural strength and other geotechnical properties so that we can take it in use for Flexible pavement.

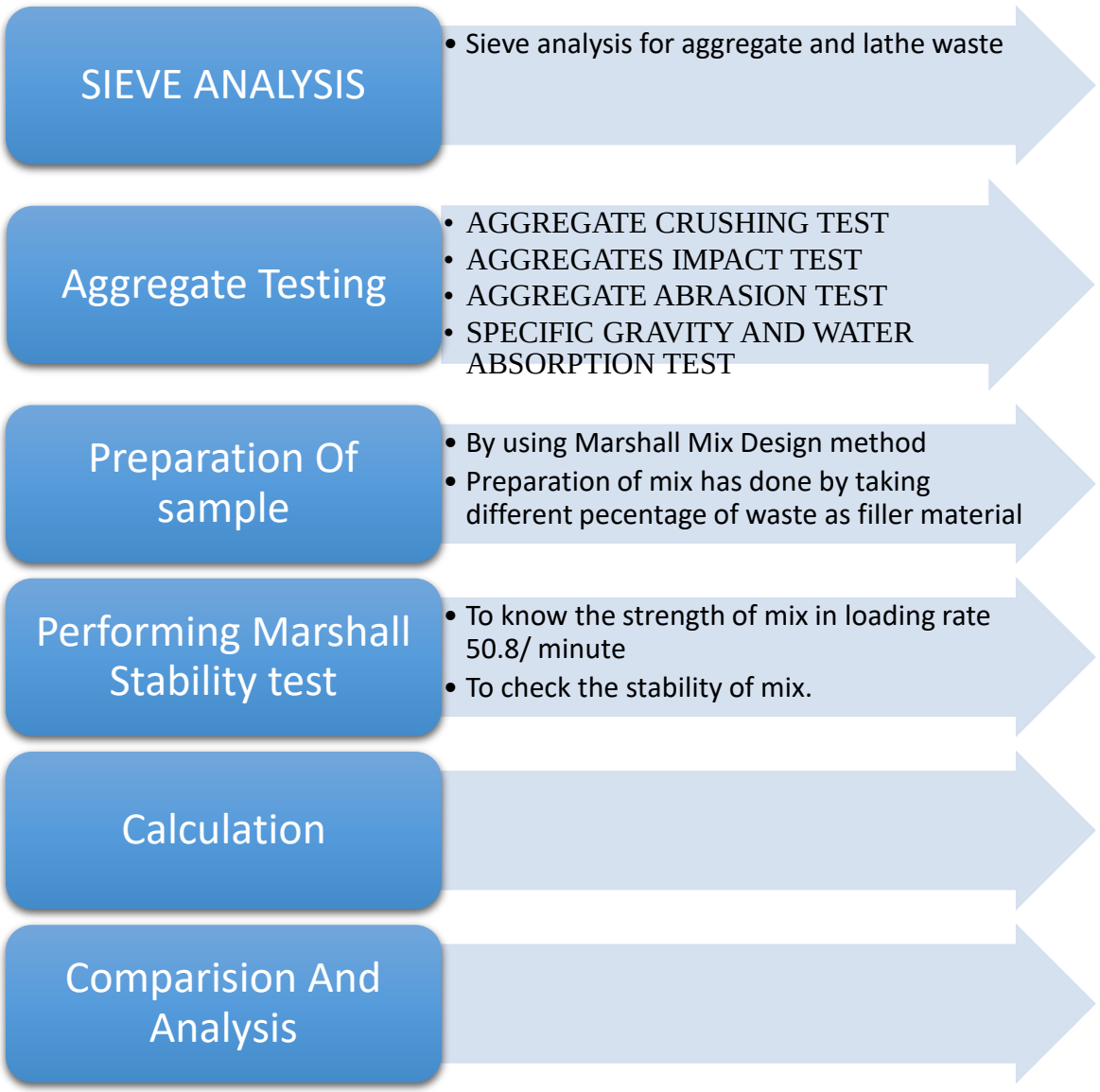
10. Role of Waste Plastic and Waste Rubber on Dense Bituminous Macadam Layer of Flexible Pavement: Sk Sohel Islam, Ayana Ghosh, Riddha Chaudhauri

Due to adverse climatic condition in India, the Bitumen fail to carry the load and for this this the mix needs the modification. They replaced aggregate with virgin polymer like crumb tire rubber and waste thermoplastic polymer and also they replace Rice husk ash with filler material in bitumen mix. It is concluded that the mix prepared by using 2% waste plastic and 2% waste rubber as modifying agent which give optimum bitumen content becomes minimum and stability becomes maximum. It is 61% much stronger than that of conventional mix. Marshal Quotient (MQ) was also raised by 52% compared to that of Standard mix. From this type the solid waste disposal problem can be solved.

