L A B M A N U A L

ON

TEXTILE TESTING-II

6th SEMESTER

INSTITUTE OF TEXTILE TECHNOLOGY

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DEPT. OF TEXTILE TECHNOLOGY

Experiment No-1

Aim of the Experiment :-

To find out the C.S.P (count strength product) of the given sample of cotton yarn by using Knowles balances and Lee Strength tester. Then to find out the standard. Deviation (S.D) and percentage of co-efficient variation (CV %) of both count and strength.

Apparatus Required:-

1. Wrap reel
2. Knowles balance
3. Lea strength tester

Principles and theory:-

Knowles balance work on fixed weight (Celebrated weights with the instrument) and fixed length (120 yds)

Principle:-

Lea Strength tester work on pendulum lever CRT (constant rate of travers) and CRE (Constant rate of extention) principle. The count of the yarn in directly obtained from the Knowles balance and multiplied with the strength of the lea bound from lea strength tester in pounds, Hence, C.S.P = Count × Strength

In English System, C S P = 'count in Ne × Strength in pounds
CSP = hank /pound x pound
C.S.P = Hank
CSP is actually a number and when yarn of length that no- of hanks when suspended under the yarn, the yarn will break due to its own weight. Otherwise it is known as the breaking length of the yarn.

A yarn produced in ideal spinning Condition the C S P of a Carded yarn should be around 2000 and C S P of a combed yam should be 2250.

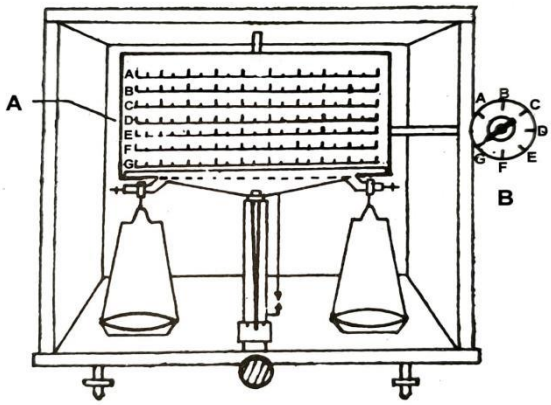


Fig. 3.1 **KNOWLES BALANCE**

A - Rectangular scale
B - Adjusting knob

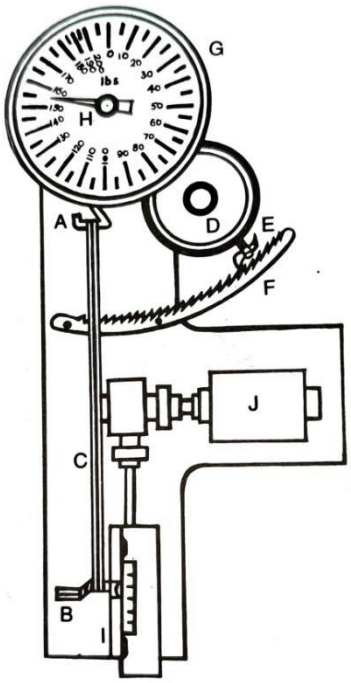


Fig 3.26 Lea Tester

A - Top Jaw
B - Bottom Jaw
C - Lea
D - Pendulum
E - Pawl
F - Serrated Quadrant
G - Dial
H - Pointer
I - Screw Mechanism
J - Motor

Procedure:-

Samples in the form of the yam lea of 120yds are prepared from the yarn Cops using wrap reel

The yarn it reeled (wrapped) under a constants tension with small traverse to separate the layer.

Then the lees of 120 yds are taken out of the wrap reel and kept marked 1, 2, 3, 4,---- etc.

Then the Lea put in the right hand pans of the Knowles balance. Knowles balance is just like a Physical balance. The difference is that a Rectangular with different count A,B,C, D, E, F, G. Starting from court ranges 2 count to 130 count . The border fixed with a behind the balance

A knob with the marking A, B, C, D, E, F, G is attached at the right hand side of the balance and rotating the knob any individual scale of Count range can be parallel to the beam of the balance. The principles of the balance is fixed weight and fixed length system.

Two counter weights, one circular and other rectangular (sliding type) marked with A, B, C, D, E, F, G are provided with the instrument.

