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Study and Analysis of Bitumen Mixture Incorporating with Waste Foundry Sand

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Abstract: ***In 20th century India is aiming to be developed country. The backbone of any developed country is its Infrastructure facility. Now day in India lot of infrastructure projects are going on, in that the road transportation facility is a very important criteria. In recent years there is spontaneous increase in demand of good quality pavements in Urban as well as in rural areas. The construction of good quality roads is mainly depend upon the funding available for construction and quality of raw material available for construction of road, so it very important to construct good quality roads in low budget.***
Due to scarcity natural resources, the cost of raw material is increasing day by day, so it is important to find out alternative material for construction of roads. Now a day's various Industrial wastes are utilized for road construction. In Kolhapur city there are lot of foundry industries, which generated lot foundry sand waste. Generally this waste is dumped in open areas. This foundry sand can be utilized for various construction purposes. Famously this is utilized in concrete.
In this study the emphasis is given to use of foundry sand waste in flexible pavement construction. The focus of this study is to analyse the impact of foundry sand on properties of bitumen. In this study we have carried out standard testing of bitumen with percentage replacement of foundry sand to compare the properties of normal bitumen and foundry sand mix bitumen. 2%, 3% & 4 % foundry sand replacement is done and tests are carried out as per standard procedure. After conduction of tests it has been found that the properties of bitumen are changed and those are not as per IS requirements. Only the value of flash point and fire is within the range specified by IS codes.
Keywords: ***Foundry sand, Bitumen, waste utilization, Highway Engineering, Flexible pavements, Bitumen testing.***

I. INTRODUCTION

Infrastructure development is the burning issue now days in India. To meet the requirements in the construction of pavements and other structures bitumen plays the important role and a large quantity of bitumen is being utilized in every construction practices. In civil engineering, due to urbanization the demand for construction materials increases, with the increase in demand there is a strong need to utilize alternative materials for sustainable development.
The problem industry facing today is waste disposal. Reuse of waste in construction or as a construction material may be cheapest and best solution. Foundry sand is abundantly available waste materials which can be used as construction material. Dumping of foundry sand can form the leachate due to its chemical properties. So reuse of foundry sand can be proved economical and environment friendly.
The increase in the popularity of using environmentally friendly, low-cost and lightweight construction materials in construction industry has brought about the need to investigate how this can be achieved by benefiting to the environment as well as maintaining the material requirements affirmed in the standards. By partial replacements of foundry sand in bitumen can reduce the environment degradation and can be a cost effective solution.
To study the properties of bitumen after replacement of foundry sand lab tests are carried out. Penetration test, softening point test, ductility value & Fire and flash point tests are carried out. First upon all tests are carried out on normal bitumen without any replacement of foundry sand & after that tests are carried out on 2%, 3% & 4% foundry sand replacement. All the tests are carried out as per IS code standards.

II. AIM AND OBJECTIVE

Following are the objective of study

A. To study the properties of bitumen incorporating with the foundry sand
B. To compare the properties of normal bitumen & Foundry sand mixed bitumen
C. To find out optimum foundry sand mix proportion for bitumen.

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III.MATERIALS

Following materials are used for this study

A. Bitumen
B. Foundry sand

IV.METHODOLOGY

A. Initially all tests are carried out on normal bitumen as per IS standards
B. For percentage replacement of foundry sand 2%, 3% & 4% quantities are decided
C. Percentage replacements are done by weight
D. For mixing of foundry sand, foundry sand is initially sieved and oven dried before testing.
E. After mixing of foundry sand the tests are carried out on foundry sand mix bitumen.

V. RESULT AND ANALYSIS

Results obtained from tests performed are analysed and represented graphically as follows,