CHAPTER-3

RESESRCH METHODOLOGY

3.1 METHODOLOGY



3.2 MATERIAL USED FOR SAMPLES: The material that are used in this research work are as under:

3.2.1 LATHE WASTE:

There are many type of iron waste which we get from the different iron industries by performing various operations on iron such as

1. Drilling
2. Cutting
3. Facing
4. Knurling
5. Threading
6. Chamfering
7. Form turning
8. Cut off
9. Threading
10. Boring

Which is mainly done by using different type of machine such as lathe machine, drilling machine, milling, drill press etc.

Machining operations conducted at machine shops, metal stamping facilities, and other metalworking operations typically generate various types of waste. Waste material generated from machining processes is a prime candidate for recycling if the waste is not co-mingled with other metals or otherwise contaminated.

Fig 3.1 Lathe machine

The material which is produced from lathe machine is in many sizes But in this research basically size used was below 2.35 mm. The image of lathe waste is given below:-

Fig. 3.2 Lathe waste From sieve size 2.35 mm. to 75 microns

SIZE USED FOR FILLER MATERIAL:-

SIEVE (mm)	% Passing		
	11.2mm	**6.7mm**	**DUST**
300µ	**0**	**18**	**35.5**
75µ	**0**	**5.2**	**9.5**

Table 3.1 Specification for lathe waste used in DBM

And For this the percentage of lathe waste which can feasible to replace is 5%, 10%, 15%, 20%, 25%, 30% and so on.

Sample No.	Local Filler + Lathe waste
1	100
2	95LF+5LW
3	90LF+10LW
4	85LF+15LW
5	80LF+20LW
6	75LF+25LW
7	70LF+30LW

Table 3.2 Table for consideration taken for lathe waste

3.2.2 Bitumen:-

The bitumen that is using in this research is VG- 30 and as per penetration. The properties of Bitumen must complying its property with IS:73

3.2.3 Aggregate:-

As Per Table the sieve analysis is already given and according that the consideration was taken.

The test which are performed for aggregate are as follows:-

- Aggregate Crushing Test
- Aggregate Impact Test
- Aggregate Abrasion Test
- Specific Gravity And Water Absorption Test

CHAPTER-4

EXPERIMENTS

4.1 EXPERIMENTS / TESTS TO BE CONDUCTED

4.1.1 Sieve analysis

The sieve Analysis which was performed for testing the size for the aggregate is as follows:-

Sieve Size (mm)	**Grading Number**	
	1(For Layer thickness ≤50mm)	**2(For Layer thickness ≥50mm)**
	Percentage Passing	
37.5	-	100
26.5	100	85-100
19	85-100	71-95
13.2	63-82	58-82
9.5	52-74	52-72
4.75	39-54	35-50
2.36	28-43	28-43
0.60	15-27	15-27
0.3	7-21	7-21
0.15	5-15	5-15
0.075	2-8	2-8

Table 4.1 Specification for DBM

4.2.2 Marshall Stability Test

Objective of Test

For measuring the resistance to plastic flow this Marshall Stability method is use to check the stability for asphalt mixture. This type of mixture are used for those mixture which contains the percentage of bitumen like Bituminous cement, Bituminous cutback, and aggregate size greater than 25.4 mm maximum size.

Main Use of Test

This type of test is also use to find the extreme load that can able to wear traffic load when material laid on pavement surface, it can only measures if the specimen is prepared by the different type of the bituminous concrete or bituminous mix which is used to construct the surface layer of the pavement or prepared by STP 204-8, that prepare the different sample so

that, the Marshall Compaction can able to measure.

Fig 4.1 Apparatus for Marshall Stability Test

Units of Measure

The Strength of samples is dignified in Newton. Flow is measured in mm.

APPARATUS AND MATERIALS

Equipment Required

1. Stopping Head – This part of machine i.e. breaking head should comprise of above and below barrel shaped portions or test heads having an inner curvature radius of 50.8 mm precisely armed. The bottom fragment should be attached above a surface has 2 alternate guide poles or posts broadening in above side. The guide sleeves in the upward portion should be in such a location as to coordinate the two fragments together, without considerable authoritative or lose movement on the guide bar.

