

INTER LABORATORY TESTING SCHEME

ON

"Testing of Chemical parameters in Textile Material"

TC/ILTS/17/MECH-3/2015

Designed and Conducted by



**Proficiency Testing Provider
Laboratories**

TEXTILES COMMITTEE

Ministry of Textiles, Government of India

P. Balu Road, Prabhadevi Chowk,

Prabhadevi, Mumbai – 400 025.

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SCHEME: INTER LABORATORY TESTING SCHEME -**TC/ILTS/017/MECH-3/2015** - Testing of Mechanical parameters in Textile Materials

DATE OF ISSUE: 19th February 2016

CONFIDENTIALITY :

All the information furnished by the participant laboratories shall be kept confidential by the PT Provider and the same shall not be revealed to others. However, if the accrediting body, for example NABL, requests the PT provider to furnish the performance of any of the participant laboratories, the same shall be provided to them directly, after obtaining permission of the concerned participant laboratory

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Disclaimer: The PT Schemes are meant for evaluation of performance of the participating laboratory for the specified tests undertaken in the programme only and are voluntary in nature. Further, it is clarified that reasonable care has been taken to meet the requirement of ISO/IEC 17043:2010, while designing and conducting the Schemes. Participating laboratories are expected to exercise due diligence while carrying out the tests and meet all safety, statutory and accreditation body's requirements. PT Provider and Textiles Committee will not be responsible for any claim/damages arising out of participating in this programme

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Report on Inter Laboratory Testing Scheme

Preamble:

Increasing awareness on textile quality and the buyer requirements are forcing textile manufacturers and traders to test quality of textile products from reputed laboratories. Reputation of any laboratory depends upon the result it produces. The test report given by any laboratory should be precise, accurate, repeatable and reproducible. This means, a set of results obtained within a laboratory by testing a representative sample at any time interval should be comparable. And also, the result obtained over testing a representative sample in any laboratory should be comparable with that of any other laboratory and fall within the statistical tolerance limit. In other words, the laboratory should be able to generate comparable results by performing the same test

The repeatability and reproducibility of any test result involves the laboratory's competence in conducting the test which involves the testing equipment, the skill and knowledge of technical manpower working in the laboratory, the testing conditions and test method adopted. In this pursuit, the laboratory has to meet a requirement of maintaining its own management system as per ISO/IEC 17025:2005, to participate in Inter Laboratory Comparison (ILC) and/or Inter Laboratory Proficiency Testing Scheme (ILPT)

Inter laboratory Comparison is defined by ISO/IEC 17043 as, Evaluation of participant performance against pre-established criteria by means of inter laboratory comparisons. The goal of the Inter-laboratory Comparisons (ILC) is to provide verification of each participating laboratory's technical capability by obtaining a measurement that agrees with all other Laboratories using different make & model of testing equipment and man-power. The requirement for inter laboratory comparisons remains in place today, and has been further entrenched into metrology management systems by its incorporation in the requirements of ISO/IEC 17025:2005

Textiles Committee:

Textiles Committee is a statutory body under the Ministry of Textiles, Government of India, established in the year 1963 vide an act of parliament. The Committee has set up 16 laboratories throughout the country for catering to the testing requirements of the textile trade and industry. Fourteen laboratories of Textiles Committee are accredited as per ISO/IEC 17025:2005 by National Accreditation Board for testing & calibration Laboratories (NABL), India. Laboratory at Mumbai is the first in India to get accredited in the field of Textile Testing. All the laboratories of Textiles Committee have facilities to test mechanical and chemical test parameters. Nine laboratories of Textiles Committee have Eco testing facilities. By virtue of the Act, Textiles Committee develops many test standards and also adopts many national and international standards for testing purpose.

**PT-Provider:**

The Laboratory, Textiles Committee at Mumbai conducts as PT Provider, Inter Laboratory Proficiency Testing (ILPT) schemes for the benefit of Textile Testing laboratories. The national accreditation agency, NABL nominated laboratory of Textiles Committee at Mumbai, as nodal agency for two ILPT schemes. The German Standards body, *Physikalisch-Technische Bundesanstalt (PTB), Germany* recognized the schemes conducted by Textiles Committee and sponsored some laboratories of SAARC countries under its Quality Infrastructure Development Project (QIDP) in SAARC countries. Apart from India, laboratories from Bangladesh, Sri Lanka, Nepal, China, Hong Kong, Vietnam and USA also participate in the ILPT schemes conducted by Textiles Committee

In order to offer ILPT schemes professionally as a PT Provider, the laboratory of Textiles Committee at Mumbai has implemented the Management System in accordance with the requirements stipulated in ISO/IEC 17043: 2010. The PT Provider has conducted 19 schemes since 2007. The details are given in **Table – 1**

Table – 1 ILPT schemes conducted by the PT Provider

| S.No | Identity of the ILPT | Year | Field | PT items | No. of test parameters | No. of participants |
|------|------------------------|---------|------------|-------------------------------|------------------------|---------------------|
| 1 | TC/ILTS/MECH/01/07 | 2007 | Mechanical | Fibre, Yarn & Fabric | 17 | 70 |
| 2 | TC/ILTS/CHEM/02/07 | 2007 | Chemical | Fabric | 13 | 70 |
| 3 | TC/ILTS/MECH/03/08 | 2008 | Mechanical | Fabric | 11 | 60 |
| 4 | TC/ILTS/CHEM/04/08 | 2008 | Chemical | Fabric | 10 | 60 |
| 5 | TC/ILTS/MECH/05/09 | 2009 | Mechanical | Fabric | 11 | 50 |
| 6 | TC/ILTS/MECH/06/09 | 2009 | Mechanical | Yarn | 12 | 31 |
| 7 | TC/ILTS/MECH/07/09 | 2009 | Mechanical | Fibre | 15 | 14 |
| 8 | TC/ILTS/CHEM/08/09 | 2009 | Chemical | Fabric | 7 | 51 |
| 9 | TC/ILTS/CHEM/09/09 | 2009 | Chemical | Fabric | 4 | 45 |
| 10 | TC/ILTS/CHEM/10/09 | 2009 | Chemical | Fabric | 2 | 20 |
| 11 | TC/ILTS/MECH/11/10-11 | 2010-11 | Mechanical | Fabric | 10 | 65 |
| 12 | TC/ILTS/CHEM/12/10-11 | 2010-11 | Chemical | Fabric | 10 | 70 |
| 13 | TC/ILTS/Mech-1/2012-13 | 2012-13 | Mechanical | Yarn & Fabric | 13 | 42 |
| 14 | TC/ILTS/Chem-1/2012-13 | 2012-13 | Chemical | Fabric and clothing accessory | 12 | 56 |
| 15 | TC/ILTS/15/Mech-2/2014 | 2014 | Mechanical | Fabric | 8 | 50 |
| 16 | TC/ILTS/16/Chem-2/2014 | 2014 | Chemical | Fabric | 8 | 45 |
| 17 | TC/ILTS/17/Mech-3/2015 | 2015 | Mechanical | Cotton Fibre, Sewing Thread | 8 | 24 |
| 18 | TC/ILTS/18/Chem-3/2015 | 2015 | Chemical | Fabric | 9 | 51 |
| 19 | TC/ILTS/19/Chem-4/2015 | 2015 | Chemical | Extract and Fabric | 2 | 30 |



The Present Programme:

Design: In order to assess the reproducibility of the test results being reported by the various textile testing laboratories, this Proficiency Testing Scheme for Mechanical testing - TC/ILTS/17/MECH-3/2015 was designed. The test parameters thus covered in the present PT Scheme and suggested test methods are given in Table – 2. However, participants were required to use the test method which is routinely adopted for the testing of regular samples. Hence, laboratories could adopt any equivalent standard or validated in-house method which is equivalent to the suggested standards.

Table – 2 : Tests covered in TC/ILTS/17/MECH-3/2015

| S.No | TC / ILTS / 017 / MECH-3 / 2015 | Standards suggested |
|------|---|----------------------|
| 1 | HVI parameters (Micronaire, Length & Uniformity, Strength, Colour – [Rd, +b]) | ASTM D 5867 |
| 2 | AFIS-N Test | ASTM D 5866 |
| 3 | Trash Analysis | IS 4871 |
| 4 | Maturity by NaOH method | IS 236, ASTM D 1442 |
| 5 | Strength of sewing thread | ASTM D 2256, IS 1670 |
| 6 | Balance of twist | ASTM D 204 |



Advisory Group:

As per the requirements stipulated in ISO/IEC 17043:2010, an **Advisory Group** comprising the following internal and external experts having the necessary expertise in testing of Textiles and/or statistics was constituted.

The terms of reference of the Advisory Group were as follows:

- a) Planning requirements
- b) Identification and resolution of any difficulties expected in the preparation and maintenance of homogeneous proficiency test items, or in the provision of stable assigned value for a proficiency test item;
- c) Preparation of detailed instructions for participants
- d) Comments on any technical difficulties raised by participants
- e) Provision of advice in evaluating the performance of participants
- f) Comments on the results and performance of participants as a whole and, where appropriate, groups of participants or individual participants;
- g) Provision of advice for participants (within limits of confidentiality), either individually or within the report;
- h) Responding to feedback from participants; and
- i) Planning or participating in technical meetings with participants.
- j) Arbitration of any dispute(s) between participating laboratory(ies) and the PT Provider.

