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CONTENTS

1. SYNOPSIS

In open end spinning machines spin box is the heart of spinning and plays a vital role in engineering the properties of yarn.

Spin box consists of sliver feeding system, opening system, rotor section with sufficient suction for receiving the opened fibres from the opening zone. As soon as the sliver enters the opening zone, fibres are separated and forced to the rotor section by the air current. These fibres, while passing through the fibre transport channel subjected to various forces before touching the rotor sidewall.

The design of fibre channel is made in such a manner that the entry portion is wider than the delivery portion to improve the fibre velocity. The position of the fibres on the striking point is affected due to the forces acting on it.

In this project, the point of the fibre strike on ~~to~~ the side wall is varied by moving the rotor front and back without changing the fibre transport position. The distance between the groove and the fibre striking point is maintained as 0.2, 0.5, 0.8 and 1.1 mm and the yarn is produced with this settings in 12 rotors of SCHLAFHORST open end spinning m/c, model AUTOCORO SE 8. The yarn count and mixing are maintained without any change throughout the course of study.

All the samples were tested for various quality parameters. In cotton mixing, in the 10s count the U% and the single yarn strength are better with 1.1mm setting. In 20s viscose yarn the U% is better in the sample produced with the 0.2 mm setting. It is established from this project that the fibre striking point on the rotor groove influences the U% and imperfections to the maximum extent.

2. INTRODUCTION

The rise in population forced the yarn manufacturers to invent new technology to meet the textile need of human being .Ring spinning serves the industry in yarn production for a long time. In this system the production rate is limited due to the traveller speed. To replace this difficulty many other yarn manufacturing systems have been invented and rotor spinning is the most popular system among them.

In rotor spinning system, the sliver is directly fed as raw material to produce yarn. The spin box in the rotor spinning system plays a vital role in engineering the yarn properties. The spin box performs three important functions such as fibre condensing and feeding, opening and thirdly the yarn formation in rotor. The opened out fibres from the opening roller zone are transported tangentially towards the rotor wall through a fibre transport channel. On striking the rotor side wall, the fibres slide into rotor groove and due to centrifugal force a fibre ring with required number of fibres is formed .On inserting a parent yarn through the doff tube the fibre ring is opened out and twisted due to the rotor revolution and finally conceived as yarn which is drawn out through the take up system .

In the yarn formation the required qualities such as yarn evenness,yarn strength, and yarn appearance are achieved by means of various process parameters and settings. One of the important settings in the spin box is the rotor setting. This setting decides two things. One is the fibre striking point on the rotor side wall and another one is the distance between the navel and the rotor which influences the degree of twist flow.

In this project, an attempt is made to study the yarn quality by varying the fibre striking point on the rotor side wall, i.e. the distance between the rotor groove and the fibre striking point is changed by moving the rotor forward and backward and keeping the fibre channel stationary. A special gauge has been designed to monitor the setting. The following settings are taken for study.

TRIAL	***SETTING*** (mm
A	***0.2***
B	***0.5***
C	***0.8***
D	***1.1***

3. LITERATURE SURVEY

3.1 TECHNICAL DETAILS OF OPEN END ROTOR SPINNING

Ring spinning has been, the conventional system of spinning yarn, in vouge for many decades. The introduction of OERS technology, in the 1960s, was a major breakthrough achieved, in yarn spinning technology, as, it was the first technology, to become commercially successful, apart from the ring spinning. The OERS technology has, since then, progressed significantly and has been replacing the ring spinning system, on a large scale. In India, however, application, so far, has been limited to coarse counts.

The passage of material through a typical OERS machine follows the, following sequence:

(a) Feed materials, in cans, in the form of drafted (and in some cases only carded) sliver, is directly, obtained form the draw frame/card.

(b) This sliver is fed to the cleaning roller (this roller is also known as the combing roller, or the opener roller), where, cleaning and opening of the feed material takes place, by means of, toothed, metallic clothing of the roller.

(c) This opened material is, then, fed through a feeding tube, to a rotor, rotating at a very high speed. The flow of material is carried out by means of suction fans, or, the natural pressure difference, developed between the fast rotating rotor and the atmosphere.

(d) The material, fed to the rotor, rotates on the periphery of the rotor and is drawn out, through the center of the rotor, through a doffing tube and a navel. While drawing of the material, twist is imparted due to rotation of the rotor.

(e) *The twisted material passes, through a traverse unit, onto a drum and finally, onto the final package.*

The most critical parts, of an OERS machine, the cleaning roller and the rotor and these are enclosed, in a box, known as the spin box. The functioning, of these two parts, determines the quality of the yarn.

3.2 SPECIFICATIONS OF RAW MATERIALS FOR OERS

OERS machine is, mainly, used for spinning of cotton yarns are fibre, with staple lengths, between 18 mm (6/8 inch) to 60 mm (2-3/8v), can be processed, on these machines. However, major benefit from OERS is possible, as it accommodates a large proportion of waste, in the mixing. The waster added is in the form of, comber noil, flat strip, pneumatic, and blow room dropping.

The main requirement of the feed material, to OERS machine, is the intensively cleaned silver. This requirement is, so stringent, that, even the micro dust, in cotton, has to be removed. It is recommended that the impurity, present on 1 gm of sliver, should be, between 1 mg to 4 mg. As a general rule, 70% of the cleaning should be done in the blow room and 25% at the card. The required number, of blow room cleaning points, will depend up on, the type and, the quality, of the material. Special types of cleaners are, also, available, for efficient removal of microdust. As regards carding, it is recommended that, either tandem cards; or, high production card, with crushing rollers, be used, depending upon, whether or not, a trash extraction unit is fitted on OERS machine.

Though, a very high percentage of waste can be added in the cotton mixing, but, due to stringent requirements, of clean sliver, comber noil is, usually, preferred, for addition. Flat strip is, also, used very widely, but, blow room dropping, being very dirty, are, usually, avoided. The percentage of waste added, can be, as high as, 70%.

To achieve a good, short-term, regularity, the U% values, of the silver, should be, between, 2.0% to 3.5%. For long term regularity, the U% value should be, the same, as that for rings spinning. Two passages, in the draw frame, are recommended. However, card sliver, from first passage, on the draw frame, could, also, be used, if, an autoleveller is installed.

3.3 HISTORICAL DEVELOPMENT OF THE TECHNOLOGY LEADING TO THE PRESENT STATE OF ART

The art of spinning originated in prehistoric times. The yarns were made by means of spindle whorl, which is, the first, known device for, discontinuous spinning and yarn winding. In the course of time, the, fully, manual operation, was, partly mechanised, by introducing the, so called, spinning wheel. The Saxony spinning wheel, developed around 1530, already incorporated, some very progressive elements, such as, the spinning flyer and the bobbin, with continuous and simultaneous, twisting and winding. The subsequent development have been the Spinning Mule (1768); operating discontinuously, with separate twisting and winding, operations; which has survived, in principle, until now, for, over, two centuries.

The technique of cotton spinning crystallized at, the beginning of, the industrial revolution. In 1738, Lewis Paul was granted a patent on, a spinning machine with, roller drafting. In 1769, Arkwright introduced the spinning flyer and mechanical yarn guiding, in winding. The next development stage was, marked, by two new metho9ds, discovered around 1828. They were Danforth's can spinning, operating at 7000 rpm and the spinning ring, operating, in conjunction with, a concentric of Thorp. The invention of the traveller is ascribed to Jenks, in *about 1830. This opened up the long area, of ring spinning, which was perfected, at the end of 19th century. Most patents were granted, between, 1875 and 1890.*

Ring spinning is, currently, the prevailing methods of yarn formation. In this method, due to continuity of fibre flow from supply bobbin to the take up yarn package, the latter has to rotate, during twisting. The rotation of the yarn package, increases, the power consumption, while, increasing the spindle speed. Thus, besides the technical barrier, created by the traveller and ring system, another economical barrier is created. Au such, the spindle speed limit, on ring spinning machines, is between 15,000 and 18,000 rpm.

Even, before the full potential of ring spinning, was fully exploited, the first idea, which led to the era of OERS, appeared, at the end of the 19th century. The basis principle of OERS is, the separation of twisting and yarn winding, although, they are done simultaneously. The development of the system was motivated, by the need to maintain continuos yarn formation, even when, the yarn package is changed and to increase the speed of the twist inserting element.

The development of the conception of OERS has taken, about, a century. The origin, of OERS, can be traced back to 1872. Although, the details are not known exactly, in 1952, objections were raised against the Kyan's patent, based on a US patent, obtained 1872.

After the first idea, the further development took place, in various stages, most of which were patented. The latest stage, in the patent literature begins in the 1950's and continues to date. A real explosion of patents was, however, recorded, after the first commercial OERS machine, was exhibited by the Cotton Industries Research Institute, of Czechoslovakia, at the International. Engineering Fair, in Brno, in 1965. This machine was known as KS 200.

Various spinning systems have been developed for OERS technology, of which, the principle, of the spinning rotor, has found a wide acceptance. The first device, of this type, was patented by a Dane, called, Berthelsen, in 1937. Meinberg exhibited, a double head model of the, so-called, comb spinning process, at the 2nd ITMA exhibition, in Brussels, in 1955, but it was not applied, commercially. At the beginning of 1960s, during short time of 10 years, Czechoslovakia developed, the OERS system, from a simple model; on which, the principle was proved; to the, commercial, BD 200 machine. This was, the first of, the OERS machines, available commercially. The first OERS mills, in the world, was opened in, the grounds of, the Cotton Industries Research Institute, at Ustinad, Orlici, Czechoslovakia, in Aug'67, with ten, BD 200 spinning machines.

The development of the, Czechoslovakian, BD 200, is considered as an, outstanding, technological achievement. The method of spinning had not really changed till its invention and the development of OERS process, for spinning staple fibres, was, most certainly, a major step forward. After the introduction of the Czech BD 200, by then operation at a rotor speed of 30,000 rpm, it was, generally, believed by scientists that, technologically speaking, 45,000 rpm, was, probably, the maximum rotor speed, that would be achievable. But, with the development of the, high speed, rotor bearing and, reduction in rotor diameter, today, the OERS machines are operating, at a rotor speed of 1,00,000 rpm, with complete automation, in piecing and package changing, rotor cleaning and electronic data processing, which is the, present, state of the art.

3.4 TECHNICAL DEVELOPMENTS OF THE ROTOR SPINNING MACHINE

3.4.1 INTRODUCTION

The design of the rotor unit may be divided, according to its operation, into four sections, namely:

1. *Sliver delivery, which involves interrelation between, feed roller, feed plate, and opening roller.*

2. *Fibre separation and transportation, which concern the opening roller, the separation edge and the shape and dimensions of the transport tube.*

3. *Fibre deposition, which is dependent on the outlet of the transport tube and the rotor size and shape.*

4. *Twist insertion, controlled by the doffing tube size and shape and the rotor groove size and shape, as well as by their frictional properties.*

A number of changes were made in all the above sections and our concentration is in the third and fourth sections.