The circular weight placed on the left hand pan of the balance and the rectangular weight on the beam.The sample of yarn in lea beam (120yd) is placed in the right hand pan. The Count of the yarnto the assumed and avoiding to the assumed count arenge scale in brought parallel to the beam by rotating knob. Then the position of the rectangular weight is so adjusted that the beam in balanced.

The count of the yarn Lea Sequence find out from the Knowles balance.

The strength of the lea el found out from Strength tester in pound.

The lea strength tester works on pendulum lever, CRT,CRE principle. It consist of a upper jaw and Lower jaw. The lower jaw can be engaged with a screw mechanism driven at a constant speed of 12" / min by a motor. The upper jaw is connected to a pendulum arm by means of a steel tape and a pulley. A heavy bob is attached to the pendulum arm which moved over a seated quadrant. A pawl controls the movement of the arm and stops the pendulum when the lea breaks. The movement of pendulum the actuates a pointer moving on a deal. Celebrated with KG and pounds to indicate the breaking force of the lea In indicate the breaking force of the Lea pounds or KG. all the Leas are found out one by one and multiple white corresponding yarn count to find out the CSP value.

Tabulation :-

Conclusion:-

No.of obs	Test Length	Count(Ne)	Strength in lbs	C.S.P	Mean C.S.P.
1	120 yds	27.1	64.0	1734.4	
2	120 yds	27.5	64.0	1760.0	
3	120 yds	28.4	57.0	1618.8	
4	120 yds	27.2	62.0	1686.4	
5	120yds	28.4	64.5	1831.8	1663.906
6	120yds	27.7	56.0	1551.2	
7	120yds	27.2	63.0	1713.6	
8	120yds	28.1	58.5	1643.85	
9	120yds	28.9	56.5	1561.8	
10	120yds	27.4	57.0	1720.2	
11	120yds	28.2	61.0	1624.5	
12	120yds	28.5	57.0	1698.8	
13	120yds	27.4	56.0	1632.35	
14	120yds	28.0	62.0	136.0	
15	120yds	27.8	58.0	1612.2	

From the above experiment we could able to find out The yarn CSP of the giver sample of cotton yarn . CSP is a parameter to compare the quality of different count in strength

Experiment No :- 2

Aim of the Experiment :-

To findout :-(i) The TPI of the given sample of cotton single yarn by using single yarn twist tester.
(ii) TPI , twist take up percentage of the given sample of cotton double yarn by using double yarn twist tester.

Apparatus Required :-

1. Single yarn twist tester.
2. Double yarn twist tester.
3. Beesley Balance.
4. Scissor.
5. Alpin.

Theory :-

In a spinning a strand of fibre comes out in parallel condition form the drafting zone then it is twisted on its own axis to form a yarn. Twist is essential to keep the component fibres/Yarn together in a single yarn or double yarn.

Defination :-

Twist is defined as the number of spiral turns given to a yarn in order to hold the constituent fibres or yarn together.
The turns per unit length or twist per unit length can be express as TPI (Turns per inch).

TPCM (Turns per cm) or TPM (Turns per meter). It may be in clockwise or anticlockwise direction. If the constituent fibres are rotated in clockwise direction ' s ' twist is imparted and it is rotated on anticlockwise direction it said to be ' z ' twist.

(i) Single yarn twist tester works on twist contraction method (untwisted and retwist priciple).

TPI in single yarn = Dial reading ÷ Test length in inch.

(ii) If two or more number of single yarn are twisted together to form a double or ply yarn than the twist in the double yarn/ply yarn is foundout by a double yarn twist tester. It works on untwist principle.

TPI in double yarn = Dial reading ÷ Test length in inches.

In general practice the twist imparted in double yarn is more or less 65% of the component single yarns in an opposite direction to that of the twist of the single yarn.
Tension given to the yarn while TPI test :-

The tension to the sample of yarn while finding TPI is standardised otherwise it will affect the test result.

Generally tension of tex/2 ± 10% gm is given.

Single yarn filament type = 0.25 ± 0.05 gm/tex.

Single spun yarn , ply & double Yarn = 0.35 ± 0.05 gm/tex.