Table – 3 : Constitution of Advisory Group

| S.No | Expert | Affiliation | Field of expertise |
|------|--|---------------------------------|-----------------------------------|
| 1 | Shri.KartikayDhanda, Director (Laboratories), Textiles Committee, Mumbai –400 025 | Chairman | Textile testing |
| 2 | Dr.K.S.Muralidhara, Joint Director (Laboratories), Textiles Committee, Mumbai –400 025 | Member | Textile testing |
| 3 | Shri. S.G. Pathi, Joint Director (Laboratories), Textiles Committee, Mumbai –400 025 | Member | Textile testing |
| 4 | Shri.K.Selvaraj,Deputy Director (Laboratories), Textiles Committee, Mumbai–400 025 Assessor (ISO/IEC 17025), NABL. | Member | Textile testing |
| 5 | Shri. S.P.Singh, Asst. Director (Laboratories), Textiles Committee, Kanpur-208005 Assessor (ISO/IEC 17025), NABL | Member | Textile testing |
| 6 | Shri. M.S.Shyamsundar, Quality Assurance Officer, (Laboratories) Textiles Committee, Tirupur–641602, Assessor (ISO/IEC 17025), NABL | Member | Textile testing& Statistics |
| 7 | Dr. P.V. Varadarajan Principal Scientific Officer (Rtd), CIRCOT, Mumbai Assessor (ISO/IEC 17025), NABL | External Technical Expert | Textile testing |

 **Participants:**

In all 24 laboratories were participated in this scheme

 **Proficiency Test Proceedings:**

Preparation of PT items:

(1) Cotton Fibre: Cotton was procured from reputed mill (a) before blow room stage for Trash analysis and (b) after blow room stage for HVI, AFIS parameters and Coefficient of maturity by NaOH swelling method. The samples were drawn from the procured (Population)cotton and homogeneity testing was carried out before dispatching to participants.

(2) Sewing Thread: Cotton plied sewing thread in spools was procured (Population)from reputed dealer.The samples were drawn from the procured (Population)spools and homogeneity testing was carried out before dispatching to participants.

Allotments of PT items: Allotments of PT items were done by following appropriate Sampling procedures adopted by using Random Numbers generated by computer, for Homogeneity

testing, Stability testing and for distribution among participants. The remaining part of the population was kept as reserve for replacement in case of loss or damage. Henceforth, the allotted PT items can be referred as *sample*.

Homogeneity testing: To verify the homogeneity of the prepared PT items homogeneity testing was conducted at the laboratory of Textiles Committee at Coimbatore, for the test parameters covered in the scheme by adopting any one of the suggested methods. However, while conducting performance evaluation of the participants, the “between- samples SD” calculated during homogeneity testing by a particular method was used for calculating “SD of PT assessment” for different methods adopted by the participants, as the inherent variation in the sample (degree of non homogeneity) is independent of the test method adopted. The procedure given in ISO 13528:2005 was followed for conducting homogeneity testing

Dispatch of PT items: The Proficiency Testing items were dispatched to the respective participant laboratories on 19th October 2015, along with the following:

- (a) Form for Acknowledging the receipt of PT items
- (b) Instructions to the participants in the Inter Laboratory Testing Scheme
- (c) Form for reporting test results by the participants in the Inter Laboratory Testing Scheme

The participant laboratories were requested to send the test results by 4th November, 2015. However, as per request of participants and administrative reasons results were accepted after the due date.

The participant laboratories were also requested to

- Treat the samples in the same manner as regularly tested samples and accordingly, codify the samples such that the technical staff testing them are not aware that they are meant for PT purposes;
- Adopt the latest test method which is routinely used by the laboratory for the testing of regular samples which may be any standard or validated in-house method;
- Forward (i) copy of the in-house method adopted (if applicable) for testing any parameter and also (ii) specify the standard method against which the validation has been done; and,
- Forward photo copy of Scope of accreditation certificate as a proof of accreditation for the test method adopted (applicable to accredited laboratories only).

The participants were informed that, in the absence of proof of accreditation, the participant's value will not be considered for arriving at “Assigned Value” for the concerned test parameter, although, performance of the participant will be evaluated for this parameter. Further, it was also informed that the test results that may be inappropriate for statistical evaluation, for example, gross errors, miscalculations and transpositions may be excluded for calculation of summary statistics and performance evaluation of participants.

Compilation of the Test Results:

In order to maintain the confidentiality of the participants of the PT Scheme, the individual participants were given Code numbers which are generated by using computer. Subsequently, the test results reported by the participants were tabulated and statistically analyzed for the basic statistics viz., Mean, Median, Mode, Maximum, Minimum, Standard Deviation, etc., While doing so, test results were checked for inappropriate for statistical evaluation, for example, gross errors, miscalculations and transpositions

Determination Assigned Value:

To ensure the measurement traceability, only **accredited participants** are considered for evaluating the Assigned Values. Thus due weightage is given to the accredited participants. That is, this weightage is given only when the participant had submitted their Scope of accreditation along with test results and accredited for the specific test in which the ILPT is conducted. However, when sufficient number of accredited participants is not available for any test, Assigned Value is derived from the consensuses from all participants for that parameter.

Initially, the robust average and the standard deviation of values reported by the accredited laboratories (in respective tests) were determined for each parameter in accordance with the procedure given in ISO 13528: 2005. Subsequently, robust Z Score were calculated on the basis of the above. The test results of those laboratories which were found to be outliers (Z score more than +3 or less than -3) were deleted and Robust Average of the remaining expert laboratories was again calculated. This Robust average is treated as the assigned value for the concerned parameter. The Assigned Value of the parameters thus arrived are given in **Table-4**

Determination of Standard Deviation for Proficiency Assessment (σ):

The robust average and the robust standard deviation (σ_1) of all qualified values reported by the participants were calculated for each of the test separately in accordance with the procedure given in ISO 13528:2005. Subsequently, the "between-samples standard deviation (S_s)" of homogeneity testing data was compared with the standard deviation of all the participants. If $S_s \leq 0.3 \sigma_1$, then the sample is considered as homogenous and the robust standard deviation of all the participants is treated as Standard Deviation for Proficiency Testing. That is $\sigma = \sigma_1$

If $S_s > 0.3 \sigma_1$, then the sample is considered as heterogeneous and Standard Deviation for Proficiency Assessment is calculated by adding allowance for heterogeneity of the sample as stipulated in ISO 13528:2005, by using the formula

$$\sigma = \sqrt{\sigma_1^2 + S_s^2}$$

Table 4: Assigned Values

| S.No. | Test | Assigned Value | Robust SD of Assigned Value | Uncertainty of Assigned Value | No. of Labs contributed for Assigned Value | Total No. of Accredited Labs available for the | Total number of participants(*) |
|-------|---|----------------|-----------------------------|-------------------------------|--|--|---------------------------------|
| 1 | HVI Parameters | | | | | | |
| | Rd | 81.2 | 1.13 | 0.63 | 5 | 2 | 5 |
| | +b | 9.3 | 0.48 | 0.27 | 5 | 2 | 5 |
| | Micronaire | 3.4 | 0.07 | 0.03 | 7 | 3 | 7 |
| | 2.5% Span Length (mm) | 29.3 | 0.42 | 0.20 | 7 | 3 | 7 |
| | 50% Span Length (mm) | 13.8 | 0.49 | 0.23 | 7 | 3 | 7 |
| | Uniformity Ratio | 47.1 | 1.08 | 0.51 | 7 | 3 | 7 |
| | Tenacity (gf/tex)-ICC Mode | 24.5 | 0.70 | 0.33 | 7 | 3 | 7 |
| | Elongation (%) | 5.92 | 0.32 | 0.15 | 7 | 3 | 7 |
| 2 | Maturity Coefficient by NaOH swelling method | 0.76 | 0.04 | 0.03 | 3 | 2 | 3 |
| 3 | AFIS parameters | | | | | | |
| | AFIS-Nep Count per gramme | 127 | 12.95 | 8.09 | 4 | 1 | 4 |
| | AFIS-Nep Diameter(µm) | 678 | 24 | 15 | 4 | 1 | 4 |
| 4 | Trash Analysis | | | | | | |
| | Lint (%) | 96.1 | 0.74 | 0.33 | 8 | 3 | 8 |
| | Trash (%) | 3.0 | 0.34 | 0.15 | 8 | 3 | 8 |
| | Cage Loss (%) | 0.9 | 0.45 | 0.20 | 8 | 3 | 8 |
| 5 | Sewing Thread Test Parameters | | | | | | |
| | Balance of Twist | 3.0 | 2.60 | 1.46 | 5 | 1 | 5 |
| | Breaking Load of Sewing Thread (cN) | 2113 | 71.5 | 29.8 | 9 | 9 | 14 |
| | Elongation (%) at break | 10.0 | 0.00 | 0.00 | 7 | 9 | 15 |

(*)Total participants reported valid results in the respective method. NA: Not Applicable



Performance Evaluation of Participants:

The performance of the individual participant was evaluated by adopting Robust Z score technique given in ISO 13528:2005, as per the following formula:


$$Z = \frac{x - X}{\sigma}$$

where x is the test result reported by the individual participant; X is the Assigned Value and σ is the standard deviation of the Proficiency Assessment. Test wise performance evaluation is given in Annexure.

 Interpretation of Performance Comment:

Table – 5: Interpretation of Performance comment

| Range | Performance of Laboratory |
|------------------------------|---------------------------|
| $ Z - \text{Score} \leq 2$ | Satisfactory |
| $2 < Z - \text{Score} < 3$ | Straggler |
| $ Z - \text{Score} \geq 3$ | Outlier |

 **Outliers and Stragglers:**

Overall performance of all the participants is good. Stragglers and Outliers are very rare and far. The Outlier and Straggler Analysis is given in **Table – 6**.

 **General Advise to the participants on the performance:**

If a participant is found to be “**Outlier**”, necessary corrective action should be taken after thorough investigation of the root cause of the problem.