3.4.2 FIBRE DEPOSITION

The fibres after separation leave the opening roller at the fibre separating edge and flow through a duct. The fibre feed duct coverage towards the spinning rotor. The fibres, on leaving the duct, can then be deposited onto the inner surface of the rotor in the most favorable configuration. The building up of contaminants such as oil, lubricant and wax in the exit area of the duct result in rotor-fouling. This results in a longer down time than even for rotor cleaning. To avoid this a number of modifications are done one of them consists of an *interchangeable ring insert, which has machined in one portion the end portion to be fibre duct and is fitted in position with a locking screw. The down time of the unit is kept to a minimum by replacing one ring with a spare, the replaced ring then being available for cleaning.*

3.4.2 TWIST INSERTION

FACTORS AFFECTING TWIST INSERTION

The insertion of twist in rotor spinning is influenced by the design of two machine components, namely, the doffing (i.e., the navel effect of the doffing tube) and the rotor (diameter and groove profile).

THE EFFECT OF THE DOFFING TUBE ON TWIST INSERTION

Under dynamic equilibrium, the twist propagates from the navel of the doffing tube into the first 8-10 mm of the fibres collected in the rotor groove. It is Important for obtaining both a good spinning performance and acceptable yarn properties. The degree of twist in the core of the yarn gives the strength.

THE EFFECT OF ROTOR PARAMETERS ON TWIST INSERTION

It is the compactness of the fibres in the rotor groove that both aids twist insertion, to give a good peripheral twist extent and produces an improved strength. Results have shown that the degree of fibre compactness in the rotor groove will depend on the rotor speed, the rotor diameter and the tightness of the groove angle. It is now well known that stronger yarns are obtained with large diameter rotors. In order to increase the degree of fibre compactness in the rotor groove, several patented designs have fitted mechanical means, which exert a controlled force on the fibre in the groove.

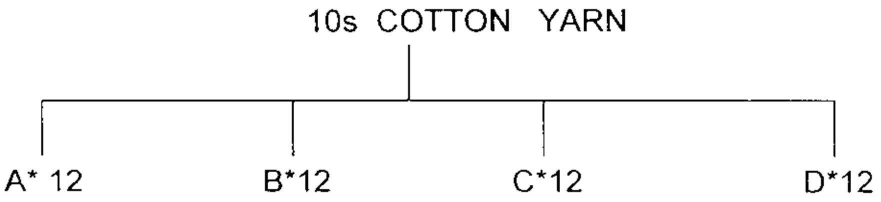
3.4.4 MODIFICATIONS TO THE COLLECTING GROOVE PROFILE

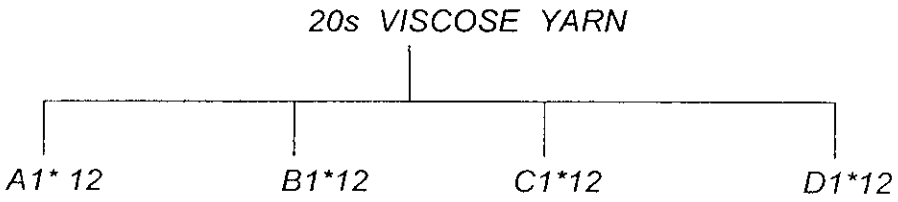
During the early development of rotor spinning machines, considerable effort was directed into optimizing the design of the rotor profile in order to improve fibre transfer to the collection groove and more efficient twist insertion. The objective was to improve yarn strength modifying the rotor profile also effected the degree of rotor fouling.

A number of rotor profiles are patented. In each design, there is a sliding wall, down which the fibres slide towards the collection groove respectively. The angle of slide wall must not be too shallow or fibre transfer to the groove will be poor, yet not too steep or dust accumulation will increase. The tighter rotor groove was also deserved to give better yarn strength. The narrower angle facilitates greater compacting of the fibres which improves the yarn strength.

4. METHODOLOGY

4.1 SAMPLE PLAN





4.1.1 SAMPLE YARN PRODUCTION

Rotors numbered 61 to 72 were selected for study. Initially the setting 0.2mm is set with the help of a special setting gauge . In all settings, similar process parameters are maintained for cotton yarn production. Likewise for producing viscose yarn also similar settings were maintained in all the four trials.

In this project SCHLAFHORST AUTOCORO open end spinning machine is used for producing yarn samples with various rotor settings.

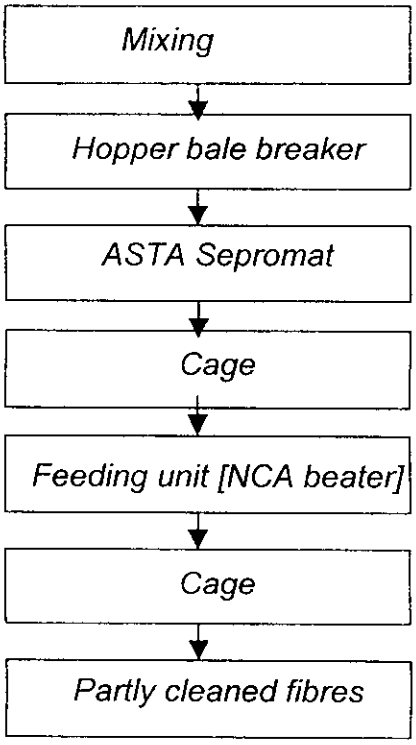
4.2 PROCESS

4.2.1 BLOW ROOM

Since the mixing is a waste mixing a pre cleaning process is done.

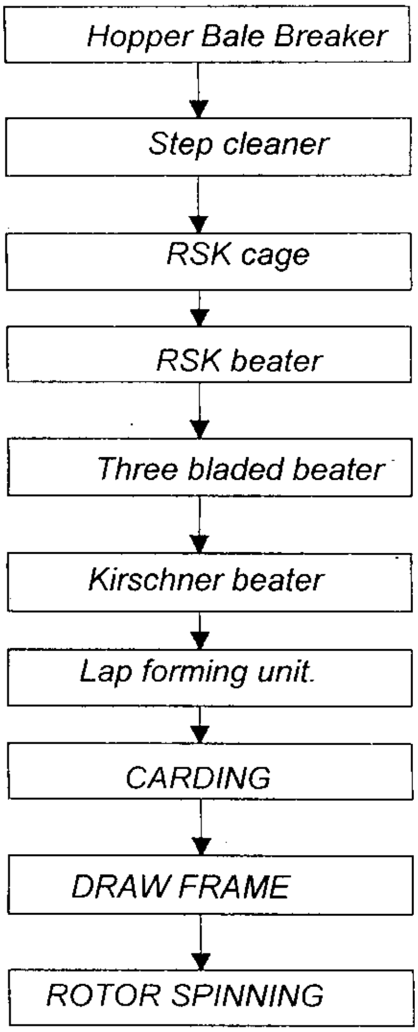
PRE CLEANING LINE:

NAVACOTANIA LINE:



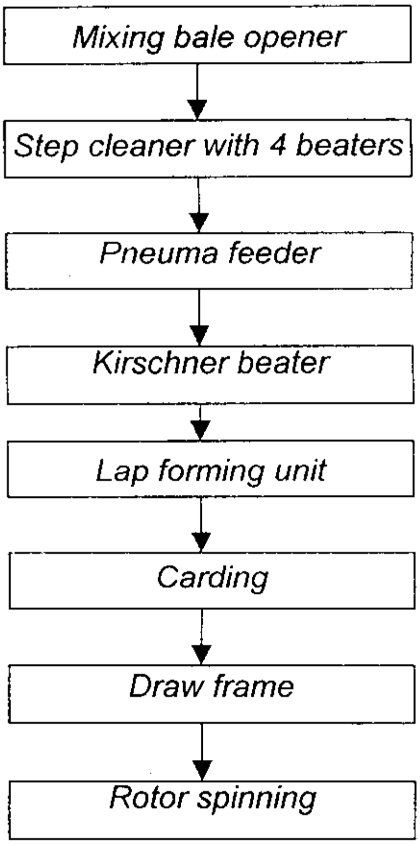
4.3 MATERIAL FLOW DIAGRAM

4.3.1 COTTON



4.3.2 VISCOSE

OPENING AND CLEANING LINE



4.4 PROCESS PARAMETERS.

The details of the process parameters are given in appendix.

4.5 ABOUT SCHLAFHORST OPEN END SPINNING MACHINE

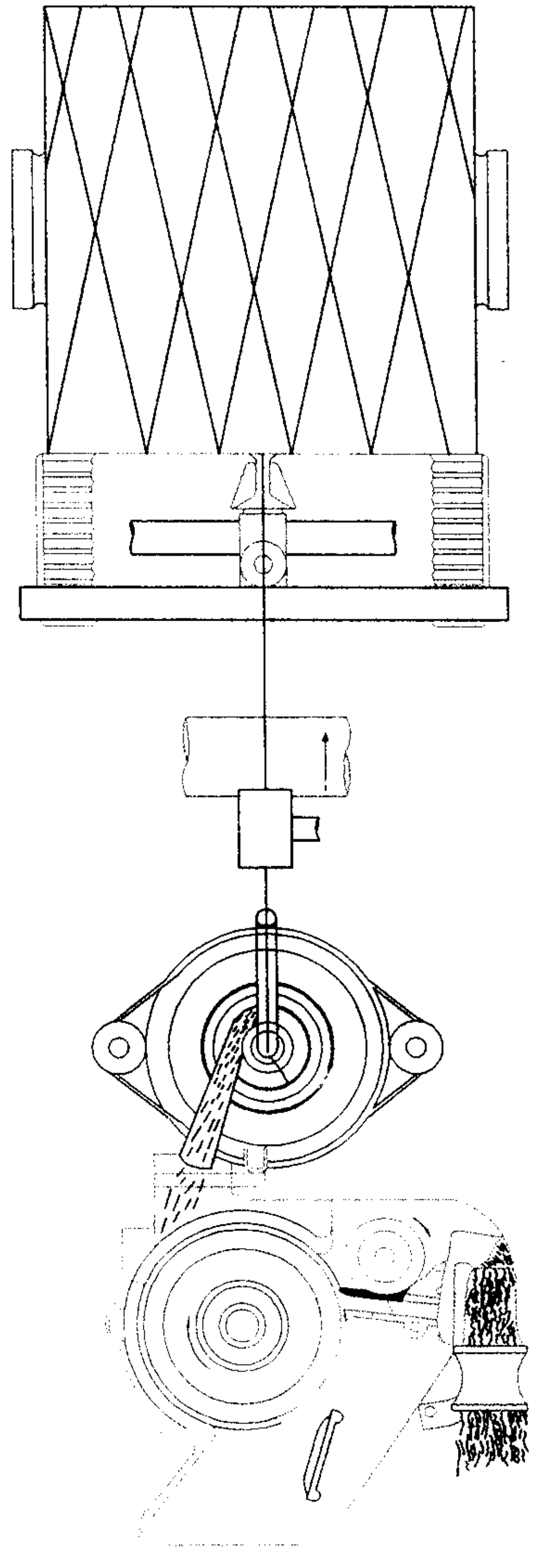
Year of make -- 1985
Number of rotors --192
Rotor system -- External pumping
Spin box -- Sussen SE 8
Piecing mode -- Automatic piecer carriage
Doffing mode -- Automatic doffer carriage
Rotor dia -- 40mm
Rotor groove -- "T"
Opening roller specification -- OB 20
Navel -- Spiral type
Package -- Zero degree package
Spinning vacuum -- 60 mbars
Trash vacuum -- 100 mbars
Rotor and opening roller drive -- Tangential belt drive

4.5.1 FIBRE FLOW

The figure shows the fibre flow through the machine. The feed cylinder pulls the sliver through the condenser into the spin box and moves it against the opening roller. The carding action of the opening roller individualize the fibre and brings them to the transport channel. The transport channel guides the fibres into the rotor. Inside the rotor, the fibres are collected and form a fibre bundle which corresponds in volume to the finished yarn count. The rotations of the rotor cause the fibre bundle to be twisted between the peeling point and the navel, thus forming the yarn. The yarn is then removed from the navel through the doff tube by the take-up shaft.

