A Review On -To Determine The Effectiveness In Repeatability In Testing Of Bitumen Mechanical Parameters

Mr Bhushan Mahajan[1], Prof. Manish D. Mata[2]
[1, 2] Dept of Civil Engineering
[1, 2]Shri Sant Gadge Baba College of Engineering and Technology, North Maharashtra University,
Bhusawal-425201, India

Abstract- *A repeatability test is an experiment performed to evaluate how repeatable your results are under a set of similar conditions. This paper is about review of repeatability and retesting n proficiency testing in physical parameters of bitumen. Bitumen sample will be selected and test for predetermined parameters in prescribed environmental conditions in respected standards. In such case of bitumen testing performance of evaluator, deviation in results is possible to determine.*

Keywords- Repeatability Testing , Bitumen testing.

I. INTRODUCTION

A repeatability test is an experiment performed to evaluate how repeatable your results are under a set of similar conditions. When performing a repeatability test, you will want to collect data using the;

a. Same method,
b. Same operator,
c. Same equipment,
d. Same environmental conditions,
e. Same location, and
f. Same item or unit under test.

Essentially, want to collect repeatable results over a short period of time without changing anything (if possible).

According to the Vocabulary in International Metrology (VIM), measurement repeatability is measurement precision under a set of repeatable conditions of measurement. Furthermore, the VIM defines a repeatability condition of measurement as a condition of measurement, out of a set of conditions that includes the same measurement procedure, same operators, same measuring system, same operating conditions, same location, and same replicate measurement on the same or similar objects over a short period of time.

Defining measurement conditions and collect repeatable results over a short period time so you can evaluate the precision of your process.

PERFORM A REPEATABILITY TEST

To perform a repeatability test step by step. Follow the instructions below to add repeatability test data to your uncertainty budgets.

Here is a list of the steps in this process;

1. Select the measurement function to test,
2. Select the measurement range,
3. Select the test-point(s),
4. Select the method,
5. Select the equipment,
6. Select the operator,
7. Perform the test,
8. Collect the number n of repeated samples,
9. Analyze your results,
10. Save a record of your results (recommended),

Number of sample collections

$$n = \left[\frac{(z \cdot \sigma)}{MOE}\right]^2$$

1. Choose your desired confidence level (z).
2. Choose your desired margin of error (MOE).
3. Multiply the result of step 1 by the value by the standard deviation of the sample set.
4. Divide the result by the margin of error selected in step 2.
5. Square the result calculated in step 4.
although testing of five samples is recommended.

Objectives of the Study

1. To understand the concept of Testing, retesting and deviation acceptance parameters in mechanical testing of Steel bars.
2. To perform mechanical testing in prescribed conditions in respective IS of major mechanical testing of ....
3. Determine the results in testing and retesting and find deveation in repeatability.
4. Results and discussion on acceptance criteria of repeatability of testing results.Scope of the Study.

Scope: In proficiency and standardization of testing with modernization in testing parameters , it is essential personal in testing shall be proficient and effective with least error . This project helps to provide acceptance criteria and check the proficiency accordingly.

II. LITERATURE SURVEY

A. O. Abd El Halim suggests that over the past 50 years, pavement engineers and researchers have invested much effort and resources to develop reliable asphalt concrete mixtures. This has led to (a) using better aggregate type and gradation and (b) selecting asphalt cement based on performance related criteria. The Canadian environment requires the use of an asphalt cement that provides resistance to low-temperature cracking in cold winter temperatures and to rutting in the elevated temperatures of summer. An earlier study in Carleton University showed that a particular Styrene Butadiene Styrene (SBS) polymer modified asphalt cement could produce such desired improvements in the asphalt cement quality. This paper focuses on testing asphalt concrete mixtures produced using three different PG 58-34 asphalt cements which had been processed in the Pressure Aging Vessel (PAV) before being used to manufacture asphalt concrete specimens. [1]