Table – 6: Outlier and Straggler Analysis

| S.No. | Test | No. of Participants* | Valid Results | % of valid Results | No. of Stragglers | % of Stragglers | No. of Outliers | % of Outliers |
|-------|---|----------------------|---------------|--------------------|-------------------|-----------------|-----------------|---------------|
| 1 | HVI Parameters | | | | | | | |
| | Rd | 5 | 5 | 100 | 0 | 0.0 | 0 | 0.0 |
| | +b | 5 | 5 | 100 | 0 | 0.0 | 0 | 0.0 |
| | Micronaire | 7 | 7 | 100 | 0 | 0.0 | 0 | 0.0 |
| | 2.5% Span Length (mm) | 7 | 7 | 100 | 0 | 0.0 | 0 | 0.0 |
| | 50% Span Length (mm) | 7 | 7 | 100 | 0 | 0.0 | 0 | 0.0 |
| | Uniformity Ratio | 7 | 7 | 100 | 0 | 0.0 | 0 | 0.0 |
| | Tenacity (gf/tex)-ICC Mode | 7 | 7 | 100 | 0 | 0.0 | 0 | 0.0 |
| | Elongation (%) | 7 | 7 | 100 | 0 | 0.0 | 1 | 14.3 |
| 2 | Maturity Coefficient by NaOH swelling method | 3 | 3 | 100 | 0 | 0.0 | 0 | 0.0 |
| 3 | AFIS parameters | | | | | | | |
| | AFIS-Nep Count per gramme | 5 | 4 | 80 | 0 | 0 | 0 | 0.0 |
| | AFIS-Nep Diameter(μm) | 4 | 4 | 100 | 1 | 25.0 | 0 | 0.0 |
| 4 | Trash Analysis | | | | | | | |
| | Lint (%) | 8 | 8 | 100 | 0 | 0.0 | 0 | 0.0 |
| | Trash (%) | 8 | 8 | 100 | 0 | 0.0 | 0 | 0.0 |
| | Cage Loss (%) | 8 | 8 | 100 | 1 | 12.5 | 0 | 0.0 |
| 5 | Sewing Thread Test Parameters | | | | | | | |
| | Balance of Twist | 5 | 5 | 100 | 0 | 0.0 | 0 | 0.0 |
| | Breaking Load of Sewing Thread (cN) | 15 | 14 | 93.3 | 0 | 0.0 | 0 | 0.0 |
| | Elongation (%) at break | 15 | 15 | 100 | 1 | 6.7 | 0 | 0.0 |

Remark: * Including participants reported with gross error

Table – 7: List of Outliers and Stragglers

| S.No. | Test | Stragglers | Outliers |
|-------|---|------------|----------|
| 1 | HVI Parameters | | |
| | Rd | 0 | 0 |
| | +b | 0 | 0 |
| | Micronaire | 0 | 0 |
| | 2.5% Span Length (mm) | 0 | 0 |
| | Uniformity Ratio | 0 | 0 |
| | Tenacity (gf/tex)-ICC Mode | 0 | 0 |
| | Elongation (%) | 0 | 17011 |
| 2 | Maturity Coefficient by NaOH swelling method | 0 | 0 |
| 3 | AFIS parameters | | |
| | AFIS-Nep Count per gramme | 0 | 0 |
| | AFIS-Nep Diameter(μ m) | 17001 | 0 |
| 4 | Trash Analysis | | |
| | Lint (%) | 0 | 0 |
| | Trash (%) | 0 | 0 |
| | Cage Loss (%) | 17008 | 0 |
| 5 | Sewing Thread Test Parameters | | |
| | Balance of Twist | 0 | 0 |
| | Breaking Load of Sewing Thread (cN) | 0 | 0 |
| | Elongation (%) at break | 17018 | 0 |



Special Evaluation:

Three participants have reported Twist Per Inch instead of Balance of Twist for Sewing Thread. As a special case the performance evaluation has been carried out among these three participants for Twist Per Inch and the same is included in the report. However, these participants are advised to get educated regarding 'Balance of Twist'.

PERFORMANCE EVALUATION OF EACH PARTICIPANT- TEST WISE

1. High Volume Instrument Parameters

| (1a) Colour: Rd | | | | |
|------------------|----------------|----------------|-----------|-------------------------|
| Participant Code | Reported Value | Method Adopted | Z - Score | Comments on performance |
| 17001 | 82.0 | ASTM D 5867-12 | 0.35 | Satisfactory |
| 17003 | 82.2 | In-House | 0.43 | Satisfactory |
| 17011 | 79.3 | ASTM D 5867-12 | -0.83 | Satisfactory |
| 17017 | 81.5 | Not Declared | 0.13 | Satisfactory |
| 17023 | 80.4 | ASTM D 5867-12 | -0.35 | Satisfactory |

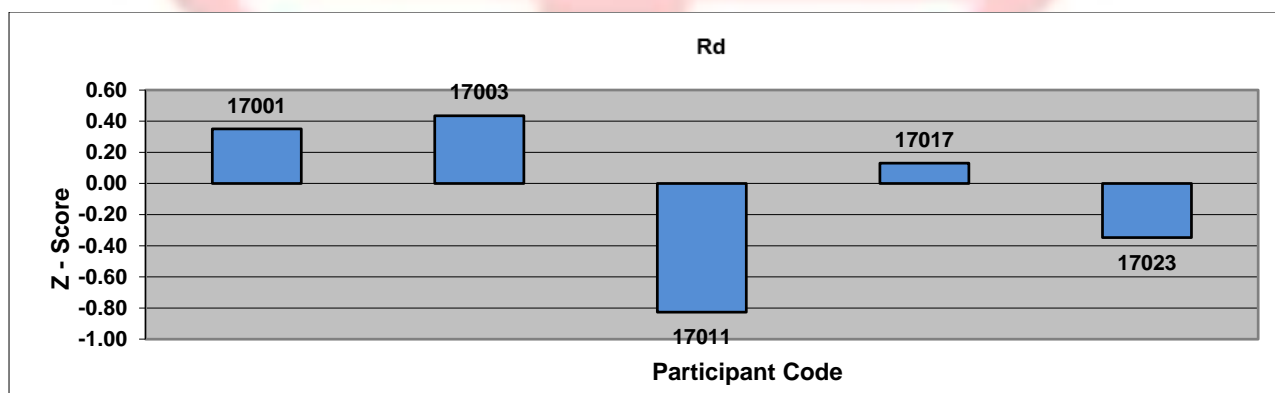
| | |
|---------------------|-------|
| No. of participants | 5 |
| Maximum | 82.2 |
| Minimum | 79.3 |
| Mean | 81.08 |
| Standard Deviation | 1.22 |
| Median | 81.50 |

SUMMARY

| | |
|---|--------|
| Robust Average = | 81.21 |
| Robust SD for all valid participants (σ_1) = | 1.13 |
| Between sample SD of Homogeneity testing (S_s) = | 2.0115 |
| SD for PT Scheme with allowance for the heterogeneity if any (σ) = | 2.31 |

Heterogeneity Accounted

| | |
|-------------------------------|------|
| Assigned Value (X) = | 81.2 |
| SD of PT Scheme(σ) = | 2.3 |



Remark: Participant 17017 tested in HVI mode instead of ICC mode. Since, no other laboratories tested in HVI mode, the results reported by Participant 17017 are not comparable for Length & Strength. However, the other results comparable and Z Scores are provided.

| (1b) Colour: + b | | | | |
|-------------------------|-----------------------|-----------------------|------------------|--------------------------------|
| Participant Code | Reported Value | Method Adopted | Z - Score | Comments on performance |
| 17001 | 9.1 | ASTM D 5867-12 | -0.40 | Satisfactory |
| 17003 | 9.4 | In-House | 0.20 | Satisfactory |
| 17011 | 9.8 | ASTM D 5867-12 | 1.00 | Satisfactory |
| 17017 | 8.7 | Not Declared | -1.20 | Satisfactory |
| 17023 | 9.6 | ASTM D 5867-12 | 0.60 | Satisfactory |

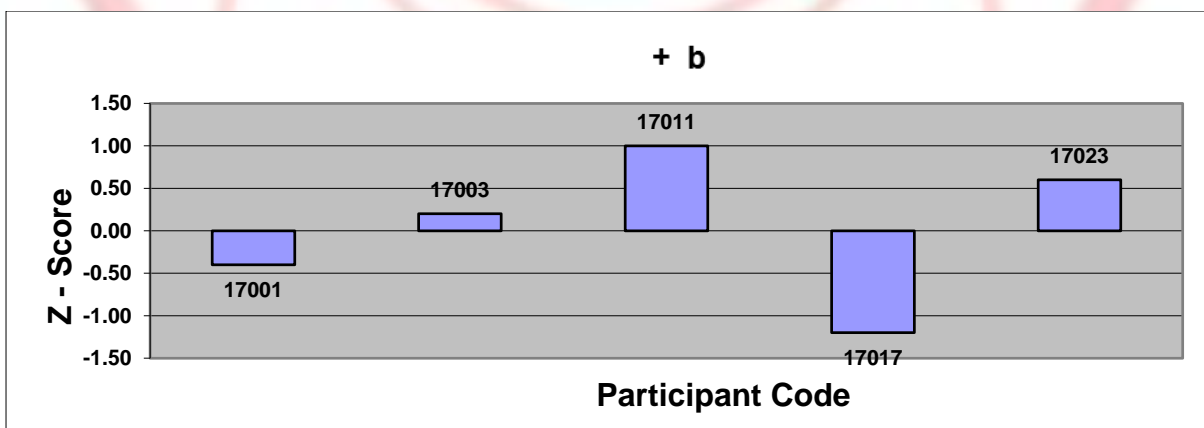
| | |
|---------------------|------|
| No. of participants | 5 |
| Maximum | 9.8 |
| Minimum | 8.7 |
| Mean | 9.32 |
| Standard Deviation. | 0.43 |
| Median | 9.40 |