The movement of the fibres through the transport channel into the rotor is assisted by the air currents in the opening roll chamber, and in the transport channel. These air currents are created by the vacuum in the spinning chamber. The air supply needed enters through the trash ejection chamber of the opening roller assembly.

FIBRE FLOW



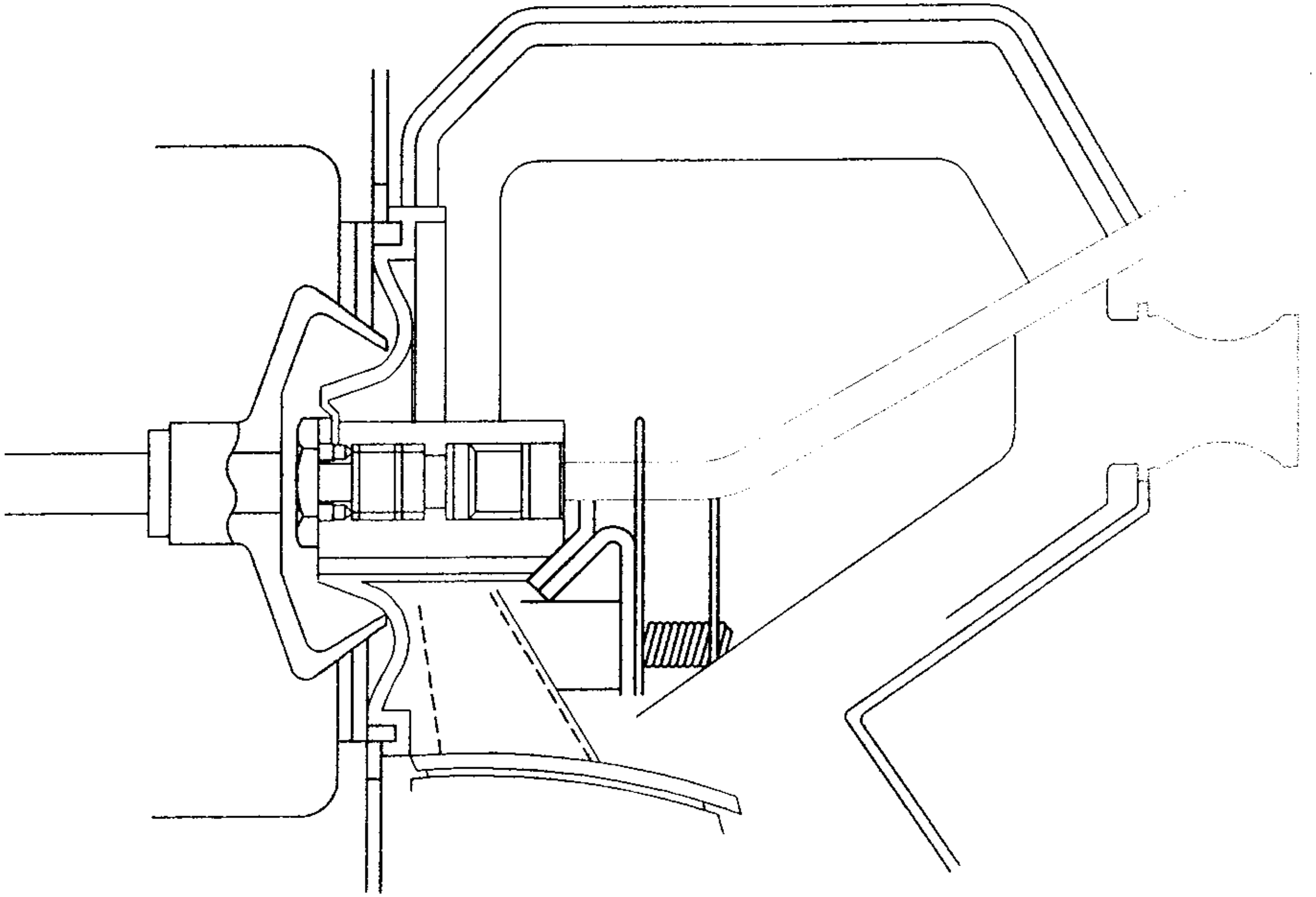
4.5.2 TRANSPORT CHANNEL

The spinning chamber vacuum creates a strong air current in the transport channel. This air current lifts the fibers out of the opener roller wire clothing, supported by the centrifugal force of the fibers themselves. The fibers are thus moved to the rotor.

The transport channel and the opening roller are so arranged to each other that the separator edge at the transport channel entrance lifts all fibers out the wire clothing. The separator edge is wear-protected as the high velocity of the fibers at this point can cause considerable wear.

The width of the transport channel entrance corresponds to the width of the opener roller wire clothing. Towards its exit, the transport channel becomes narrower in its cross section so that at the exit in the transport channel plate the diameter is only 6.3 mm. This reduction in cross section causes an increase in the air velocity the transport channel. This both accelerates and straightens the individual fibre.

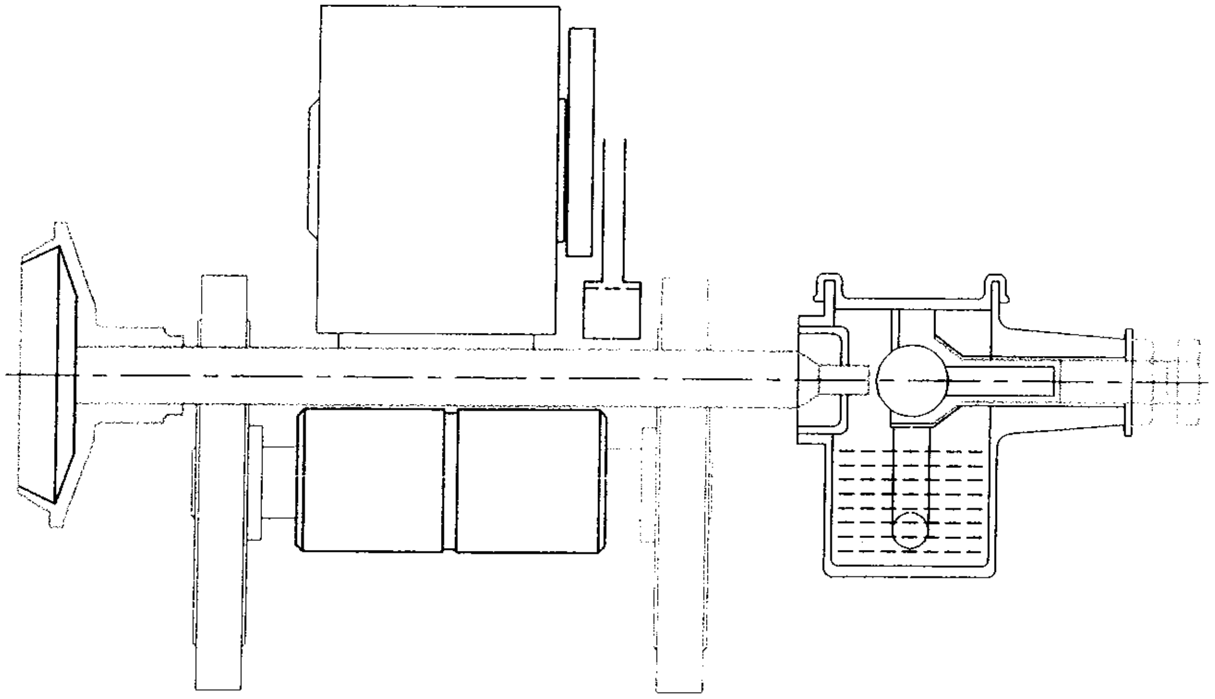
TRANSPORT CHANNEL



4.5.3 ROTOR ADJUSTMENT

The figure shows the cross sectional view of a rotor and its shaft. The rotor can be moved forward and backward by adjusting the lock nut and the bolt, provided at the end of the shaft. By loosening the lock nut and rotating the screw, the rotor can be moved. The pitch of the screw is 1 mm. So when we turn the screw by 90^0*, a distance of 0.25 mm can be moved. After this, the lock nut is tightened so that the rotor is fixed on that position.*

ROTOR ADJUSTMENT



4.6 SAMPLE MARKING

In each trial about 300gms. of yarn is produced in each rotor and samples were marked as in sample plan with individual rotor numbers. The samples were tested for the following parameters.

For identification of different samples of different settings, we have adopted the following convention.

A – cotton 10^{s} setting 0.2 mm T.M. 5.6 Rotor number 61 – 72
B – cotton 10^{s} setting 0.5 mm T.M. 5.6 Rotor number 61 – 72
C – cotton 10^{s} setting 0.8 mm T.M. 5.6 Rotor number 61 – 72
D – cotton 10^{s} setting 1.2 mm T.M. 5.6 Rotor number 61 – 72

A_1 – viscose 20^{s} setting 0.2 mm T.M 4.0 Rotor number 37 to 48
B_1 – viscose 20^{s} setting 0.5 mm T.M 4.0 Rotor number 25 to 36
C_1 – viscose 20^{s} setting 0.8 mm T.M 4.0 Rotor number 49 to 60
D_1 – viscose 20^{s} setting 1.2 mm T.M 4.0 Rotor number 61 to 72

4.7 TESTING INSTRUMENTS & TESTS

PARAMETER	INSTRUMENTS
COUNT	WRAP REEL & AUTO SORTER
LEA STRENGTH	LEA STRENGTH TESTER
TWIST	ELECTRONIC TWIST TESTER
SINGLE YARN STRENGTH	USTER DYNAMOMETER
U%	UT 3
HAIRINESS	UT 3
YARN APPEARANCE	B.BOARD WINDER & ASTM std.