Chiara Mignini 2018, put forwards that Cold bitumen emulsion mixtures are eco-friendly materials for road pavement construction. Portland cement and other supplementary cementitious materials are added to the mixtures to improve their performance. In bitumen emulsion–cement (BEC) mixtures, the two binders affect the mechanical behaviour and the curing process. In this research, BEC mixtures are considered as multiphase composite materials consisting of a mortar matrix and coarse aggregate inclusions. The main objectives are to identify the composition of BEC mortar phase and to compare mixtures and mortars throughout the curing process. Starting from two BEC mixtures containing 80% reclaimed asphalt, eighteen mortars were manufactured by changing their water and air voids content. Then, two design composition were selected to analyse the curing process by monitoring indirect tensile strength (ITS), indirect tensile stiffness modulus (ITSM) and moisture loss. Results showed that the short-term ITS of mortars (1 day of curing) increased by reducing their water and their air voids content. During curing (from 1 to 28 days), the mechanical properties (ITS and ITSM) of mixtures and mortars increased in a similar way. Unique relationships were identified between mortar and mixture properties, regardless of bitumen to cement (B/C) ratio, curing time and curing condition. In terms of predictive behaviour, the design composition slightly underestimated mixture stiffness and overestimated mixture strength. [2]

Diego Maria Barbieri a 2020, suggests that expensive and time-consuming maintenance operations are routinely performed to preserve the ballast mechanical properties in railway lines. Binding agents are used for ballast stabilisation. Four different additives based on bitumen, organosilane, lignosulphonate and polyurethane are investigated in the laboratory by means of repeated load triaxial tests. The parameters that are directly relevant for use in railway structures are assessed. Each binder type significantly influences both the resilient modulus and the resistance to permanent deformation of the treated specimens. The ballast mechanical properties can be conveniently modified, thus being beneficial to track stability and railway maintenance programme.[3]

M. K. Nivedya opines that the material characterization and design of pavement structures with Bitumen Stabilized Material (BSM) within the context of cold in-place recycling are challenging. Diverse opinion exists related to the mechanical behavior of BSM. Few investigators have characterized BSM as granular and measured the confinement pressure dependent resilient modulus, whereas few others have characterized this material as bituminous and measured the frequency dependent dynamic modulus. It is interesting to note that BSM can exhibit both these responses depending on the mode of testing and the environmental conditions. In this investigation, the BSM sample was subjected to resilient modulus test and dynamic modulus test at room temperature. When compared with a regular base course granular material, considerable disparity existed. The resilient modulus of BSM was found to decrease during the sequences where confinement was increased. During dynamic modulus testing, BSM exhibited similar frequency dependent characteristics when compared to a standard dense graded bituminous mixture.

SANJAY YADAV , 2008, Author gives the results of the proficiency testing (PT) accomplished for 17 laboratories, accredited by National Accreditation Board for Testing and Calibration of Laboratories (NABL). The measurements were performed in the pressure range 10-70 MPa using pressure dial gauge as an artifact. Only laboratories having best measurement capabilities 0.25 % or coarser than 0.25 % of fullscale pressure were included in this PT. The program started in May 2006 and completed during October, 2007. The comparison was carried out at 10 arbitrarily chosen pressure points i.e. 10, 20, 30, 40, 45, 50, 55, 60, 65 and 70 MPa. The results thus obtained show that out of the total 159 measurement results, 135 (84.91 %) are found in good agreement with the results of the reference laboratory. The relative deviations between laboratories values and reference values are well within 0.15 % for 75 measurement points, 0.25% for 108 measurement points and 0.50% for 148 measurement points. The difference of the laboratories values with reference values are found almost well within the uncertainty band of the reference values at 71.07 % measurement results, within their reported expanded uncertainty band at 62.26% measurement results and within the combined expanded measurement uncertainty band at 84.91 % measurement results. Overall, the results are considered to be reasonably good, being the first proficiency testing for most of the participating laboratories. [4]