SUMMARY

| | |
|---|---------------|
| Robust Average = | 9.33 |
| Robust SD for all valid participants (σ_1) = | 0.48 |
| Between sample SD of Homogeneity testing (S_s) = | 0.0760 |
| SD for PT Scheme with allowance for the heterogeneity if any (σ) = | 0.48 |

No heterogeneity observed

| | |
|-------------------------------|------------|
| Assigned Value (X) = | 9.3 |
| SD of PT Scheme(σ) = | 0.5 |



Remark: Participant 17017 tested in HVI mode instead of ICC mode. Since, no other laboratories tested in HVI mode, the results reported by Participant 17017 are not comparable for Length & Strength. However, the other results comparable and Z Scores are provided.

| (1c) Micronaire | | | | |
|-------------------------|-----------------------|-----------------------|------------------|--------------------------------|
| Participant Code | Reported Value | Method Adopted | Z - Score | Comments on performance |
| 17001 | 3.5 | ASTM D 5867-12 | 0.5 | Satisfactory |
| 17003 | 3.4 | In-House | 0.0 | Satisfactory |
| 17008 | 3.4 | Not Declared | 0.0 | Satisfactory |
| 17009 | 3.3 | ASTM D 5867-12 | -0.5 | Satisfactory |
| 17011 | 3.4 | ASTM D 5867-12 | 0.0 | Satisfactory |
| 17017 | 3.4 | Not Declared | 0.0 | Satisfactory |
| 17023 | 3.3 | ASTM D 5867-12 | -0.5 | Satisfactory |

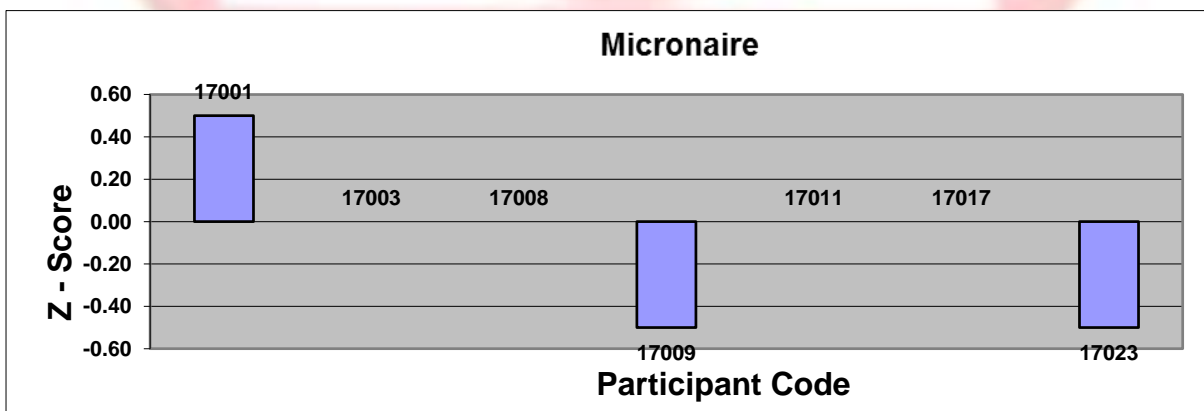
| | |
|------------------------|------|
| Number of participants | 7 |
| Maximum | 3.5 |
| Minimum | 3.3 |
| Mean | 3.39 |
| Standard Deviation | 0.07 |
| Median | 3.40 |

SUMMARY

| | |
|---|---------------|
| Robust Average = | 3.39 |
| Robust SD for all valid participants (σ_1) = | 0.07 |
| Between sample SD of Homogeneity testing (S_s) = | 0.1354 |
| SD for PT Scheme with allowance for the heterogeneity if any (σ) = | 0.154 |

Heterogeneity Accounted

| | |
|-------------------------------|------------|
| Assigned Value (X) = | 3.4 |
| SD of PT Scheme(σ) = | 0.2 |



Remark: Participant 17017 tested in HVI mode instead of ICC mode. Since, no other laboratories tested in HVI mode, the results reported by Participant 17017 are not comparable for Length & Strength. However, the other results comparable and Z Scores are provided.

| (1d) 2.5% Span Length (mm) | | | | |
|-----------------------------------|-----------------------|-----------------------|------------------|--------------------------------|
| Participant Code | Reported Value | Method Adopted | Z - Score | Comments on performance |
| 17001 | 28.9 | ASTM D 5867-12 | -0.50 | Satisfactory |
| 17002 | 29.3 | ASTM D 5867-12 | 0.00 | Satisfactory |
| 17003 | 28.9 | In-House | -0.50 | Satisfactory |
| 17008 | 29.6 | Not Declared | 0.34 | Satisfactory |
| 17009 | 29.7 | ASTM D 5867-12 | 0.50 | Satisfactory |
| 17011 | 29.1 | ASTM D 5867-12 | -0.25 | Satisfactory |
| 17023 | 29.8 | ASTM D 5867-12 | 0.63 | Satisfactory |

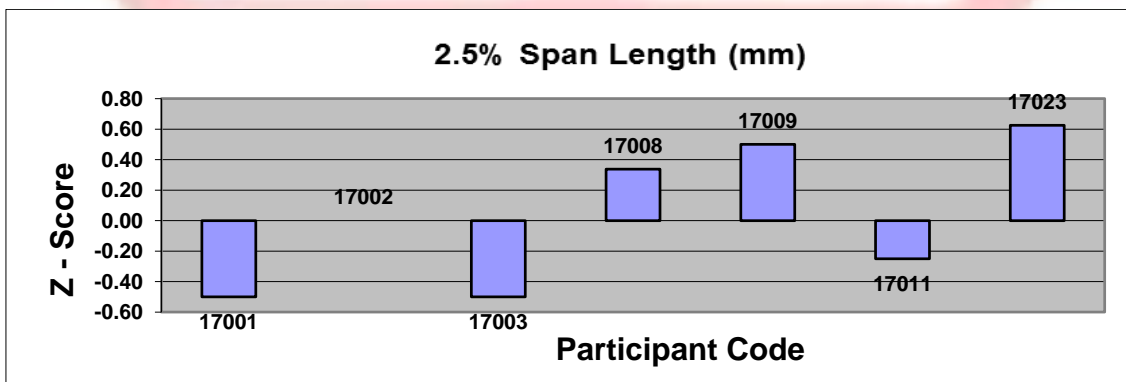
| | |
|------------------------|-------|
| Number of participants | 7 |
| Maximum | 29.8 |
| Minimum | 28.9 |
| Mean | 29.32 |
| Standard Deviation | 0.37 |
| Median | 29.30 |

SUMMARY

| | |
|---|---------------|
| Robust Average = | 29.32 |
| Robust SD for all valid participants (σ_1) = | 0.42 |
| Between sample SD of Homogeneity testing (S_s) = | 0.6518 |
| SD for PT Scheme with allowance for the heterogeneity if any (σ) = | 0.78 |

Heterogeneity Accounted

| | |
|-------------------------------|-------------|
| Assigned Value (X) = | 29.3 |
| SD of PT Scheme(σ) = | 0.8 |



Remark: Participant 17017 tested in HVI mode instead of ICC mode. Since, no other laboratories tested in HVI mode, the results reported by Participant 17017 are not comparable for Length & Strength. However, the other results comparable and Z Scores are provided.

| Participant code | Reported Value |
|------------------|----------------|
| 17017 | 29.07 mm |

| (1e) Uniformity Ratio | | | | |
|------------------------------|-----------------------|-----------------------|------------------|--------------------------------|
| Participant Code | Reported Value | Method Adopted | Z - Score | Comments on performance |
| 17001 | 46.9 | ASTM D 5867-12 | -0.17 | Satisfactory |
| 17002 | 47.2 | ASTM D 5867-12 | 0.08 | Satisfactory |
| 17003 | 47.5 | In-House | 0.33 | Satisfactory |
| 17008 | 45.0 | Not Declared | -1.75 | Satisfactory |
| 17009 | 47.8 | ASTM D 5867-12 | 0.58 | Satisfactory |
| 17011 | 46.0 | ASTM D 5867-12 | -0.92 | Satisfactory |
| 17023 | 48.7 | ASTM D 5867-12 | 1.33 | Satisfactory |

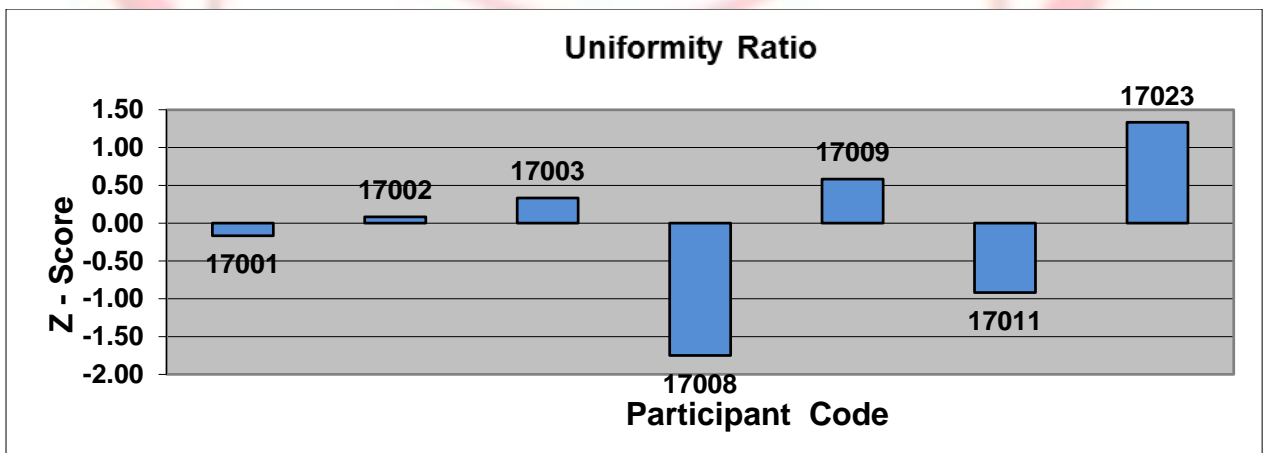
| | |
|------------------------|-------|
| Number of participants | 7 |
| Maximum | 48.7 |
| Minimum | 45.0 |
| Mean | 47.01 |
| Standard Deviation | 1.21 |
| Median | 47.20 |