5. RESULTS AND DISCUSSION

CONSOLIDATED RESULTS

TABLE 5.1

COUNT 10 s O.E.

T.M.: 5.6

Property / Setting	*0.2 mm*	*0.5 mm*	*0.8 mm*	*1.1mm*
Actual count (Ne)	*10.9*	*10.8*	*10.9*	*10.8*
Strength in lbs	***107.7***	*107.2*	*101.7*	*105.8*
C.S.P	***1174***	*1158*	*1108*	*1143*
Corrected C.S.P	***1190***	*1172*	*1124*	*1157*
Appearance Index	*8.0*	*8.0*	*8.0*	*8.0*
Appearance Grade	*D*	*D*	*D*	*D*
Single yarn strength (gms)	*346.5*	***377.7***	*344.90*	*365.12*
Strength C.V (%)	*24.2*	***18.25***	*24.04*	*20.64*
Elongation %	*6.16*	***6.81***	*6.49*	*6.62*
C.V. % elongation	*11.67*	***10.95***	*15.50*	*14.57*
R.K.M	*5.87*	***6.40***	*5.84*	*6.22*
T.P.I	*18.23*	*18.76*	*18.73*	***18.96***
C.V %	*7.5*	***6.2***	*6.6*	*7.09*
U %	*14.90*	*14.42*	*14.42*	***13.9***
Thin / km	*300*	*474*	*142*	***66***
Thick / km	*467*	*294*	*332*	***205***
Neps / km	*814*	*531*	*495*	***291***
Hairiness	*8.10*	***7.8***	*8.04*	*8.05*

TABLE 5.2

VISCOSE 20s O.E.

T.M : 4.0

Property / Setting	*0.2 mm*	*0.5 mm*	*0.8 mm*	*1.1mm*
Actual count (Ne)	*21.78*	*23.7*	*21.4*	*21.3*
Count C.V %	***4.83***	*10.5*	*6.28*	*6*
Lea strength (lbs)	*79.33*	*70.5*	*76.5*	***83***
Strength C.V(%)	***6.22***	*11.7*	*9.73*	*8.43*
C.S.P	*1727*	*1670*	*1637*	***1768***
Corrected C.S.P	*1755*	*1736*	*1662*	***1791***
Single yarn strength (gms)	*270.36*	*234.96*	*257.28*	***275.4***
Strength C.V %	***10.23***	*16.65*	*17.29*	*10.25*
Elongation at break (%)	*11.26*	*10.95*	*11.09*	***12.02***
C.V (%)	*7.99*	*17.75*	*15.89*	***7.84***
R.K.M	*9.16*	*7.95*	*8.71*	***9.32***
T.P.I.(Average)	*15.1*	***16.37***	*15.12*	*14.73*
Maximum	*16.8*	*19.6*	*16.72*	*17.71*
Minimum	*13.3*	*14.18*	*14.04*	*13.15*
C.V.%	***6.7***	*9.6*	***5.48***	*8.67*
U %	*10.26*	*10.45*	*10.95*	*10.53*
Thin (- 50%) / km	*2.0*	*4*	*3*	***1***
Thick (+ 50%) / km	***2***	*19*	*27*	*22*
Neps (+ 280 %) / km	*7*	*7*	*8*	***5***
Hairiness	***4.69***	*4.83*	*5.15*	*4.75*

SLIVER TEST RESULTS

TABLE 5.3

COTTON : 0.13S SPEED : 25 m/min TIME : 2.5 min

Number	Um %	CVm %	CVm (1m) %	CVm (3m) %
1	4.58	5.79	1.25	0.98
2	4.06	5.08	1.36	1.14
3	4.85	6.11	1.47	0.94
4	4.38	5.52	1.15	1.25
5	4.35	5.53	1.36	1.14

VISCOSE

Number	Um %	CVm %	CVm (1m) %	CVm (3 m) %
1	4.36	5.60	2.08	1.57

TPI TEST RESULTS

TABLE 5.4

COTTON 10s O.E.

TENSION : 30 gms

T.M : 5.6

SETTING 0.2mm		SETTING 0.5mm		SETTING 0.8mm		SETTING 1.1mm	
ROTOR NO.	TPI	ROTOR NO.	TPI	ROTOR NO.	TPI	ROTOR NO.	TPI
A61	16.95	B61	18.43	C61	18.22	D61	17.57
A62	20.62	B62	20.45	C62	18.83	D62	18.71
A63	17.15	B63	18.14	C63	17.31	D63	18.92
A64	18.08	B64	18.81	C64	18.85	D64	18.28
A65	18.16	B65	16.38	C65	19.19	D65	18.50
A66	17.92	B66	18.47	C66	16.85	D66	18.80
A67	18.87	B67	19.79	C67	18.45	D67	20.63
A68	18.64	B68	18.19	C68	21.98	D68	21.70
A69	17.70	B69	19.18	C69	19.64	D69	17.85
A70	17.72	B70	19.89	C70	18.44	D70	18.73
A71	20.80	B71	19.96	C71	19.22	D71	20.87
A72	16.19	B72	17.45	C72	17.86	D72	17.01
AVG	18.23	AVG	18.76	AVG	18.73	AVG	18.96
MAX	20.8	MAX	20.45	MAX	21.98	MAX	21.70
MIN	16.95	MIN	16.38	MIN	16.85	MIN	17.01
C.V	7.5%	C.V	6.2%	C.V	6.64%	C.V	7.09

SINGLE YARN STRENGTH TEST RESULTS

TABLE 5.5

COTTON 10s

ROTOR NO. A 61 – A 72

SETTING 0.2 mm T.M. – 5.6

ROTOR NO.	*SINGLE YARN STRENGTH (gms)*	*STRENGTH C.V (%)*	*ELONGATION AT BREAK (%)*	*C.V % OF ELONGATION*	*R.K.M.*
A61	*510.3*	*6.19*	*6.5*	*10.7*	*8.64*
A62	*226.8*	*14.5*	*5.8*	*8.41*	*3.84*
A63	*384.6*	*17.3*	*6.42*	*13.3*	*6.51*
A64	*372*	*7.03*	*6.30*	*6.3*	*6.30*
A65	*390*	*8.99*	*6.60*	*7.39*	*6.62*
A66	*353.3*	*10.13*	*5.92*	*10.17*	*5.98*
A67	*318.6*	*14.74*	*6.30*	*12.02*	*5.4*
A68	*289.9*	*13.56*	*5.55*	*7.38*	*4.91*
A69	*279*	*9.84*	*6.85*	*13.86*	*4.72*
A70	*325*	*21.98*	*5.42*	*14.43*	*5.51*
A71	*279*	*7.81*	*5.97*	*11.11*	*4.70*
A72	*428.1*	*11.5*	*6.30*	*6.94*	*7.25*
AVERAGE	*346.5*	*24.2*	*6.16*	*11.67*	*5.87*

SINGLE YARN STRENGTH TEST RESULTS

TABLE 5.6

COTTON 10s

ROTOR NO. B 61 – B 72

SETTING 0.5mm T.M. – 5.6

ROTOR NO.	*SINGLE YARN STRENGTH (gms)*	*STRENGTH C.V (%)*	*ELONGATION AT BREAK (%)*	*C.V % OF ELONGATION*	*R.K.M.*
B61	*412.5*	*16.76*	*7.25*	*6.78*	*6.99*
B62	*371.2*	*18.64*	*7.25*	*9.04*	*6.29*
B63	*392.9*	*10.94*	*6.72*	*13.3*	*6.65*
B64	*382.9*	*17.07*	*6.47*	*17.4*	*6.48*
B65	*455.5*	*6.94*	*7.22*	*9.27*	*7.71*
B66	*429*	*14.75*	*7*	*7.47*	*7.27*
B67	*326*	*19.32*	*6.42*	*18.12*	*5.52*
B68	*329*	*9.04*	*6.8*	*4.94*	*5.57*
B69	*382.9*	*10.96*	*7.3*	*3.08*	*6.48*
B70	*319.9*	*11.74*	*6.22*	*9.88*	*5.42*
B71	*298.6*	*7.56*	*6.10*	*9.33*	*5.06*
B72	*432.5*	*9.54*	*6.95*	*3.81*	*7.32*
AVERAGE	*377.7*	*18.25*	*6.81*	*10.95*	*6.4*

SINGLE YARN STRENGTH TEST RESULTS

TABLE 5.7

COTTON 10s

ROTOR NO. C 61 – C 72

SETTING 0.8mm T.M. – 5.6

ROTOR NO.	*SINGLE YARN STRENGTH (gms)*	*STRENGTH C.V (%)*	*ELONGATION AT BREAK (%)*	*C.V % OF ELONGATION*	*R.K.M.*
C61	*375.*	*10.22*	*7.37*	*7.67*	*6.35*
C62	*322*	*22.36*	*5.67*	*49.24*	*5.43*
C63	*409.4*	*13.56*	*6.77*	*16.34*	*6.93*
C64	*369.8*	*27.29*	*6.07*	*18.48*	*6.26*
C65	*405.5*	*12.12*	*7.05*	*10.14*	*6.86*
C66	*411.2*	*16.4*	*7.12*	*8.68*	*6.96*
C67	*371.6*	*16.7*	*6.9*	*17.18*	*6.29*
C68	*219*	*16.88*	*5.37*	*22.06*	*3.7*
C69	*370.7*	*18.19*	*6.95*	*10.86*	*6.27*
C70	*281.2*	*14.81*	*5.97*	*10.3*	*4.76*
C71	*339*	*17.36*	*6.45*	*14.17*	*5.74*
C72	*384.2*	*9.67*	*6.62*	*4.99*	*6.5*
AVERAGE	*344.9*	*24.04*	*6.49*	*15.5*	*5.8*

ROTORWISE RESULTS

TABLE 5.8

COTTON 10s

ROTOR NO. D 61 – D 72

SETTING 1.1mm T.M. – 5.6

ROTOR NO.	*SINGLE YARN STRENGTH (gms)*	*STRENGTH C.V (%)*	*ELONGATION AT BREAK (%)*	*C.V % OF ELONGATION*	*R.K.M.*
D61	*408.6*	*17.05*	*6.97*	*6.14*	*6.91*
D62	*268.1*	*54.91*	*5.45*	*49.32*	*5.04*
D63	*330.3*	*10.75*	*6.57*	*7.83*	*5.59*
D64	*372.5*	*36.51*	*6.80*	*8.16*	*6.30*
D65	*425.1*	*13.76*	*6.50*	*4.90*	*7.19*
D66	*391.0*	*14.93*	*7.01*	*11.77*	*6.62*
D67	*419.4*	*15.56*	*6.95*	*6.60*	*7.10*
D68	*372.0*	*12.62*	*7.55*	*3.41*	*6.29*
D69	*349.4*	*6.17*	*6.65*	*2.65*	*5.91*
D70	*383.8*	*14.35*	*6.72*	*7.49*	*6.49*
D71	*320.3*	*8.91*	*5.85*	*10.63*	*5.42*
D72	*342.5*	*12.02*	*6.6*	*7.39*	*5.8*
AVERAGE	*365.1*	*20.64*	*6.62*	*14.57*	*6.22*