Arif Sanjid M , 2008, Surface finish of products indicates the quality of machining process in manufacturing industry. Surface texture measurements provide index of quality of manufacturing stability. National Physical Laboratory, New Delhi, India (NPLI) maintains reference surface roughness standards and measuring equipment and established traceability in surface roughness measurement rendering the surface roughness calibration services. National accreditation board for testing, calibration laboratories (NABL) conducted proficiency testing (PT) program among NABL accredited laboratories for the measurement of surface roughness standard and groove depth. NPLI coordinated the PT Program and acting as reference laboratory among ten accredited laboratories. A technical protocol is designed in line with internationally adopted method. Results are analyzed statistically by arithmetic mean methods. The performance of the laboratories is described using the calculated normalized error (En) value as an index.[5]

Hong Huang , 2011, Author describes the statistical tools such as descriptive statistics, full factorial design and analysis of source of variation were used to identify the potential factors that impact the validity of testing method for determining the strength of cement. The results showed that personal error impacted both accuracy and precision of test greatly. Experimental time associated with temperature fluctuation resulted in strength variation but did not impact the precision of test in all curing ages. Different compactions did not impact the precision of test but resulted in the strength variation on 3 d and 28 d significantly. Different methods for the initial moist air curing significantly impacted the precision of testing method and resulted in the strength variation of cement on 1 d. [6]

III. LITERATURE GAP

This paper is about review of repeatability and retesting in proficiency testing in physical parameters of bitumen. Past authors have various studies based on iter-laboratory comparisons in various material as concrete, altman z score, and suggested methods of comparison. This study will further deal with testing of bitumen repetedly in defined environmental conditions and hence comparison of results and determine z-score and acceptability , thereby analising erormance of evaluator.

IV. CONCLUSION

1. Values of testing parameters of mechanical testing is determined for slected parameters of bitumen testing.
2. Results comparison with minimum criteria as selected from mean and standard deviation in bitumen testing.
3. Repeatability results in bitumen will be determined and deviation n results of bitumen testing.
4. Acceptability of the testing in repeatability in bitumen testing which will evaluate performance of testing personnel.

V. ACKNOWLEDGMENT

I would sincerely like to thank our Professor Manish Mata, Department of Civil Engineering, SSBGCOET, Bhusawal for his guidance, encouragement and the interest shown in this project by timely suggestions in this work. His expert suggestions and scholarly feedback had greatly enhanced the effectiveness of this work.

REFERENCES

[1] A. O. Abd El Halim, Y. Hassan, and K. Kandil, S. A. Bhutta, and K. Davidson, “Comparison of Mechanical Properties of Asphalt Concrete Mixes with Aged Asphalt Cements”
[2] Chiara Mignini, Fabrizio Cardone, Andrea Graziani, “Experimental study of bitumen emulsion–cement mortars: mechanical behaviour and relation to mixtures”, Materials and Structures (2018) 51:149, October 2018
[3] Diego Maria Barbieri a, Marius Tangerås b, Elias Kassa a, Inge Hoff a, Zhuangzhuang Liu c, Fusong Wang, “Railway ballast stabilising agents: Comparison of

mechanical properties", Construction and Building Materials 252 (2020) 119041, 22 April 2020
[4] SANJAY YADAV, OM PRAKASH, V. K. GUPTA, B.V. KUMARASWAMY and A. K. BANDYOPADHYAY, "Evaluation of Interlaboratory Performance through Proficiency Testing using Pressure Dial Gauge in the Hydraulic Pressure Measurement up to 70 MPa", Journal of metrology society of india, vol.23, 2008, pp 79-99.
[5] Arif Sanjid M., K P. Chuadhary And R.P. Singhal, "Proficiency Testing for Surface Roughness Standardand Groove Depth Standard", Journal of metrology society of india, vol.23, 2008, pp 11-20.
[6] Hong HUANG, Xiao-Dong SHEN, "Analysis of variance for testing method of cement in determination of strength" Science Direct, 21 June 2011, pp 341-346.