SUMMARY

| | |
|---|---------------|
| Robust Average = | 47.11 |
| Robust SD for all valid participants (σ_1) = | 1.08 |
| Between sample SD of Homogeneity testing (S_s) = | 0.4702 |
| SD for PT Scheme with allowance for the heterogeneity if any (σ) = | 1.18 |

Heterogeneity Accounted

| | |
|-------------------------------|-------------|
| Assigned Value (X) = | 47.1 |
| SD of PT Scheme(σ) = | 1.2 |



Remark: Participant 17017 tested in HVI mode instead of ICC mode. Since, no other laboratories tested in HVI mode, the results reported by Participant 17017 are not comparable for Length & Strength. However, the other results comparable and Z Scores are provided.

| | |
|------------------|----------------|
| Participant code | Reported Value |
| 17017 | 82.2 UI |

| (1f) Tenacity (gf/tex) - ICC mode | | | | |
|--|-----------------------|-----------------------|------------------|--------------------------------|
| Participant Code | Reported Value | Method Adopted | Z - Score | Comments on performance |
| 17001 | 25.1 | ASTM D 5867-12 | 0.57 | Satisfactory |
| 17002 | 23.3 | ASTM D 5867-12 | -1.13 | Satisfactory |
| 17003 | 24.1 | In-House | -0.38 | Satisfactory |
| 17008 | 25.5 | Not Declared | 0.96 | Satisfactory |
| 17009 | 24.5 | ASTM D 5867-12 | 0.00 | Satisfactory |
| 17011 | 24.7 | ASTM D 5867-12 | 0.19 | Satisfactory |
| 17023 | 24.1 | ASTM D 5867-12 | -0.38 | Satisfactory |

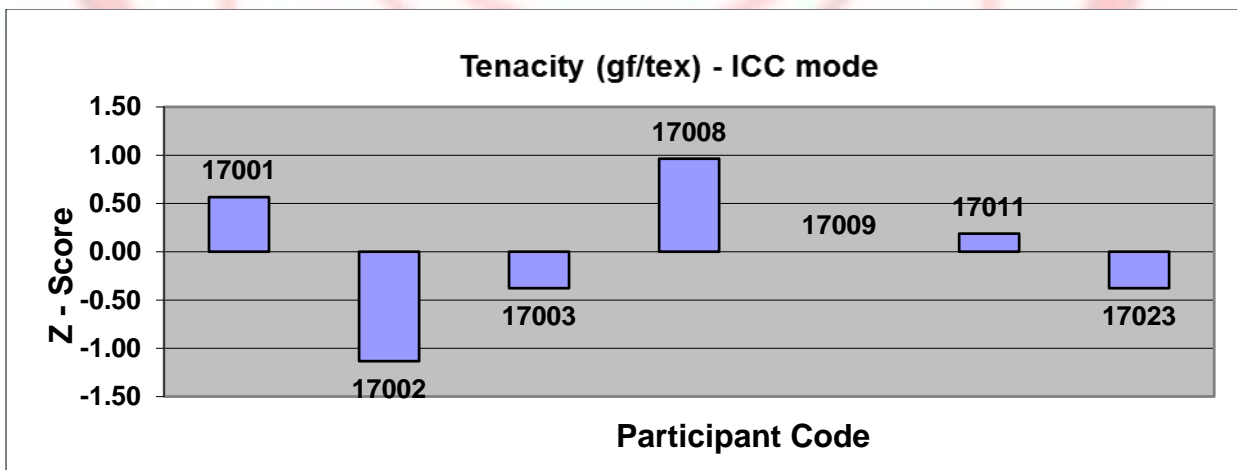
| | |
|------------------------|-------|
| Number of participants | 7 |
| Maximum | 25.5 |
| Minimum | 23.3 |
| Mean | 24.47 |
| Standard Deviation | 0.73 |
| Median | 24.50 |

SUMMARY

| | |
|---|---------------|
| Robust Average = | 24.50 |
| Robust SD for all valid participants (σ_1) = | 0.70 |
| Between sample SD of Homogeneity testing (S_s) = | 0.7926 |
| SD for PT Scheme with allowance for the heterogeneity if any (σ) = | 1.06 |

Heterogeneity Accounted

| | |
|-------------------------------|-------------|
| Assigned Value (X) = | 24.5 |
| SD of PT Scheme(σ) = | 1.1 |



Remark: Participant 17017 tested in HVI mode instead of ICC mode. Since, no other laboratories tested in HVI mode, the results reported by Participant 17017 are not comparable for Length & Strength. However, the other results comparable and Z Scores are provided.

| | |
|------------------|----------------|
| Participant code | Reported Value |
| 17017 | 31.13gf/tex |

| (1g) Breaking Elongation (%) - ICC mode | | | | |
|--|-----------------------|-----------------------|------------------|--------------------------------|
| Participant Code | Reported Value | Method Adopted | Z - Score | Comments on performance |
| 17011 | 7.6 | ASTM D 5867-12 | 3.4 | Outlier |
| 17023 | 5.6 | ASTM D 5867-12 | -0.6 | Satisfactory |
| 17009 | 6 | ASTM D 5867-12 | 0.2 | Satisfactory |
| 17001 | 5.7 | ASTM D 5867-12 | -0.4 | Satisfactory |
| 17003 | 5.9 | In-House | 0.0 | Satisfactory |
| 17008 | 5.7 | Not Declared | -0.4 | Satisfactory |
| 17002 | 6.2 | ASTM D 5867-12 | 0.6 | Satisfactory |

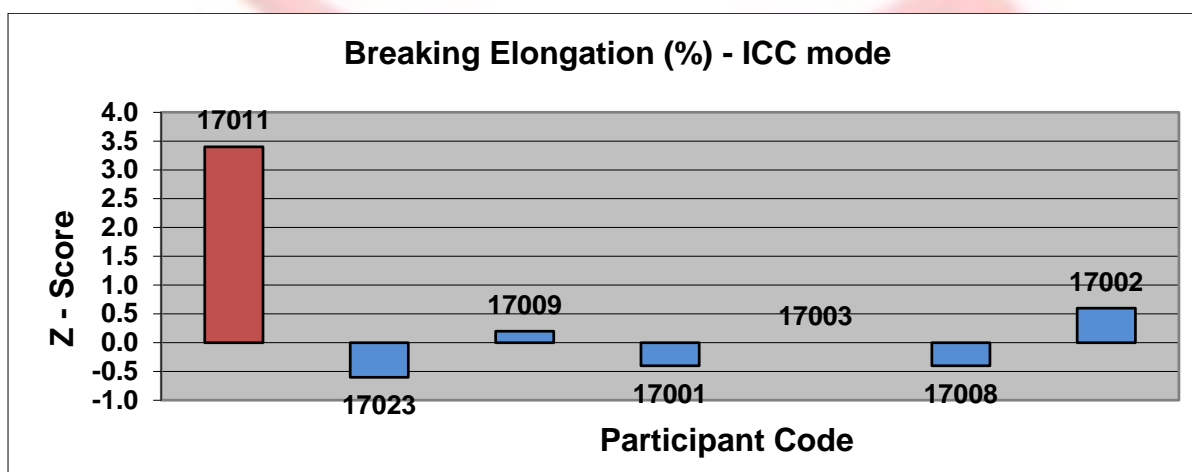
| | |
|---------------------|------|
| No. of participants | 7 |
| Maximum | 7.6 |
| Minimum | 5.6 |
| Mean | 6.10 |
| Standard Deviation | 0.69 |
| Median | 5.90 |

SUMMARY

| | |
|---|--------|
| Robust Average = | 5.92 |
| Robust SD for all valid participants (σ_1) = | 0.32 |
| Between sample SD of Homogeneity testing (S_s) = | 0.3844 |
| SD for PT Scheme with allowance for the heterogeneity if any (σ) = | 0.50 |

Heterogeneity Accounted

| | |
|-------------------------------|-----|
| Assigned Value (X) = | 5.9 |
| SD of PT Scheme(σ) = | 0.5 |



2. Maturity Coefficient of Cotton by NaOH swelling method

| Participant Code | Reported Value | Method Adopted | Z - Score | Comments on performance |
|------------------|----------------|------------------------|-----------|-------------------------|
| 17009 | 0.72 | IS 236:1968 (Method 1) | -0.92 | Satisfactory |
| 17011 | 0.79 | IS 236:1968 (Method 1) | 0.84 | Satisfactory |
| 17012 | 0.76 | IS 236:1968 (Method 1) | 0.08 | Satisfactory |