IMPERFECTIONS RESULT

TABLE 5.9

COTTON 10s

SETTING 0.2 mm

ROTOR NO.	U_M %	CV_M %	THIN (-50 %)	THICK (+ 50 %)	NEPS (+ 280 %)	REL.CT (%)	HAIRINESS (-)
A61	13.19	16.8	16	194	304	100.0	7.84
A62	18.83	24.16	1636	1733	2999	100.0	8.42
A63	13.41	16.95	32	124	179	100.0	7.47
A64	14.81	18.98	62	445	909	100.0	7.30
A65	13.79	17.48	50	187	265	100.0	7.54
A66	14.04	17.8	44	223	343	100.0	8.00
A67	17.28	22.02	918	869	1742	100.0	8.89
A68	15.15	19.32	94	538	1075	100.0	9.32
A69	14.10	17.97	31	295	752	100.0	7.32.
A70	14.80	18.85	266	282	404	100.0	8.07
A71	14.99	19.08	100	304	407	100.0	8.27
A72	14.18	18.00	380	410	389	100.0	7.81
AVG	14.90	18.95	300	467	814	100.0	8.05

IMPERFECTIONS RESULT

TABLE 5.1.0

COTTON 10s

SETTING 0.5 mm

ROTOR NO.	U_M %	CV_M %	THIN (-50 %)	THICK (+ 50 %)	NEPS (+ 280 %)	REL.CT (%)	HAIRINESS (-)
B61	13.70	17.36	57	218	334	100.0	7.53
B62	14.98	19.07	94	280	365	100.0	7.40
B63	13.20	16.67	99	126	166	100.0	7.88
B64	14.90	18.99	135	388	494	100.0	7.29
B65	14.74	18.71	160	336	267	100.0	7.49
B66	14.67	18.71	65	405	932	100.0	8.24
B67	15.42	19.64	331	500	1478	100.0	7.90
B68	16.59	21.09	2160	418	771	100.0	8.83
B69	12.48	16.42	19	106	158	100.0	7.61
B70	14.28	18.18	80	247	352	100.0	8.06
B71	15.18	19.32	132	358	816	100.0	8.19
B72	12.99	16.45	21	147	238	100.0	7.60
Mean	14.42	18.38	274	294	531	100.0	7.8

IMPERFECTIONS RESULT

TABLE 5.1.1

COTTON 10s

SETTING 0.8 mm

ROTOR NO.	U_M %	UV_M %	THIN (-50 %)	THICK (+ 50 %)	NEPS (+ 280 %)	REL.CT (%)	HAIRINESS (-)
C61	13.45	17.04	43	176	284	100.0	8.17
C62	13.88	17.61	50	216	293	100.0	7.47
C63	13.01	16.44	20	106	106	100.0	7.60
C64	14.28	18.14	64	259	310	100.0	7.26
C65	15.62	19.93	100	770	610	100.0	8.71
C66	13.64	17.29	46	172	240	100.0	7.90
C67	14.9	18.84	84	392	768	100.0	7.96
C68	14.95	19.00	170	315	564	100.0	8.91
C69	13.36	16.94	23	179	485	100.0	8.20
C70	16.40	20.93	763	642	806	100.0	8.23
C71	14.37	18.29	101	291	396	100.0	7.97
C72	15.17	19.31	236	462	1076	100.0	8.24
Avg.	14.42	18.32	142	332	495	100.0	8.05

IMPERFECTIONS RESULT

TABLE 5.1.2

COTTON 10s

SETTING 1.1 mm

ROTOR NO.	U_M %	CV_M %	THIN (-50 %)	THICK (+ 50 %)	NEPS (+ 280 %)	REL.CT (%)	HAIRINESS (-)
D61	13.67	17.28	46	168	350	100.0	8.2
D62	14.33	18.98	85	245	297	100.0	7.5
D63	13.91	17.54	67	168	117	100.0	7.95
D64	14.21	18.12	70	278	403	100.0	8.12
D65	13.14	16.63	16	155	174	100.0	7.85
D66	13.26	16.80	19	145	177	100.0	7.44
D67	14.52	18.44	86	251	369	100.0	8.12
D68	14.15	17.93	100	218	412	100.0	8.80
D69	12.40	15.67	09	76	97	100.0	7.82
D70	15.30	19.47	216	393	609	100.0	8.10
D71	14.83	17.96	55	214	285	100.0	8.52
D72	13.16	16.69	20	145	198	100.0	8.09
Avg	13.90	17.55	66	205	291	100.0	8.04

TABLE 5.1.3

VISCOSE – 20s

SETTING - 0.2 mm

ROTOR NO. D1 37 TO D1 48

ROTOR No.	*COUNT Ne.*	*STRENGTH (lbs)*	*CSP*
37	***23.1***	***75.2***	***1737***
38	***21.9***	***80.0***	***1752***
39	***21.6***	***74.8***	***1616***
40	***21.6***	***24.0***	***1814***
41	***19.9***	***90.0***	***1791***
42	***20.1***	***82.0***	***1652***
43	***22.4***	***78.0***	***1738***
44	***21.1***	***82.0***	***1730***
45	***22.2***	***83.6***	***1856***
46	***23.8***	***73.6***	***1752***
47	***21.9***	***75.6***	***1656***
48	***21.7***	***73.2***	***1588***
AVG	*21.78*	*79.33*	*1727*

Max. count = 23.8

Min. count = 19 9

Count C.V = 4.83 %

Str. C.V = 6.22 %

Corrected C.S.P. = 1755

COUNT & STRENGTH RESULTS

TABLE 5.1.4

VISCOSE – 20s O.E.

SETTING - 0.5 MM

ROTOR NO.B1 25 TO B1 36

ROTOR NO.	*COUNT Ne.*	*STRENGTH (lbs)*	*CSP*
25	***23.0***	***70***	***1610***
26	***22.0***	***58***	***1276***
27	***22.1***	***76***	***1680***
28	***23.3***	***74***	***1724***
29	***25.6***	***68***	***1740***
30	***23.0***	***76***	***1748***
31	***28.5***	***60***	***1710***
32	***29.0***	***56***	***1624***
33	***22.4***	***70***	***1568***
34	***21.7***	***76***	***1649***
35	***20.9***	***84***	***1755***
36	***22.9***	***78***	***1786***
AVG	*23.7*	*70.5*	*1670*

Max. count = 29.0

Min. count = 20.9

Count C.V % = 10.5 %

Strength C.V % = 11.7%

Corrected CSP = 1736

TABLE 5.1.5

VISCOSE – 20s

SETTING - 0.8 MM

ROTOR NO. B1 49 TO B1 60

ROTOR NO.	COUNT Ne.	STRENGTH (lbs)	CSP
49	**21.4**	**74**	**1583**
50	**22.2**	**74**	**1642**
51	**20.9**	**80**	**1672**
52	**20.9**	**78**	**1630**
53	**20.4**	**84**	**1713**
54	**24.6**	**64**	**1574**
55	**21.6**	**62**	**1339**
56	**22.7**	**78**	**1770**
57	**21.5**	**74**	**1591**
58	**20.9**	**76**	**1588**
59	**19.7**	**80**	**1576**
60	**19.6**	**92**	**1803**
AVG	21.4	76.5	1637

Max. count = 24.6

Min. count = 19.6

Count C.V % = 6.29 %

Strength C.V% = 9.73 %

Corrected CSP = 1662

TABLE 5.1.6

VISCOSE – 20 s

SETTING - 1.1 MM

ROTOR NO. D1 61 TO D1 72

ROTOR NO.	*COUNT Ne.*	*STRENGTH (lbs)*	CSP
61	***21.2***	***82***	1738
62	***19.5***	***96***	1872
63	***19.5***	***90***	1755
64	***19.4***	***90***	1746
65	***21.5***	***84***	1806
66	***21.4***	***84***	1797
67	***22.2***	***76***	1687
68	***22.4***	***70***	1568
69	***23.1***	***78***	1801
70	***23.3***	***76***	1770
71	***21.1***	***82***	1812
72	***21.0***	***88***	1848
AVG	*21.3*	*83*	1767

Max. count = 23.3

Mn. count = 19.4

Count C.V % = 6 %

Strength C.V = 8.43 %

Corrected CSP= 1791

TABLE 5.1.7

VISCOSE 20S O.E

TENSION : 15 GMS.

T.M. - 4.0

SETTING 0.2mm		SETTING 0.5mm		SETTING 0.8mm		SETTING 1.1mm	
ROTOR NO.	TPI	ROTOR NO.	TPI	ROTOR NO.	TPI	ROTOR NO.	TPI
A37	15.3	B25	18.54	C49	15.03	D61	13.41
A38	13.3	B26	18.40	C50	15.26	D62	14.10
A39	16.4	B27	16.52	C51	14.57	D63	13.33
A40	14.9	B28	16.07	C52	16.53	D64	13.15
A41	14.4	B29	15.01	C53	14.04	D65	15.52
A42	14.8	B30	15.38	C54	16.72	D66	15.55
A43	14.6	B31	16.41	C55	15.72	D67	15.18
A44	14.2	B32	19.60	C56	15.32	D68	17.71
A45	14.7	B33	15.52	C57	15.22	D69	14.80
A46	16.4	B34	15.20	C58	14.41	D70	16.14
A47	15.4	B35	14.18	C59	14.61	D71	16.12
A48	16.8	B36	15.62	C60	14.10	D72	13.72
AVG.	15.1	AVG.	16.37	AVG.	15.12	AVG.	14.73
MAX.	16.8	MAX	19.60	MAX	16.72	MAX.	17.71
MIN.	13.3	MIN.	14.18	MIN	14.04	MIN.	13.15
C.V.	6.7 %	AVG.	9.6 %	C.V.	5.48 %	C.V.	8.6 7%

SINGLE YARN STRENGTH RESULTS

TABLE 5.1.8

VISCOSE 20s

SETTINGS 0.2 mm

ROTOR NO. A1 37 - A1 48

ROTOR NO.	*SINGLE YARN STRENGTH (gms)*	*STRENGTH C.V (%)*	*ELONGATION AT BREAK (%)*	*C.V % OF ELONGATION*	*R.K.M.*
37	*262.86*	*11.49*	*11.52*	*13.06*	*8.9*
38	*278.52*	*3.04*	*10.90*	*4.13*	*9.43*
39	*260.28*	*5.12*	*11.47*	*4.96*	*8.81*
40	*256.28*	*5.25*	*12.10*	*7.39*	*10.03*
41	*319.74*	*8.44*	*10.90*	*6.58*	*10.82*
42	*287.16*	*6.72*	*11.02*	*19.34*	*9.72*
43	*261.06*	*6.90*	*11.12*	*4.63*	*8.84*
44	*260.28*	*4.50*	*11.50*	*3.84*	*8.81*
45	*275.94*	*9.66*	*11.50*	*8.20*	*9.34*
46	*234.18*	*3.92*	*10.85*	*4.64*	*7.93*
47	*262.62*	*4.09*	*11.40*	*9.10*	*8.89*
48	*245.94*	*5.25*	*10.82*	*9.05*	*8.32*
AVG	***270.36***	***10.23***	***11.26***	***7.99***	***9.16***

SINGLE YARN STRENGTH RESULTS

TABLE 5.1.9

VISCOSE 20s O.E.