A. Penetration Test

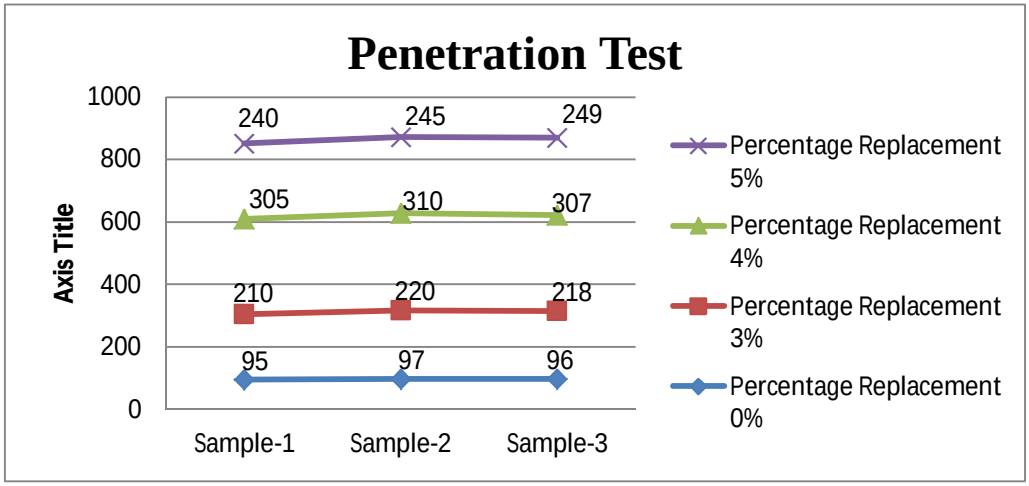

Fig.1 Penetration Value Comparison

B. Softening Point Test

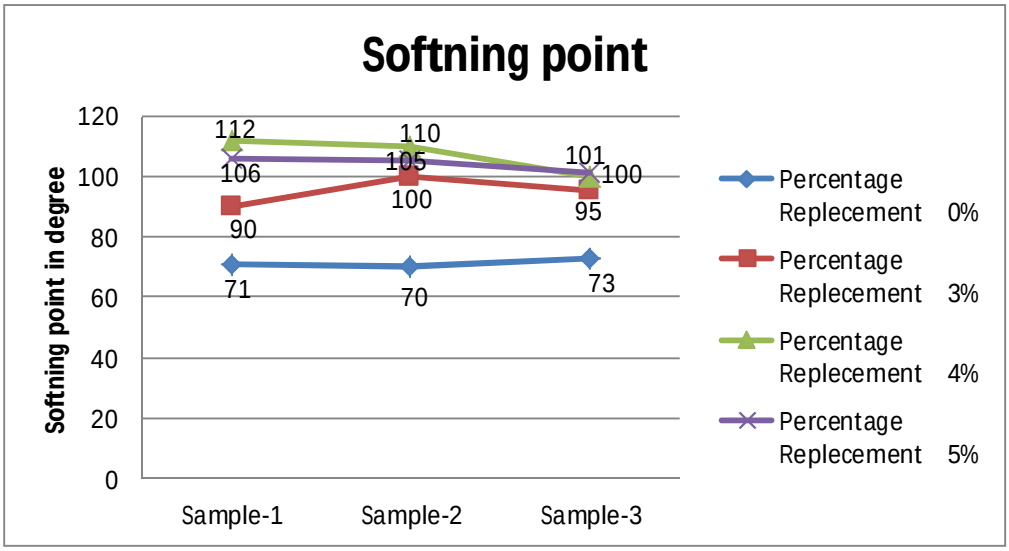

Fig.2 Softening point Value Comparison

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C. Ductility Test

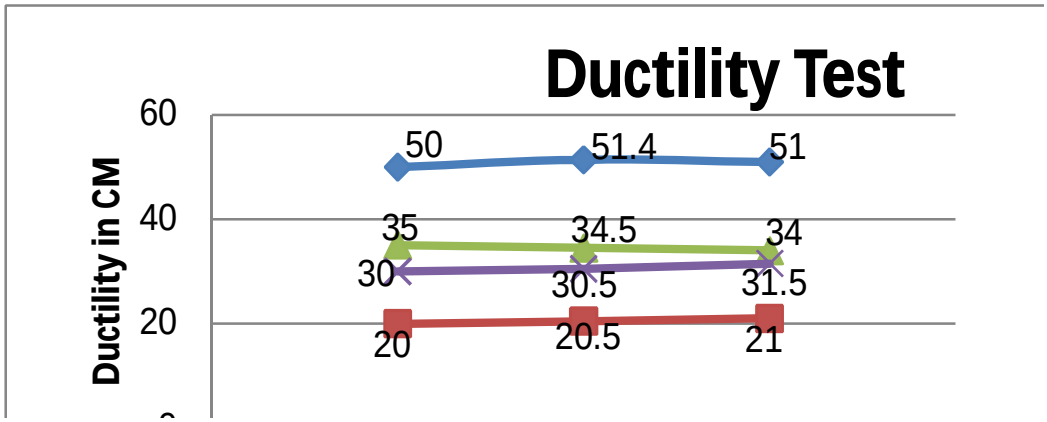

Fig.3 Ductility Value Comparison

D. Flash and Fire point Test

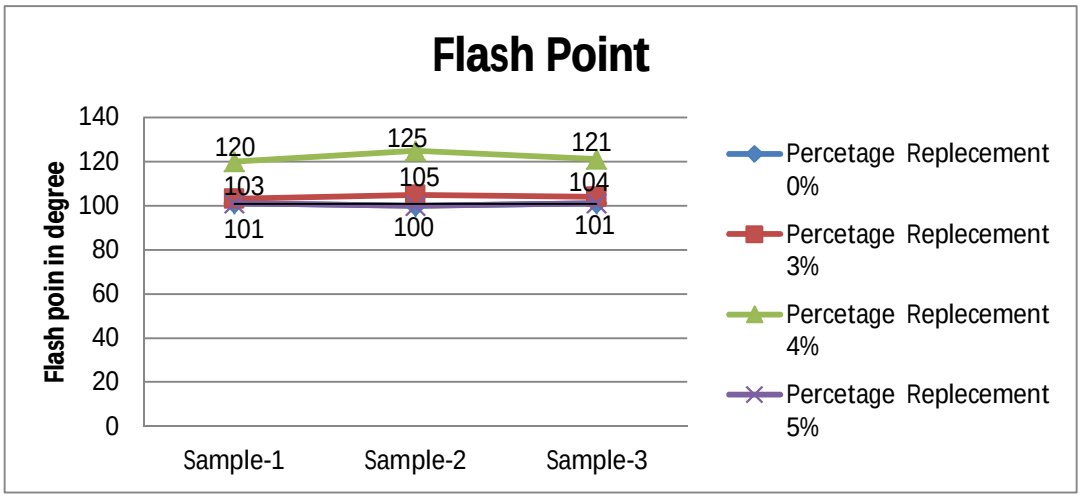

Fig.3 Flash point Comparison

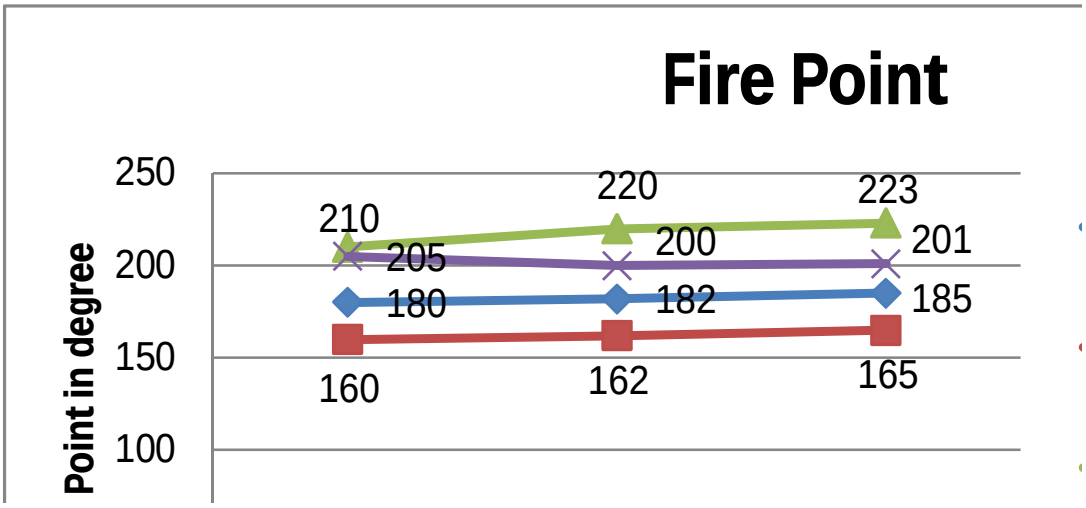

Fig.3 Fire point Comparison

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VI. CONCLUSION

A. The standard reading of penetration test on normal bitumen as per IS:1203-1978 range between 80-100mm. observed reading in percentage replacement of foundry sand is greater than the 38% of normal bitumen

B. The standard reading of softening point test on normal bitumen as per IS:1205-1978 range between 35-70 ºC. observed reading in percentage replacement of foundry sand is greater than the 70%of normal bitumen

C. The standard reading of ductility test normal bitumen as per IS:1208-1978 range between 50-75cm. observed reading in percentage replacement of foundry sand is lesser than the 59% of normal bitumen.