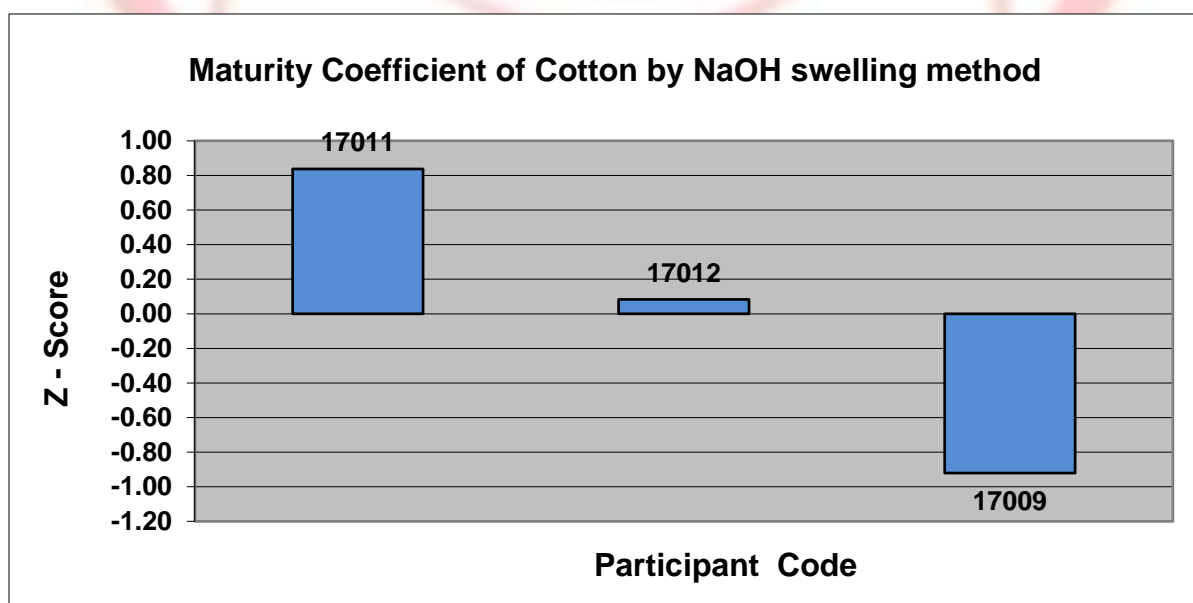
| | |
|------------------------|------|
| Number of participants | 3 |
| Maximum | 0.79 |
| Minimum | 0.72 |
| Mean | 0.76 |
| Standard Deviation | 0.04 |
| Median | 0.76 |

SUMMARY

| | |
|---|---------------|
| Robust Average = | 0.76 |
| Robust SD for all valid participants (σ_1) = | 0.04 |
| Between sample SD of Homogeneity testing (S_s) = | 0.0055 |
| SD for PT Scheme with allowance for the heterogeneity if any (σ) = | 0.04 |

No heterogeneity observed

| | |
|-------------------------------|-------------|
| Assigned Value (X) = | 0.76 |
| SD of PT Scheme(σ) = | 0.04 |



3. Neps by Advanced Fibre Information System

(3a) Nep Count

| Participant Code | Reported Value | Method Adopted | Z - Score | Comments on performance |
|------------------|----------------|----------------|-----------|-------------------------|
| 17001 | 128 | ASTM D 5866-12 | 0.05 | Satisfactory |
| 17002 | 114 | ASTM D 5866-12 | -0.59 | Satisfactory |
| 17003 | 161 | In House | 1.55 | Satisfactory |
| 17011 | 124 | ASTM D 5866-12 | -0.14 | Satisfactory |

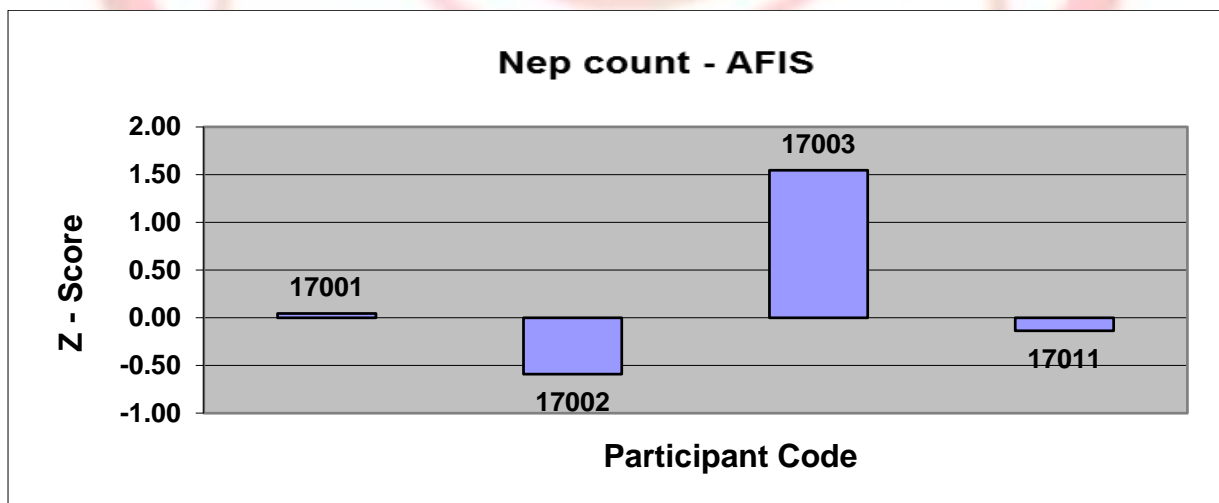
| | |
|---------------------|--------|
| No. of participants | 4 |
| Maximum | 161.0 |
| Minimum | 114.0 |
| Mean | 131.75 |
| Standard Deviation | 20.37 |
| Median | 126 |

SUMMARY

| | |
|---|---------|
| Robust Average = | 126.89 |
| Robust SD for all valid participants (σ_1) = | 12.95 |
| Between sample SD of Homogeneity testing (S_s) = | 18.2303 |
| SD for PT Scheme with allowance for the heterogeneity if any (σ) = | 22.36 |

Heterogeneity Accounted

| | |
|-------------------------------|-----|
| Assigned Value (X) = | 127 |
| SD of PT Scheme(σ) = | 22 |



Remark: Participant 17008 has not declared the method adopted and the value reported is of Gross Error and hence not considered for evaluation.

| Participant code | Reported Value |
|------------------|----------------|
| 17008 | 3 |

(3b) Nep Diameter (μm)

| Participant code | Reported Value | Method Adopted | Z - Score | Comments on performance |
|------------------|----------------|----------------|-----------|-------------------------|
| 17001 | 750 | ASTM D 5866-12 | 2.13 | Straggler |
| 17002 | 680 | ASTM D 5866-12 | 0.07 | Satisfactory |
| 17003 | 654 | In House | -0.70 | Satisfactory |
| 17011 | 672 | ASTM D 5866-12 | -0.17 | Satisfactory |

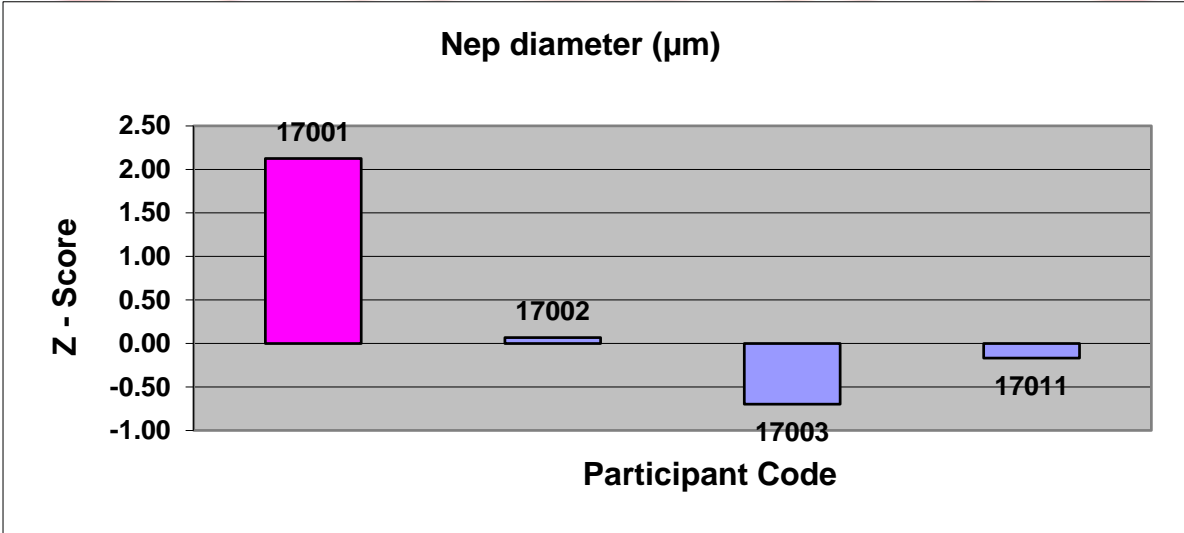
| | |
|---------------------|--------|
| No. of participants | 4 |
| Maximum | 750.0 |
| Minimum | 654.0 |
| Mean | 689.00 |
| Standard Deviation | 42.10 |
| Median | 676 |

SUMMARY

| | |
|---|----------------|
| Robust Average = | 677.73 |
| Robust SD for all valid participants (σ_1) = | 23.97 |
| Between sample SD of Homogeneity testing (S_s) = | 24.1172 |
| SD for PT Scheme with allowance for the heterogeneity if any (σ) = | 34.00 |

Heterogeneity Accounted

| | |
|-------------------------------|------------|
| Assigned Value (X) = | 678 |
| SD of PT Scheme(σ) = | 34 |