SETTING 0.5 mm

ROTOR NO. - B1 25 - B1 36

ROTOR NO.	*SINGLE YARN STRENGTH (gms)*	*STRENGTH C.V (%)*	*ELONGATION AT BREAK (%)*	*C.V % OF ELONGATION*	*R.K.M.*
25	243.06	6.7	12.07	8.75	8.23
26	219.84	7.84	9.30	33.86	7.44
27	238.86	13.68	10.72	10.07	8.09
28	247.95	13.27	11.60	12.63	8.39
29	228.72	11.22	10.75	26.78	7.74
30	221.64	37.87	10.27	40.89	7.50
31	208.62	5.53	10.85	9.23	7.06
32	174.96	14.49	10.7	9.87	5.92
33	240.72	7.46	11.3	7.6	8.15
34	271.5	6.1	11.82	7.39	9.19
35	271.5	10.64	10.8	15.12	9.19
36	256.38	3.57	11.75	6.51	8.68
AVG	***234.96***	***16.65***	***10.95***	***17.75***	*7.95*

SINGLE YARN STRENGTH RESULTS

TABLE 5.2.0

VISCOSE 20s O.E.

SETTING 0.8 mm

ROTOR NO. C1 49 - C1 60

ROTOR NO.	*SINGLE YARN STRENGTH (gms)*	*STRENGTH C.V (%)*	*ELONGATION AT BREAK (%)*	*C.V % OF ELONGATION*	*R.K.M.*
49	*246.18*	*6.04*	*10.07*	*8.41*	*8.33*
50	*259.38*	*17.0*	*11.20*	*16.92*	*8.78*
51	*278.52*	*6.67*	*12.22*	*6.19*	*9.43*
52	*191.16*	*52.84*	*8.75*	*51.81*	*6.47*
53	*264.18*	*4.88*	*10.62*	*8.99*	*8.94*
54	*222.18*	*17.33*	*11.07*	*15.7*	*7.52*
55	*214.98*	*6.44*	*10.32*	*13.69*	*7.28*
56	*244.62*	*8.8*	*11.90*	*7.93*	*8.28*
57	*246.18*	*2.75*	*10.75*	*6.64*	*8.33*
58	*280.38*	*3.49*	*11.15*	*4.68*	*9.49*
59	*295.98*	*2.47*	*12.42*	*2.97*	*10.02*
60	*287.4*	*9.23*	*11.60*	*8.0*	*9.73*
AVG	***257.28***	***17.29***	***11.09***	***15.89***	***8.71***

SINGLE YARN STRENGTH RESULTS

TABLE 5.2.1

VISCOSE 20s O.E.

SETTING 1.1 mm

ROTOR NO. - D1 61 - D1 72

ROTOR NO.	*SINGLE YARN STRENGTH (gms)*	*STRENGTH C.V (%)*	*ELONGATION AT BREAK (%)*	*C.V % OF ELONGATION*	*R.K.M.*
61	*270.68*	*8.32*	*12.37*	*6.88*	*9.15*
62	*312.72*	*1.47*	*12.42*	*2.97*	*10.59*
63	*299.64*	*3.95*	*12.20*	*3.54*	*10.14*
64	*295.20*	*5.06*	*11.42*	*17.88*	*9.99*
65	*299.16*	*3.68*	*12.52*	*5.73*	*10.13*
66	*259.74*	*10.04*	*11.47*	*10.23*	*8.79*
67	*259.50*	*4.53*	*12.23*	*4.37*	*8.78*
68	*240.42*	*3.87*	*11.75*	*7.48*	*8.14*
69	*246.96*	*5.02*	*11.82*	*4.90*	*8.36*
70	*250.62*	*7.75*	*11.42*	*7.94*	*8.48*
71	*294.96*	*7.77*	*12.57*	*5.96*	*9.99*
72	*275.94*	*9.43*	*12.0*	*6.66*	*9.34*
AVG	***275.4***	***10.25***	***12.02***	***7.84***	***9.32***

IMPERFECTIONS AND U% RESULTS

TABLE 5.2.2

VISCOSE 20s

SETTING 0.2mm

ROTOR NO. - A1 37 - A1 48

ROTOR NO.	*Um %*	*CVm %*	*THIN /KM*	*THICK / KM*	*NEPS / KM*	*REL. COUNT (%)*	*HAIRINESS*
37	10.44	13.2	3	4	5	100	4.68
38	10.13	12.78	1	2	2	100	4.62
39	10.14	12.79	1	0	3	100	4.58
40	9.69	12.22	1	0	2	100	4.69
41	10.0	12.62	1	1	3	100	4.61
42	9.98	12.59	2	0	4	100	4.78
43	11.31	14.27	4	7	11	100	4.67
44	10.82	13.63	2	2	12	100	4.79
45	9.54	12.02	0	1	4	100	4.58
46	10.02	12.62	2	2	7	100	4.79
47	11.20	14.14	4	4	20	100	4.72
48	9.96	12.53	1	1	6	100	4.77
AVG	**10.26**	**12.94**	**2**	**2**	**7**	**100**	**4.69**

IMPERFECTIONS AND U% RESULTS

TABLE 5.2.3

VISCOSE 20s

SETTING 0.5MM

ROTOR NO. - B1 25 - B1 36

ROTOR NO.	*Um %*	*CVm %*	*THIN /KM*	*THICK /KM*	*NEPS / KM*	*REL. COUNT %*	*HAIRINESS*
25	9.96	12.54	2	8	3	100	4.74
26	10.48	13.25	3	20	14	100	5.24
27	10.09	12.70	1	8	3	100	4.61
28	9.90	12.48	2	9	2	100	4.65
29	10.84	13.68	8	24	6	100	4.65
30	10.06	12.68	0	9	2	100	4.85
31	11.66	14.69	9	52	13	100	4.66
32	11.06	13.92	16	13	05	100	5.36
33	11.25	14.22	4	43	23	100	5.09
34	9.87	12.46	1	10	5	100	4.72
35	10.50	13.20	3	24	3	100	4.86
36	9.75	12.30	2	8	6	100	4.55
AVG	**10.45**	**13.17**	**4.25**	**19**	**6.83**	**100**	**4.83**

IMPERFECTIONS AND U% RESULTS

TABLE 5.2.4

VISCOSE 20s

SETTING 0.8 MM

ROTOR NO. C1 49- C1 60

ROTOR NO.	*Um %*	*CVm %*	*THIN /KM*	*THICK /KM*	*NEPS / KM*	*REL. COUNT %*	*HAIRINESS*
49	11.99	15.17	11	121	11	100	6.92
50	11.18	14.11	03	49	9	100	5.73
51	10.61	13.36	1	22	5	100	5.48
52	11.01	13.86	2	14	7	100	4.76
53	10.76	13.56	2	23	5	100	4.92
54	11.25	14.17	3	36	12	100	5.06
55	11.07	13.98	2	39	14	100	4.79
56	10.97	13.83	2	37	7	100	5.01
57	10.56	13.31	1	19	7	100	4.81
58	10.67	13.47	2	30	6	100	4.82
59	10.67	13.45	0	28	6	100	4.80
60	10.66	13.38	1	16	5	100	4.71
AVG	**10.95**	**13.8**	**1**	**16**	**5**	**100**	**5.15**

IMPERFECTIONS AND U% RESULTS

TABLE 5.2.5

VISCOSE 20s O.E.

SETTING 1.1MM

ROTOR NO. - D1 61 - D1 72

ROTOR NO.	*Um %*	*CVm %*	*THIN /KM*	*THICK / KM*	*NEPS / KM*	*REL. COUNT %*	*HAIRINESS*
61	10.33	13.03	0	16	3	100	4.78
62	10.67	13.47	2	23	6	100	4.86
63	10.77	13.58	2	23	2	100	4.72
64	10.58	13.34	1	29	6	100	4.86
65	10.79	13.52	1	18	3	100	4.64
66	10.83	13.67	1	30	8	100	4.79
67	10.59	13.35	0	27	4	100	4.67
68	9.91	12.50	2	14	6	100	4.98
69	10.73	13.54	1	28	10	100	4.76
70	10.80	13.62	1	29	8	100	4.86
71	10.53	13.28	2	23	2	100	4.66
72	9.66	12.17	1	8	3	100	4.53
AVG	**10.53**	**13.25**	**1**	**22**	**5**	**100**	**4.75**

DISCUSSION

COTTON

TABLE 5.2.6

SINGLE YARN STRENGTH

SAMPLE	*Setting*	*Single yarn strength (gms)*	*Strength c.v. (%)*	*Elongation at break (%)*	*c.v.of elongation (%)*	*R.K.M*
A	*0.2 mm*	*346.5*	*24.2*	*6.16*	*11.67*	*5.87*
B	***0.5 mm***	***377.7***	***18.25***	***6.81***	***10.95***	***6.40***
C	*0.8 mm*	*344.9*	*24.04*	*6.49*	*15.50*	*5.84*
D	*1.1 mm*	*365.1*	*20.64*	*6.62*	*14.57*	*6.22*

From the above results, it can be noted that the strength, elongation and R.K.M values are better for sample B than the other samples. Also the strength C.V. and elongation C.V. are minimum for this. So from the single yarn test results, it can be inferred that if the setting is too close or too wide, the single yarn strength results are found to be poor.

The two dimensional graph is plotted against the above mentioned values and is given in the graph.