2. Loading Jack – Tis component contain screw jack which is over headed in a testing frame and that is also gives a uniform vertical movement in the rate of 50.8mm/min. The Jacking mechanism is attached by an electric motor.

3. The Ring Dynamometer Assembly or Electronic Equivalent – The single ring dynamometer of weight 2267 kg limit and affectability of 4.536 kg up to 453.6 kg and 11.34 kg in the vicinity of 453.6 and 2267 kg should be furnished with a micrometer dial. The micrometer dial might be graduated in 0.0025 mm. above and below ring dynamometer connections are required for affixing the ring dynamometer to the analyzing, casing and traversing the heap to the breaking head.

4. Flowmeter –In this machine there is a flow meter attached that should cover of a guide sleeve and a gauge. The passing pin of the gauge should skid in this sleeve with a limited measure of frictional protection. This type of guide sleeve might skid openly finished the guide pole of the breaking head. The gauge of flowmeter should be acclimated to zero when set in position on the breaking head when every single testing example is embedded between the breaking head fragments.

5. Water Bath - the water bath should be no less than 152 mm profound and might be thermos-statically controlled in order to keep up the bath at 60 ± 10 C. This tank might have a punctured false base or be furnished with a rack for supporting examples 51 mm over the base of the bath.

6. Air Bath - the air bath for black-top reduction blends should be thermos-statically controlled and might keep up the air temperature at 25 ± 10 C.

PROCEDURE

3.1 Equipment Preparation

Simply the cleaning of the inner surface and guide rod should be done to start the test, and put some grease on guide rods so that it lubricate and become friction less and also the upper test head skids freely over them.

3.2 Test Procedure

Apply the black-top bonded examples at the limited temperature by put in a bath filled with water for 30 minutes. Maintain the temperature of the bath or oven as per requirement i.e. 60 ± 1 ° C for examples of black bonds. Bring the black tip reduction examples to the preset temperature by putting them around the bath for at least 2 hours. Maintain the temperature of the air bath at 25 ± 1 ° C. The temperature of the probe can be maintained between 20 and 38 ° C. Complete the example of the water bath, oven or air bath and place in the lower part. Place the top of the breaker head on the example and place the assembly in location above the test machine. During use, place the flowmeter by positioning more than one guide rods and see the zero on the gauge of flowmeter before holding the sleeve securely against the top of the breaker head. Slowly hold the flowmeter sleeve slowly from the tip of the bursting head while connecting the test cell. Turn the pile on the example using methods for constant pile rate or test head development of 50.8 mm / min until the time of greatest load and the stack falls the dial shows. Record the most extreme load on the test machine or replace it with the larger micrometer

disc. Discharge the flowmeter sleeve or note the micrometer dial used when the largest load starts to fall. Record and record the current estimate or units of measure in millimeters when using a micrometer gauge to measure the flow. The time elapsed before the test from the expulsion of the test sample of the water bath to the largest load ratings must not exceed the time of 30 seconds

Collection of Test Results

For samples with a thickness other than 63.5 mm, recorrect the load with appropriate multiplication aspect

The reports should contain the following information:

a) The type of sample which is to be tested (laboratory sample or paving core sample). The height of each sample must be measured.

b) The correction of the average maximum load in Newton, revised if necessary.

c) Usual flow value in millimeters

d) The test temperature

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2. Utilization of Industrial Waste in Flexible Pavement Construction Dr. D S V Prasad (Professor, B V C Engineering College, Odalarevu), Dr. G V R Prasada Raju (Professor, J N TU College of Engineering, Kakinada), M Anjan Kumar (Associate Professor, GIET, Rajahmundry)

3. EXPERIMENTAL STUDY ON FIBER REINFORCED CONCRETE USING LATHE SCRAP FIBER Sheetal Chinnu James1, Dr. Mini Mathew2, Ms. Anitta Jose3

4. Use of Waste Materials in Highway Construction: State of the Practice and Evaluation of the Selected Waste Products

5. Study on Marshall Stability Properties of BC Mix Used In Road Construction by Adding Waste Plastic Bottles: Shiva Prasad K, Manjunath K. R, K. V R Prasad

6. Study of Addition of Waste Plastic in Dense Bituminous Macadam with Stone Dust and Bagasse Ash as Filler Priyadarshini.H.P1, Dr. Lekha.B.M21P G Student, 2Prof. Dept. Civil Engg, K.V.G.C.E, Sullia

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