4. Trash Analysis

(4a) Lint (%)

| Participant code | Reported Value | Method Adopted | Z - Score | Comments on performance |
|------------------|----------------|----------------|-----------|-------------------------|
| 17002 | 97.0 | IS 4871:1968 | 1.34 | Satisfactory |
| 17003 | 95.7 | In House | -0.57 | Satisfactory |
| 17008 | 94.8 | Not mentioned | -1.93 | Satisfactory |
| 17009 | 96.2 | IS 4871:1968 | 0.14 | Satisfactory |
| 17011 | 95.4 | In House | -1.00 | Satisfactory |
| 17012 | 96.7 | IS 4871:1968 | 0.86 | Satisfactory |
| 17017 | 96.4 | Not mentioned | 0.43 | Satisfactory |
| 17023 | 96.3 | IS 4871:1968 | 0.23 | Satisfactory |

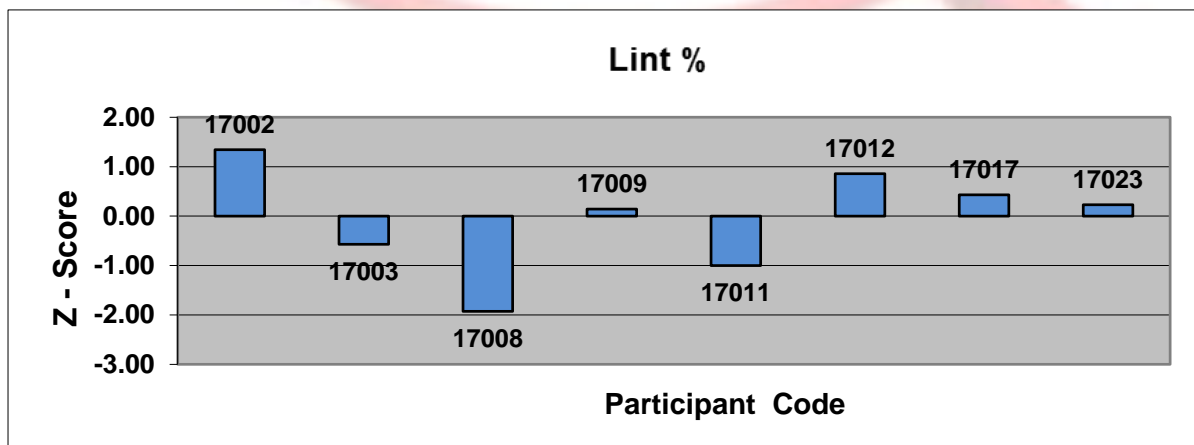
| | |
|---------------------|-------|
| No. of participants | 8 |
| Maximum | 97.0 |
| Minimum | 94.8 |
| Mean | 96.06 |
| Standard Deviation | 0.74 |
| Median | 96.23 |

SUMMARY

| | |
|---|---------------|
| Robust Average = | 96.10 |
| Robust SD for all valid participants (σ_1) = | 0.74 |
| Between sample SD of Homogeneity testing (S_s) = | 0.1820 |
| SD for PT Scheme with allowance for the heterogeneity if any (σ) = | 0.74 |

No heterogeneity observed

| | |
|-------------------------------|-------------|
| Assigned Value (X) = | 96.1 |
| SD of PT Scheme(σ) = | 0.7 |



(4b) Trash (%)

| Participant code | Reported Value | Method Adopted | Z - Score | Comments on performance |
|------------------|----------------|----------------|-----------|-------------------------|
| 17002 | 2.6 | IS 4871:1968 | -1.00 | Satisfactory |
| 17003 | 3.3 | In House | 0.75 | Satisfactory |
| 17008 | 3.4 | Not mentioned | 1.00 | Satisfactory |
| 17009 | 3.1 | IS 4871:1968 | 0.25 | Satisfactory |
| 17011 | 3.2 | In House | 0.50 | Satisfactory |
| 17012 | 2.6 | IS 4871:1968 | -1.00 | Satisfactory |
| 17017 | 2.8 | Not mentioned | -0.63 | Satisfactory |
| 17023 | 3.3 | IS 4871:1968 | 0.80 | Satisfactory |

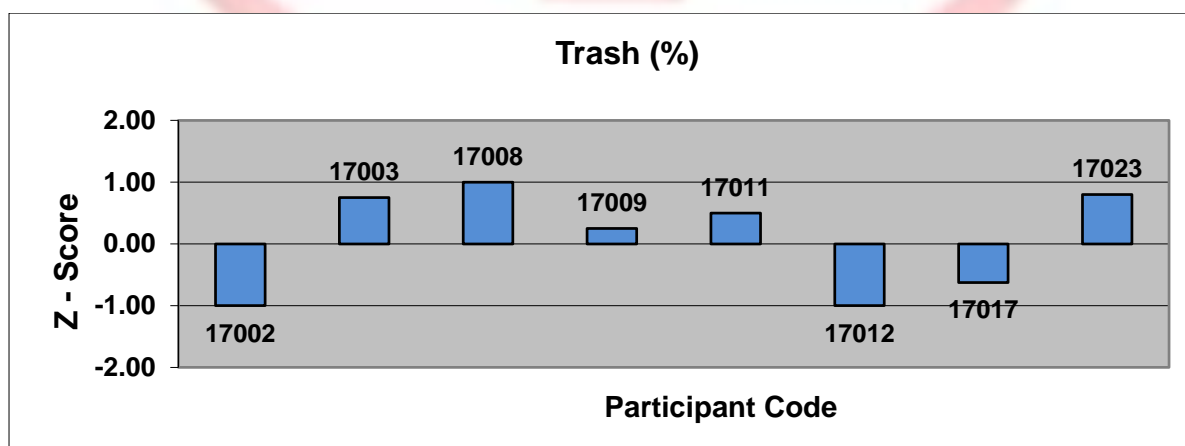
| | |
|---------------------|------|
| No. of participants | 8 |
| Maximum | 3.4 |
| Minimum | 2.6 |
| Mean | 3.03 |
| Standard Deviation | 0.33 |
| Median | 3.15 |

SUMMARY

| | |
|---|---------------|
| Robust Average = | 3.05 |
| Robust SD for all valid participants (σ_1) = | 0.34 |
| Between sample SD of Homogeneity testing (S_s) = | 0.1896 |
| SD for PT Scheme with allowance for the heterogeneity if any (σ) = | 0.39 |

Heterogeneity Accounted

| | |
|-------------------------------|------------|
| Assigned Value (X) = | 3.0 |
| SD of PT Scheme(σ) = | 0.4 |



(4c) Cage Loss (%)

| Participant code | Reported Value | Method Adopted | Z - Score | Comments on performance |
|------------------|----------------|----------------|-----------|-------------------------|
| 17002 | 0.4 | IS 4871:1968 | -1.35 | Satisfactory |
| 17003 | 1.0 | In House | 0.25 | Satisfactory |
| 17008 | 1.9 | Not mentioned | 2.38 | Straggler |
| 17009 | 0.7 | IS 4871:1968 | -0.50 | Satisfactory |
| 17011 | 1.4 | In House | 1.25 | Satisfactory |
| 17012 | 0.7 | IS 4871:1968 | -0.50 | Satisfactory |
| 17017 | 0.9 | Not mentioned | -0.13 | Satisfactory |
| 17023 | 0.4 | IS 4871:1968 | -1.20 | Satisfactory |

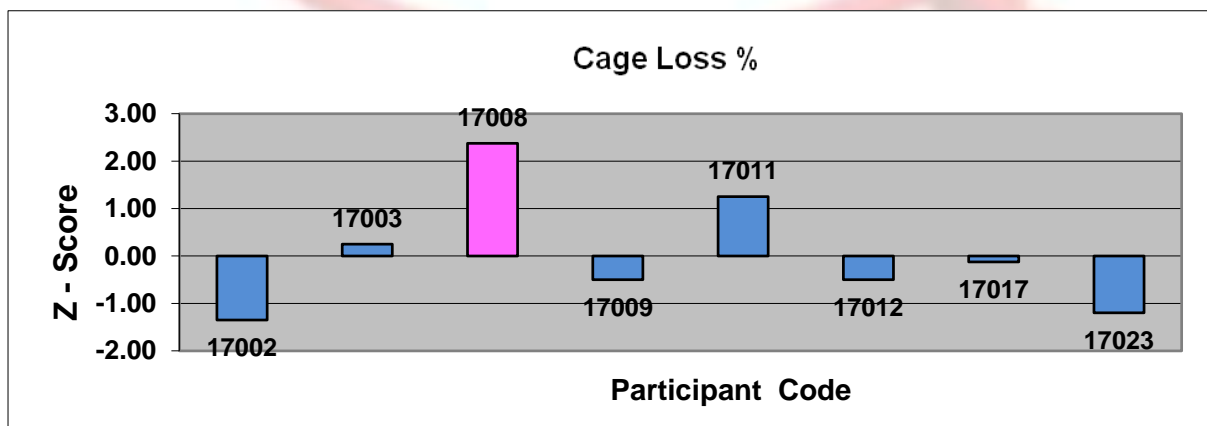
| | |
|---------------------|------|
| No. of participants | 8 |
| Maximum | 1.9 |
| Minimum | 0.4 |
| Mean | 0.91 |
| Standard Deviation | 0.50 |
| Median | 0.78 |

SUMMARY

| | |
|---|--------|
| Robust Average = | 0.86 |
| Robust SD for all valid participants (σ_1) = | 0.45 |
| Between sample SD of Homogeneity testing (S_s) = | 0.1323 |
| SD for PT Scheme with allowance for the heterogeneity if any (σ) = | 0.45 |

No heterogeneity observed

| | |
|-------------------------------|-----|
| Assigned Value (X) = | 0.9 |
| SD of PT Scheme(σ) = | 0.4 |