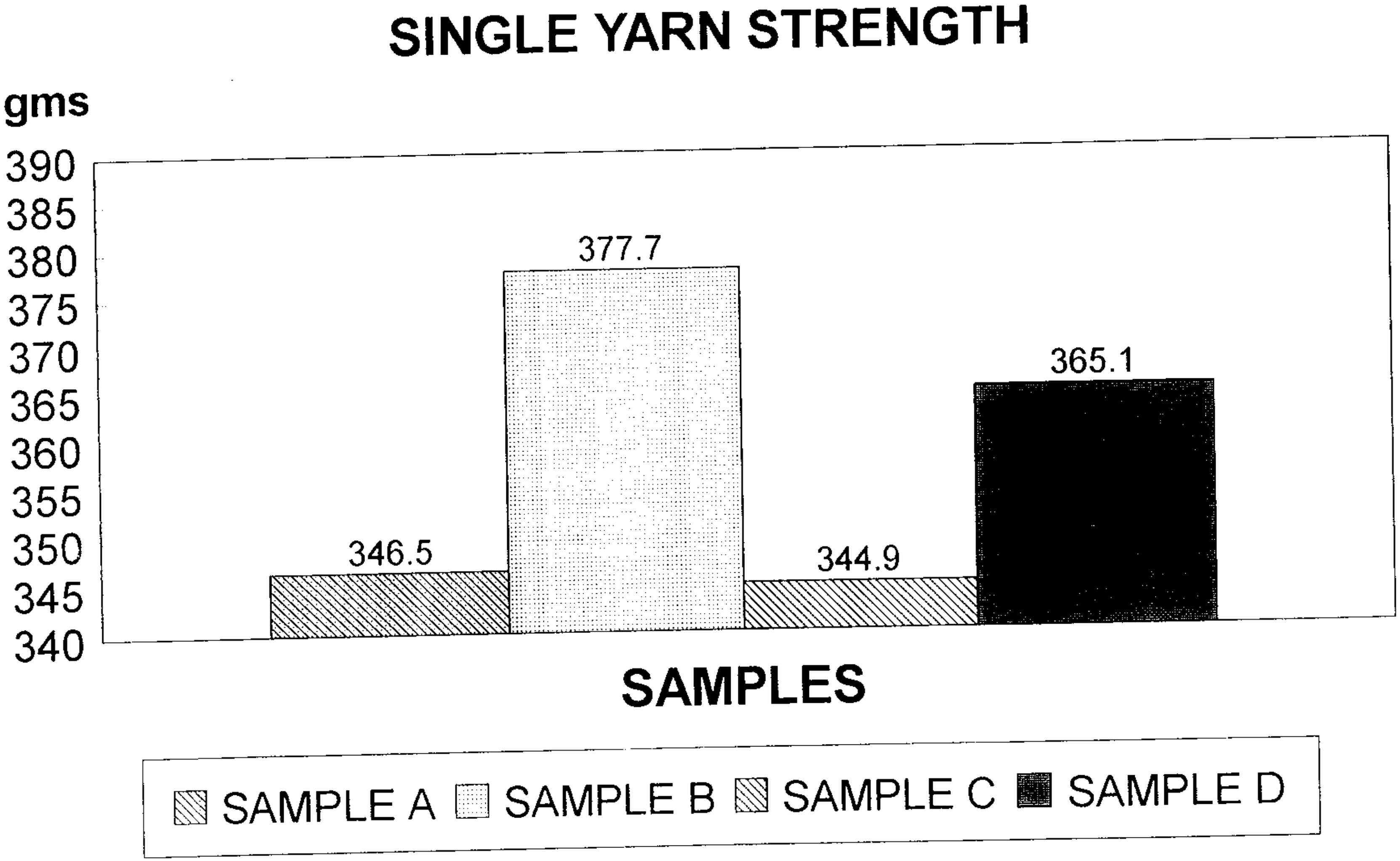

SINGLE YARN STRENGTH
gms
390
385
380
375
370
365
360
355
350
345
340
346.5
377.7
344.9
365.1
SAMPLES
SAMPLE A
SAMPLE B
SAMPLE C
SAMPLE D

TABLE 5.2.7

TPI

SAMPLE	*Setting*	*Avg T.P.I*	*Max.*	*Min.*	*c.v. (%)*
A	*0.2 mm*	*18.23*	*20.8*	*16.95*	*7.5*
B	*0.5 mm*	***18.76***	*20.45*	*16.38*	***6.2***
C	*0.8 mm*	*18.73*	*21.98*	*16.85*	*6.64*
D	*1.1 mm*	*18.96*	*21.70*	*17.01*	*7.09*

For the given T.M the yarn T.P.I should be 18.5. whereas there are some variations in T.P.I are shown in the above table.Yarn in the sample B gives better T.P.I value than the others.

The graph is plotted against the above mentioned values and it is given in graph 2.

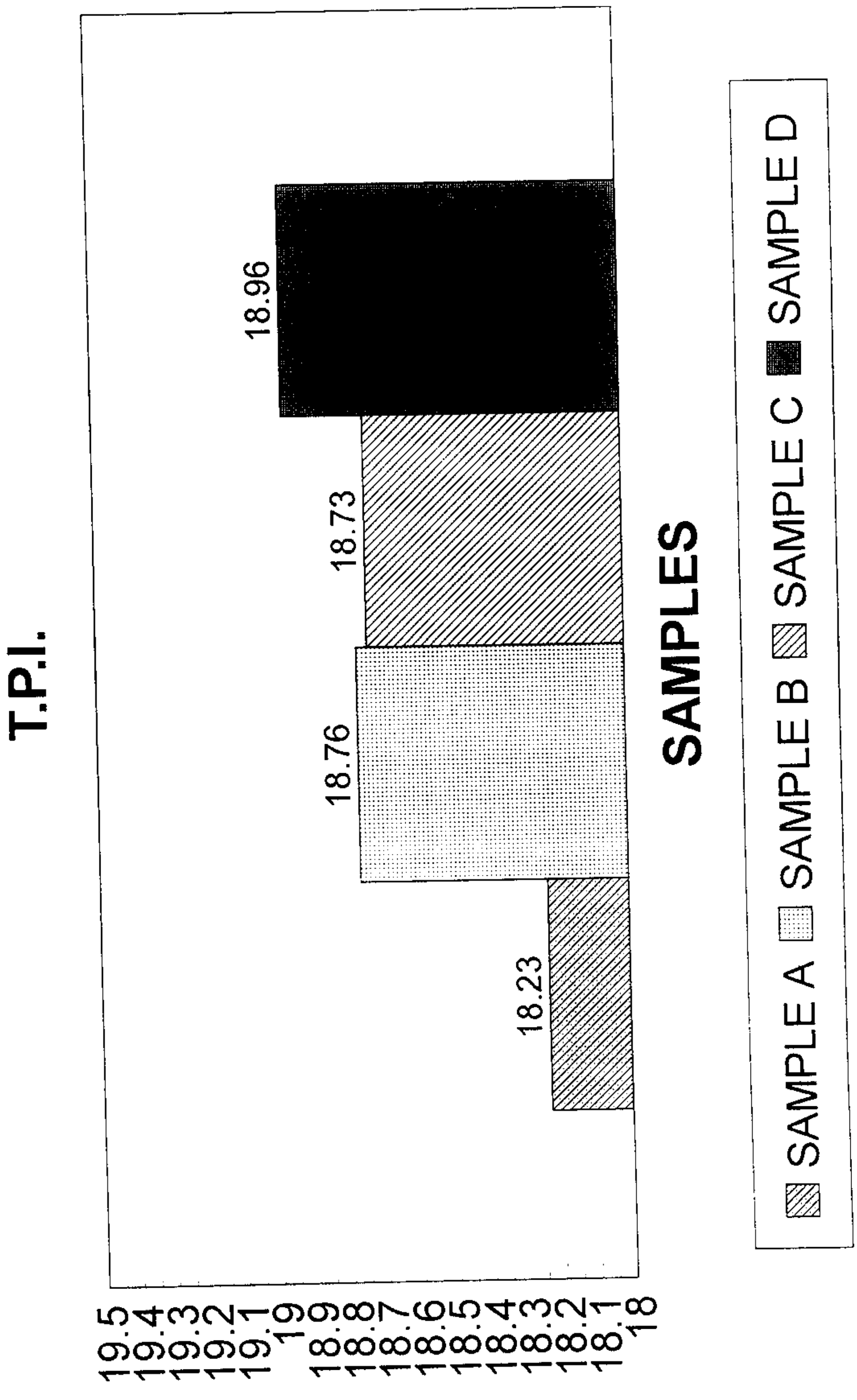

T.P.I.
19.5
19.4
19.3
19.2
19.1
19
18.9
18.8
18.7
18.6
18.5
18.4
18.3
18.2
18.1
18
18.23
18.76
18.73
18.96
SAMPLES
SAMPLE A
SAMPLE B
SAMPLE C
SAMPLE D

TABLE 5.2.8

CSP

SAMPLE	*Setting*	*Count (Ne)*	*Strength (lbs)*	*CSP*	*Corrected CSP*
A	***0.2 mm***	***10.9***	***107.7***	***1174***	***1190***
B	*0.5 mm*	*10.8*	*107.2*	*1158*	*1172*
C	*0.8 mm*	*10.9*	*101.7*	*1108*	*1124*
D	*1.1 mm*	*10.8*	*105.8*	*1143*	*1157*

From the above result, values are not having much variations. However the sample A is having greater values than all other samples. The yarn produced with closer setting gives very good C.S.P. as the fibres slide quickly and and consolidated firmly. The graph is plotted for the above values as in the graph 3.