Procedure :-

(i) Single yarn twist tester :-

The counter of twist tester is set to zero. The yarn to be tested is first clipped with the rotating jaw and the fixed jaw adjusting the calculated tension.The fixed jaw is mounted on a pointer pivoted and the lower portion of the pointer touches a datum mark.The length of the test specimen may be taken from 5 inch to 10 inch as per convinience.When the rotating jaw is rotated the twist in the yarn isbopned and lengthbof the yarn increases which enables the pointer to reach in a vertical position.When all the twist is taken out the fibres becomes parallel but the rotating jaw is kept rotated in the same direction to impart twist in a direction opposite to the original twist. This will again contact the yarn length and the pointer again goes back to its original position and touches the datum mark. This indicates the amount of twist that has been takenout is again imparted to the yarn.

Now the dial reading is noted tabulated and the TPI in single yarn is calculated using the formula :-

TPI in single yarn = Dial reading ÷ 2 × test length in inches.

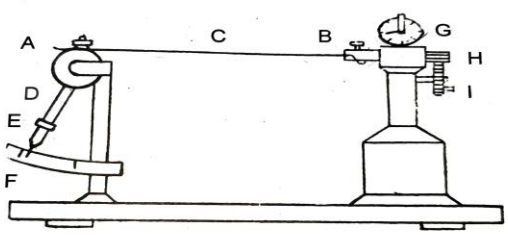
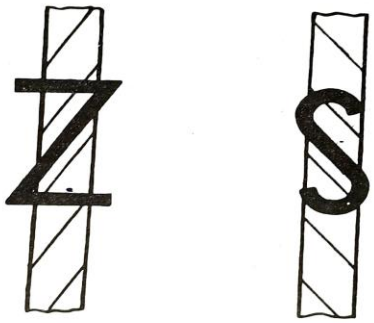


Fig. 3.12 **TENSION TYPE TWIST TESTER**

A - Non rotating jaw
B - Rotating jaw
C - Yarn sample
D - Pointer
E - Tension weight
F - Quadrant scale
G - Counter
H - Pinion
I - Handle



S Twist Z Twist

Fig. 3.5 **DIRECTION OF TWIST IN YARN**

Tabulation for single yarn :-

No of observation	Test length in inches	Dial reading	TPI	Mean TPI
01	**10**	**484**	**24.2**	
02	**10**	**478**	**23.9**	
03	**10**	**475**	**23.8**	
04	**10**	**494**	**24.7**	**24.08**
05	**10**	**505**	**25.4**	
06	**10**	**518**	**25.9**	
07	**10**	**454**	**22.4**	
08	**10**	**440**	**22.0**	
09	**10**	**514**	**25.7**	
10	**10**	**450**	**22.5**	

Calculation :-

Count of the yarn found from beesley balance = 32.4s

Count converted to tex = 590.5 ÷ 32.4 = 18.22T.

Tension weight required for finding TPI of the single yarn = 0.35 ± 0.05 gm/tex.

Therefore , Tension weight required = 7.3 gm - 5.5 gm.

The mean TPI of the single yarn = 24.08.

(ii) Double yarn twist tester :-

The double yarn twist tester is identical in mechanism with the single yarn twist tester. The difference is only in place of the fixed jaw attach to a pointer there is a platform on which the fixed jaw sides over two polished bars as the length of the yarn increases when the twist is taken from the double yarn.The dial of the twist tester is set to zero.The double yarn is clipped between the rotating jaw and fixed jaw and extra yarn is extended over the pulley to hold the tension weight as per calculation.As the twist of the double yarn is opened the length of the yarn increases and the fixed jaw moves from its original position due to the tension.When all the twist is takenout the length of the fixed jaw travels feom its original position is noted in inches and twist takeup percentage is calculated.Now the rotating jaw is rotated till all the twist is opened from the double yarn and is conformed by inserting an alpin in between the double yarn.The alpin is moved from the fixed jaw towards the rotating jaw and if residual twist is there then it is finally opened by rotating the pulley.By the time , the fixed jaw slides over the bars to some extend to indicate the twist take up length of the yarn.The process is repeated and the TPI , take up percentage of the double yarn is foundout by formula :-

TPI in double yarn = Dial teading ÷ Test length in inches.