5. Sewing Thread Parameters

(5a) Balance of Twist - No. of Revolutions

| Participant code | Reported Value | Method Adopted | Z - Score | Comments on performance |
|------------------|----------------|----------------|-----------|-------------------------|
| 17009 | 0.0 | ASTM D 204-02 | -1.15 | Satisfactory |
| 17011 | 4.0 | ASTM D 204-02 | 0.38 | Satisfactory |
| 17012 | 0.0 | ASTM D 204-02 | -1.15 | Satisfactory |
| 17016 | 3.0 | ASTM D 204-02 | 0.00 | Satisfactory |
| 17018 | 5.0 | ASTM D 204-02 | 0.77 | Satisfactory |

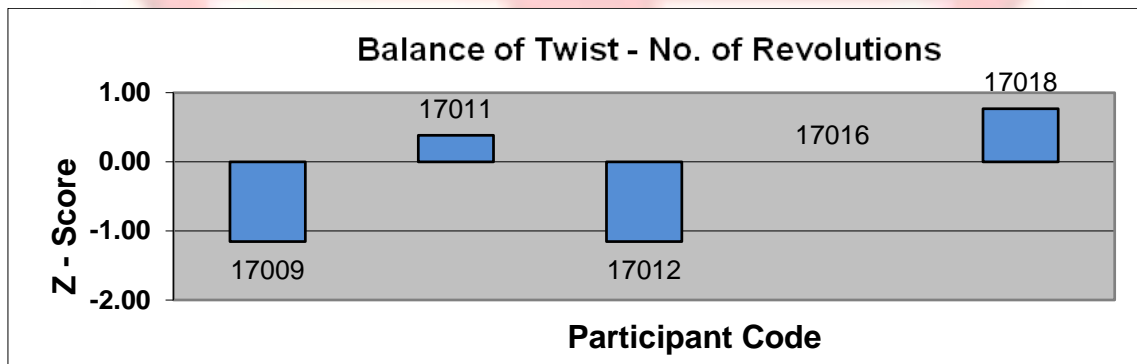
| | |
|---------------------|-----|
| No. of participants | 5 |
| Maximum | 5 |
| Minimum | 0 |
| Mean | 2.4 |
| Standard Deviation | 2.3 |
| Median | 3 |

SUMMARY

| | |
|---|---------------|
| Robust Average = | 2.40 |
| Robust SD for all valid participants (σ_1) = | 2.61 |
| Between sample SD of Homogeneity testing (S_s) = | 0.5332 |
| SD for PT Scheme with allowance for the heterogeneity if any (σ) = | 2.61 |

No heterogeneity observed

| | |
|-------------------------------|------------|
| Assigned Value (X) = | 3 |
| SD of PT Scheme(σ) = | 2.6 |



Twist Per Inch

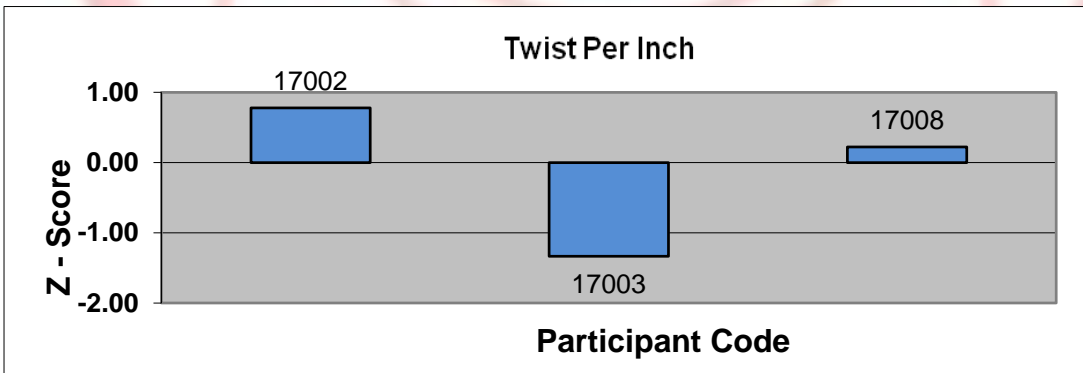
Remark: Participant 17002, 17003, 17008 have reported Twist Per Inch instead of Balance of twist and hence evaluated separately as special test

| Participant code | Reported Value | Method Adopted | Z - Score | Comments on performance |
|---------------------|----------------|----------------|-----------|-------------------------|
| 17003 | 12.6 | In House | -1.33 | |
| 17008 | 14.0 | Not mentioned | 0.22 | |
| 17002 | 14.5 | Not mentioned | 0.78 | |
| No. of participants | 3 | | | |
| Maximum | 14.5 | | | |
| Minimum | 12.6 | | | |
| Mean | 13.70 | | | |
| Standard Deviation | 0.98 | | | |
| Median | 14.00 | | | |

SUMMARY

| | |
|---------------------------------------|---------------|
| Robust Aaverage= | 13.80 |
| Robust SD for all valid participants= | 0.94 |
| No. of participants= | 3 |
| Uncertainty of the PT Scheme = | 0.6754 |

| | |
|-------------------------|-------------|
| Assigned Value= | 13.8 |
| SD of PT Scheme= | 0.9 |



(5b) Breaking Load of Sewing Thread

| Participant code | Reported Value | Method Adopted | Z - Score | Comments on performance |
|------------------|----------------|----------------|-----------|-------------------------|
| 17003 | 2164.5 | In house | 0.35 | Satisfactory |
| 17006 | 2033.0 | IS 1670:1991 | -0.54 | Satisfactory |
| 17009 | 2203.9 | IS 1670:1991 | 0.62 | Satisfactory |
| 17010 | 2092.0 | IS 1670:1991 | -0.14 | Satisfactory |
| 17011 | 2161.0 | IS 1670:1991 | 0.33 | Satisfactory |
| 17012 | 2186.0 | ASTM D 2256-10 | 0.50 | Satisfactory |
| 17013 | 2030.0 | IS 1670:1991 | -0.56 | Satisfactory |
| 17014 | 2109.2 | IS 1670:1991 | -0.03 | Satisfactory |
| 17016 | 2060.0 | IS 1670:1991 | -0.36 | Satisfactory |
| 17018 | 2052.5 | IS 1670:1991 | -0.41 | Satisfactory |
| 17019 | 2102.0 | IS 1670:1991 | -0.07 | Satisfactory |
| 17020 | 2133.9 | IS 1670:1991 | 0.14 | Satisfactory |
| 17022 | 2037.0 | IS 1670:1991 | -0.52 | Satisfactory |
| 17023 | 2120.3 | IS 1670:1991 | 0.05 | Satisfactory |

| | |
|---------------------|---------|
| No. of participants | 14 |
| Maximum | 2203.9 |
| Minimum | 2030.0 |
| Mean | 2106.09 |
| Standard Deviation | 58.49 |
| Median | 2105.60 |

SUMMARY

| | |
|---|-----------------|
| Robust Average = | 2106.09 |
| Robust SD for all valid participants (σ_1) = | 66.33 |
| Between sample SD of Homogeneity testing (S_s) = | 130.6701 |
| SD for PT Scheme with allowance for the heterogeneity if any (σ) = | 146.54 |

Heterogeneity Accounted

| | |
|-------------------------------|-------------|
| Assigned Value (X) = | 2113 |
| SD of PT Scheme(σ) = | 147 |

(5c) Elongation(%) of Sewing Thread at Break

| Participant code | Reported Value | Method Adopted | Z - Score | Comments on performance |
|------------------|----------------|----------------|-----------|-------------------------|
| 17002 | 11.4 | ASTM D 2256-10 | 1.05 | Satisfactory |
| 17003 | 10.0 | In house | 0.00 | Satisfactory |
| 17006 | 11.3 | IS 1670:1991 | 0.97 | Satisfactory |
| 17009 | 9.4 | IS 1670:1991 | -0.46 | Satisfactory |
| 17010 | 9.2 | IS 1670:1991 | -0.62 | Satisfactory |
| 17011 | 10.0 | IS 1670:1991 | 0.00 | Satisfactory |
| 17012 | 8.3 | ASTM D 2256-10 | -1.31 | Satisfactory |
| 17013 | 12.0 | IS 1670:1991 | 1.54 | Satisfactory |
| 17014 | 10.0 | IS 1670:1991 | 0.00 | Satisfactory |
| 17016 | 9.8 | IS 1670:1991 | -0.15 | Satisfactory |
| 17018 | 7.0 | IS 1670:1991 | -2.31 | Straggler |
| 17019 | 9.2 | IS 1670:1991 | -0.62 | Satisfactory |
| 17020 | 10.0 | IS 1670:1991 | 0.00 | Satisfactory |
| 17022 | 10.0 | IS 1670:1991 | 0.00 | Satisfactory |
| 17023 | 9.1 | IS 1670:1991 | -0.69 | Satisfactory |

| | |
|---------------------|-------|
| No. of participants | 15 |
| Maximum | 12.0 |
| Minimum | 7.0 |
| Mean | 9.78 |
| Standard Deviation | 1.23 |
| Median | 10.00 |

SUMMARY

| | |
|---|---------------|
| Robust Average = | 9.824 |
| Robust SD for all valid participants (σ_1) = | 1.128 |
| Between sample SD of Homogeneity testing (S_s) = | 0.6864 |
| SD for PT Scheme with allowance for the heterogeneity if any (σ) = | 1.32 |

Heterogeneity Accounted

| | |
|-------------------------------|-------------|
| Assigned Value (X) = | 10.0 |
| SD of PT Scheme(σ) = | 1.3 |