D. The standard reading of flash and fire point test on normal bitumen as per IS:1209-1978 Range between 65°C - 107°C. Observed reading in percentage replacement of foundry sand is similar to the normal bitumen.

E. From result and analysis it has been found that after replacement of foundry sand bitumen changes its properties significantly and results are not as per standard.

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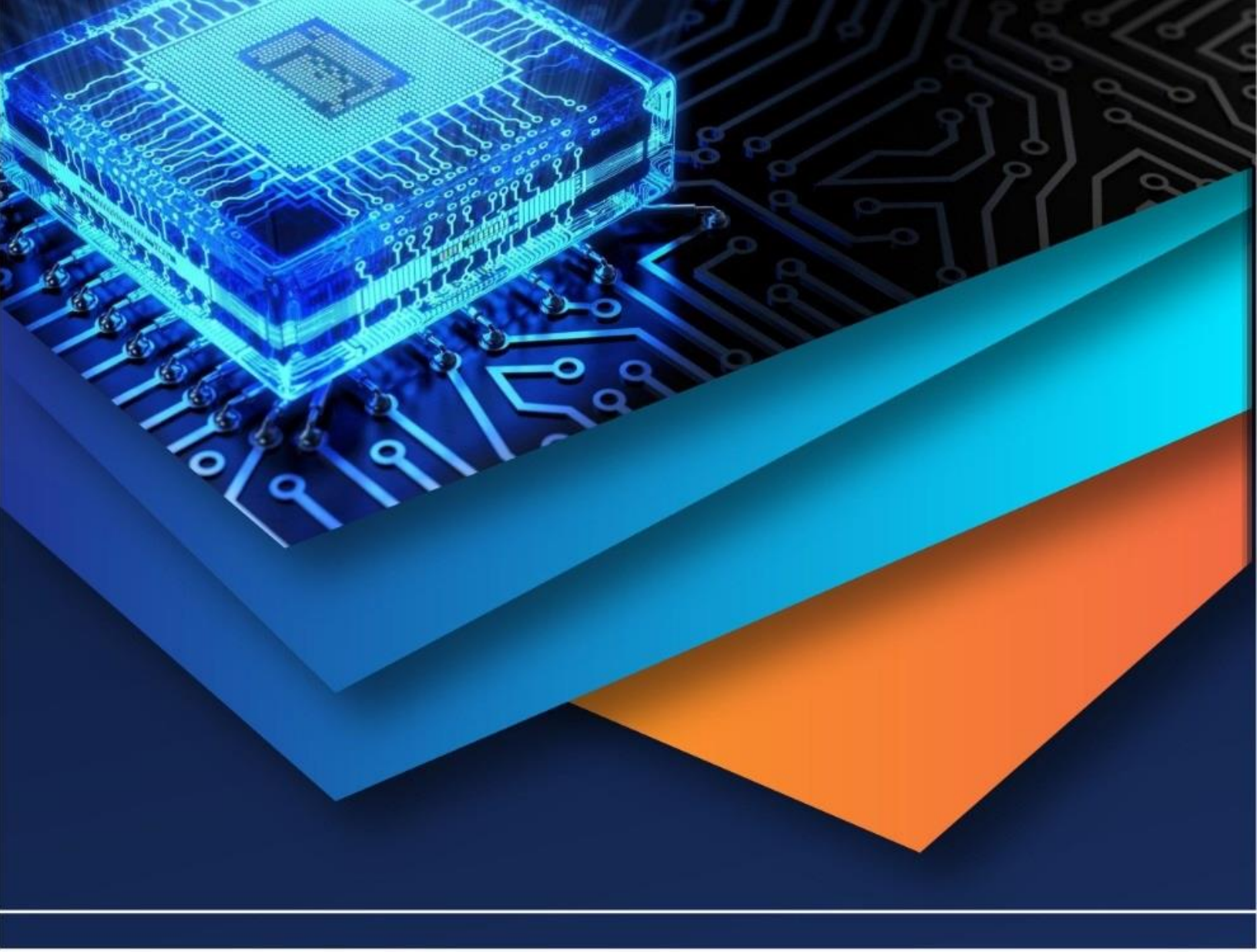

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