Twist takeup percentage = Untwist length - twisted length ÷ untwisted length × 100

= Takeup kength in inches ÷ untwisted length in inches × 100

Tabulation for double yarn :-

No of obs.	Test length in inch	Dial reading	TPI	Mean TPI	Twist take up length in inches	Untwist length of the specimen in inch	Twist take up (%)	Mean twist takeup %
01	10	162	16.2		0.7	10.7	6.54%	
02	10	154	15.4		0.7	10.7	6.54%	
03	10	145	14.5		0.6	10.6	5.66%	
04	10	144	14.4		0.6	10.6	5.66%	
05	10	135	13.5	14.37	0.5	10.5	4.76%	6.35%
06	10	143	14.3		0.7	10.7	6.54%	
07	10	140	14.0		0.8	10.8	7.40%	
08	10	141	14.1		0.7	10.7	6.54%	
09	10	132	13.2		0.7	10.7	6.54%	
10	10	141	14.1		0.8	10.8	7.40%	

Calculation :-

The count of the double yarn = 2/20s.

Count converted to tex = 590.5 ÷ 10 = 59.05 T.

Tension weight required gor finding TPI of the a/b yarn = 0.35 ± 0.05 gms/tex.

Therefore , Tension weight required = 17.71 gm - 23.62 gm = 20 gm approximately.

Conclusion :-

From the above experiment we could able to findout the TPI of the given sample of cotton single yarn and the TPI , twist take up percentage of the given sample of cotton double yarn and the test result of follows :-

(i) TPI of single yarn = 24.08.

(ii) TPI of double yarn = 14.37.

(iii) Twist take up percentage of the double yarn = 6.35%.

Experiment No - 3

Aim of the Experiment :-

To find out the single yarn strength and elongation percentage at break of the given sample of cotton single yarn by using single yarn strength tester.

Apparatus Required :-

1. Single yarn strength tester.
2. Beesley Balance.
3. Wrap reel.

Principle :-

Single yarn strength tester works on CRT , CRE and pendulum lever principle.

Strength of single yarn in gm/tex = Breaking load in gm ÷ Count of the yarn in tex.

Count of the yarn in tex = 590.5 ÷ Ne. (Ne is the count of yarn in english system).

Description :-

The single yarn strength tester works pendulum lever principle.

The force applied in the yarn ,

$F = mg \times R \div r \times \sin\emptyset$

$F = W \times R \div r \times \sin \emptyset$. {Where W is the weight of dead weight used to select the capacity of instrument .

R = Length of pendulum arm from the centre of pulley of the centre of dead weight.

r = Radius of the pulley of momentum.}

$F = K \times \sin\emptyset$

F is directly proportional to $\sin\emptyset$.

For a given instrument and test the value of W , R and r remains contant. The force applied on the specimen is directly proportional to the sini of angle created by the pendulum with its vertical or initial position. These is motor driven pendulum type strength tester. It is made up of a weight arm provided in ball bearing having a quadrant on which the pendulum arm moves. The pendulum arm is fixed with a pawl which runs over the serated quadrant and stops the momentum of the pendulum arm when the yarn breaks.

The pulley force acting on the specimen is transferred to the pendulum through the clamping arrangement via a steel tape. The steel tape runs over a pulley the centre of which is

the centre of momentum. The pendulum arm with the weft displaced in portion through its magnitude and can be read on the quadrant scale. There are two ranges in the quadrant scale :-

a --- Lower range (0 to 2 kgF)

b --- Higher range (0 to 10 KgF)

The lower scale is used when there is a small weight in the pendulum and the higher scale is used when pendulum carries additional weight. The capacity of the instrument should be so selected that the specimen should break with a force more than 10% less than 90% of the scale value.The lower jaw is moved downward connects to a screw mechanism given by a motor. The rate of traverse of the lower jaw is at a constant speed of 12 inches/min. The lower jaw is attached to a specimen scale with pin holes indicates the length of the specimen starting from 15 to 60cm by choosing any pin hole the length of the specimen can be selected.

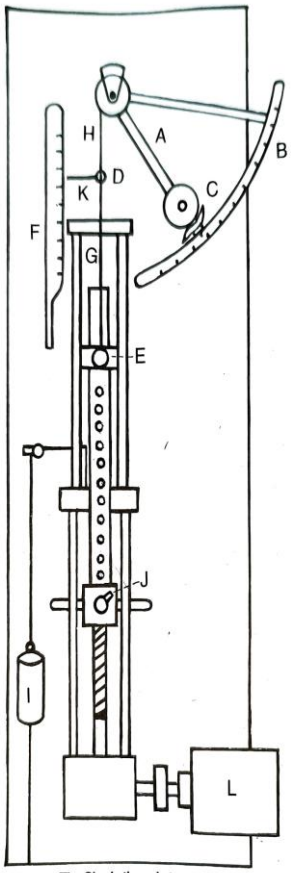


Fig : 3.19 The Single thread strength tester

A - Pendulum	B - Quadrant Scale	C- Pawl	D - Top clamp
E - Bottom clamp	F - Elongation	G Yarn Sample	H - Steel Tape
I - Dead Weight	J - Clutch	K - Pointer	L - Motor

Procedure :-

The particular test leghth of the specimen is fixed in between the jaws. The length of the specimen is taken as 50cm. The extra material is cut off exactly at the clamp position. When the machine is started the lower jaw travels downward and tension develop in the soecimen. The pointer is attached to the pendulum arm moves on the quadrant scale and stop by the pawl when the specimen breaks. The position of the pendulum arm given breaking load. Again the bottom jaw attached with a steel tape which moves downward with an elongation scale when the yarn breaks.Another wire pawl drops and stops the momentum of the elongation scale gives the elongation of the specimen at breaks. Then the procedure is repeated with 20 such specimens and tenacity of the single yarn in gms/tex and elongation percentage is calculated.Prior to the experiment the count of the yarn found out from the beesley balance by cutting the length of the yarn according to the template provided with the instrument. The english count (Ne) of the yarn is then converted to takes by the formula :- Tex = 590.5 ÷ Ne.

Tabulation for singke yarn strength and elongation :-

No of obs	Test length	Count in tex	Breaking load in gms	Tenacity in gm/tex	Mean tenacity in gm/tex	Elongatin in cm	Elongation %	Mean Elongation %
01	50 cm	22.28 T	230	10.32	11.51	2.1	4.2	4.41
02	50 cm	22.28 T	250	11.22	11.51	2.0	4.0	4.41
03	50 cm	22.28 T	260	11.66	11.51	1.9	3.8	4.41
04	50 cm	22.28 T	240	10.77	11.51	1.8	3.6	4.41
05	50 cm	22.28 T	260	11.66	11.51	2.6	5.2	4.41
06	50 cm	22.28 T	230	10.32	11.51	2.4	4.8	4.41
07	50 cm	22.28 T	270	12.11	11.51	2.1	4.2	4.41
08	50 cm	22.28 T	240	10.77	11.51	1.9	3.8	4.41
09	50 cm	22.28 T	250	11.22	11.51	2.5	5.0	4.41
10	50 cm	22.28 T	230	10.32	11.51	2.2	4.4	4.41
11	50 cm	22.28 T	260	11.66	11.51	2.1	4.2	4.41
12	50 cm	22.28 T	240	10.77	11.51	1.8	3.6	4.41
13	50 cm	22.28 T	250	11.22	11.51	2.5	5.0	4.41
14	50 cm	22.28 T	270	12.11	11.51	1.7	3.4	4.41

15	50 cm	22.28 T	280	12.56	11.51	2.2	4.4	4.41
16	50 cm	22.28 T	260	11.66	11.51	2.0	4.0	4.41
17	50 cm	22.28 T	270	12.11	11.51	2.6	5.2	4.41
18	50 cm	22.28 T	280	15.56	11.51	2.7	5.4	4.41
19	50 cm	22.28 T	290	13.01	11.51	2.7	5.4	4.41
20	50 cm	22.28 T	270	12.11	11.51	2.3	4.6	4.41

Conclusion :- From the experiment we could able to find out tensile strength and elongation percentage at break of the given sample of cotton single yarn and the result found as follows :-

Mean tenacity of single yarn = 11.51 gm/tex.
Mean elongation percentage at breaks = 4.41%