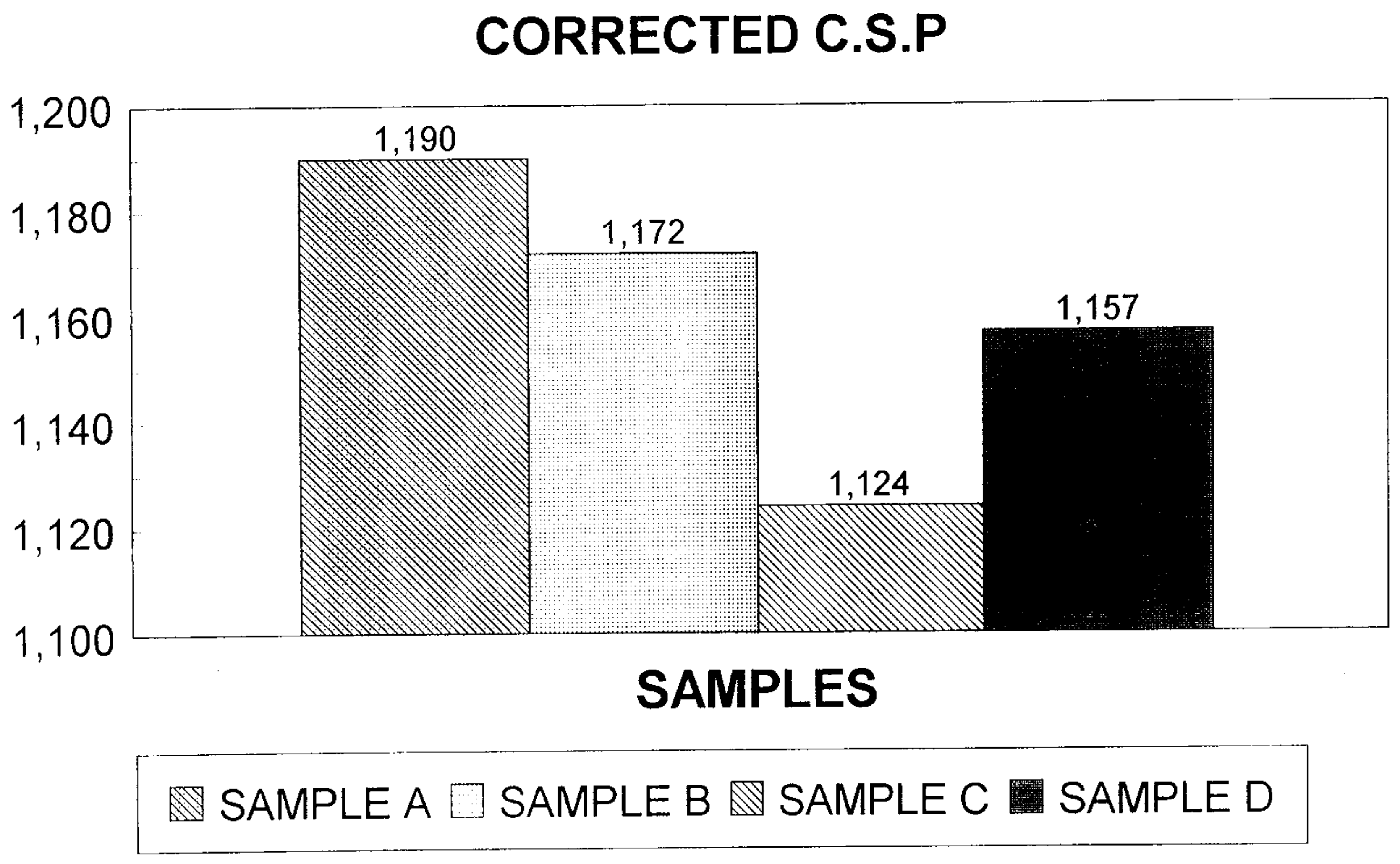

CORRECTED C.S.P
1,200
1,180
1,160
1,140
1,120
1,100
1,190
1,172
1,124
1,157
SAMPLES
▨ SAMPLE A
☐ SAMPLE B
▨ SAMPLE C
■ SAMPLE D

TABLE 5.2.9

IMPERFECTIONS AND U%

SAMPLE	Setting	U%	Thin /km	Thick/km	Neps/km	Hairiness
A	0.2 mm	14.9	300	467	814	8.05
B	0.5 mm	14.42	274	294	531	7.80
C	0.8 mm	14.42	142	332	495	8.05
D	**1.1 mm**	**13.9**	**66**	**205**	**291**	**8.04**

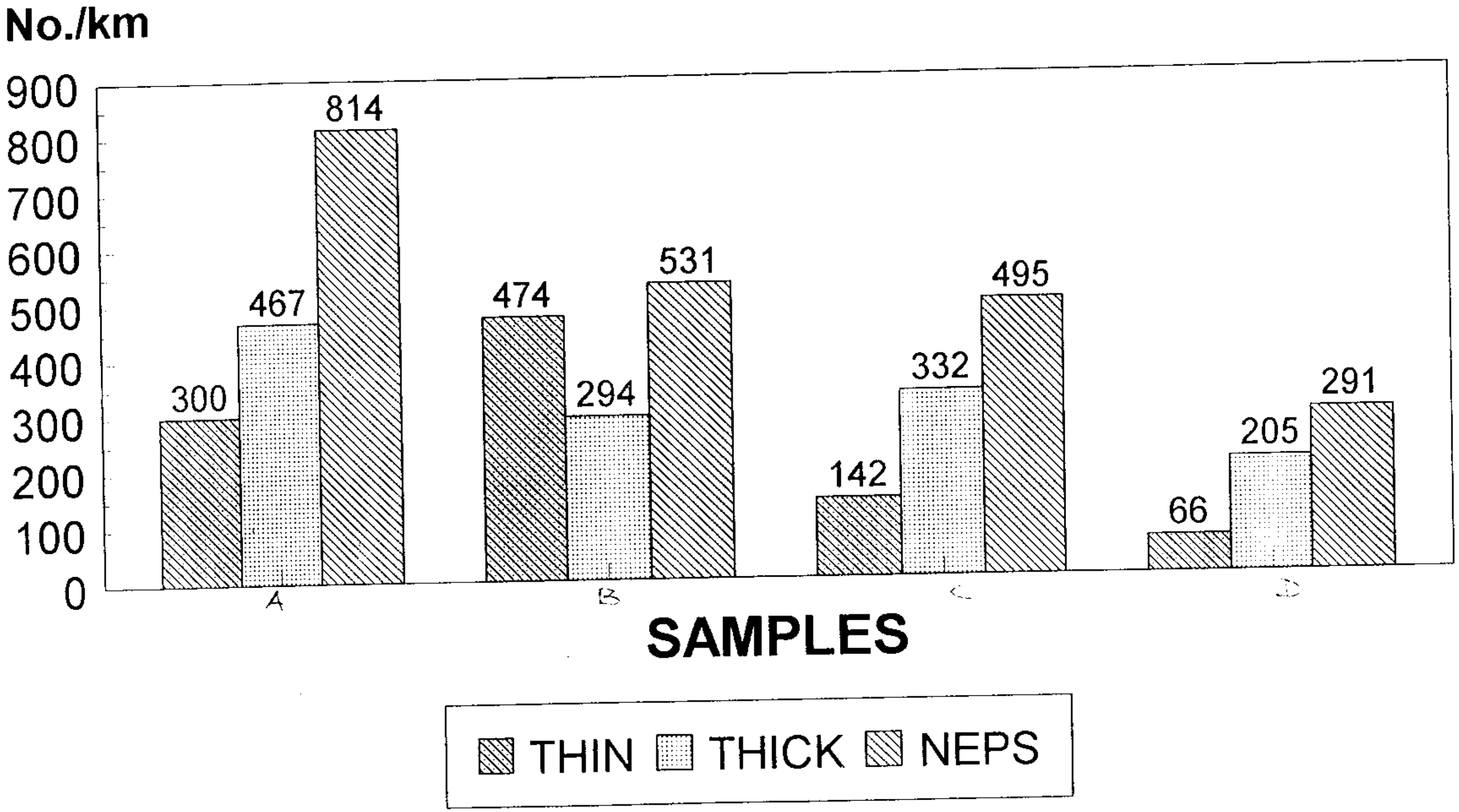
From the above data U% is minimum in the sample D. Out of four samples sample D gives better U% than the other samples. Similarly sample D is having minimum number of imperfections than the others. The percentage of improvement in U% is about 8%. The percentage of reduction in imperfections is given below.

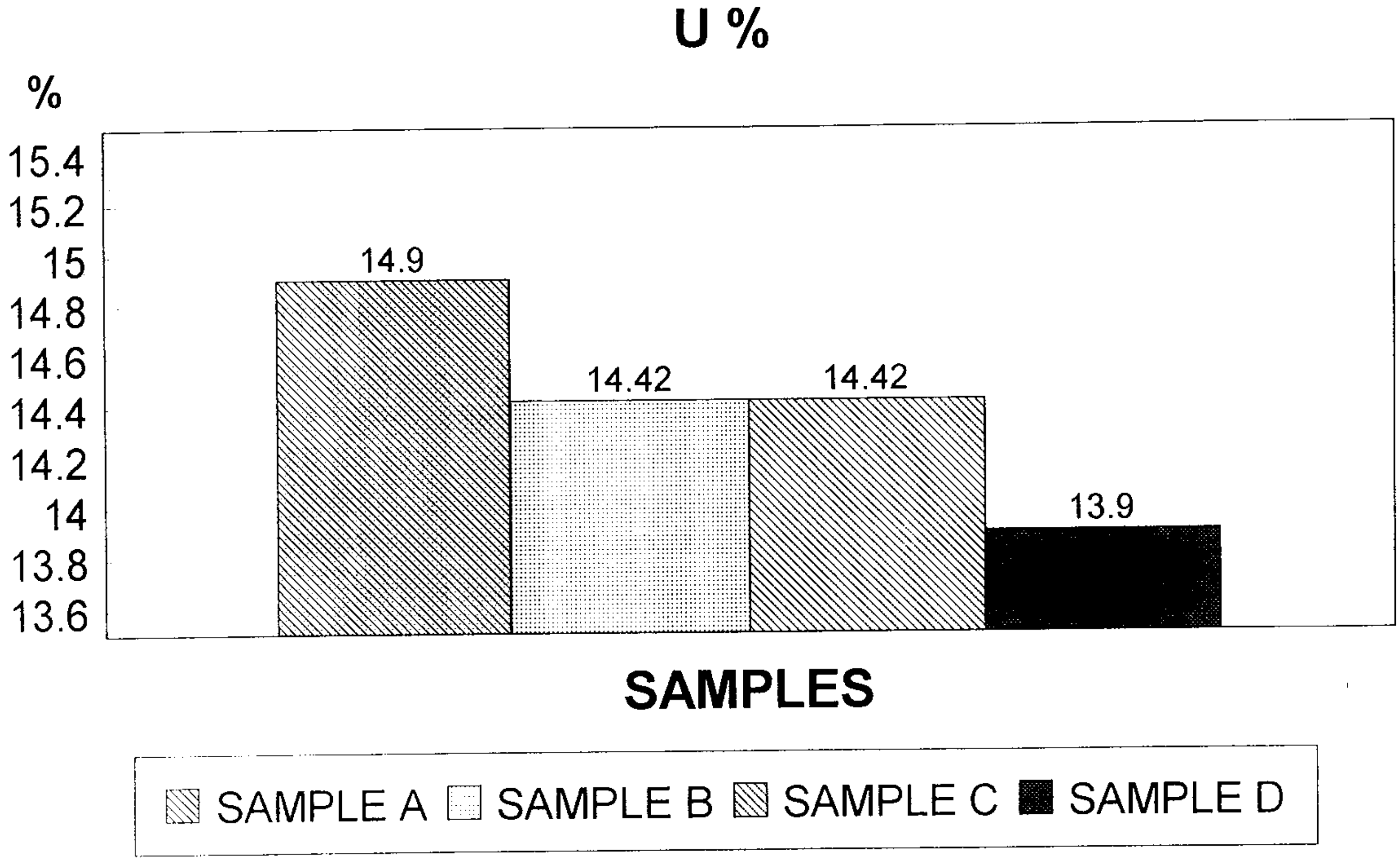
Thin places/km -- 78%

Thick places/km -- 56%

Neps/km -- 64%

IMPERFECTIONS




U %
%
15.4
15.2
15
14.8
14.6
14.4
14.2
14
13.8
13.6
14.9
14.42
14.42
13.9
SAMPLES
▨ SAMPLE A
☐ SAMPLE B
▨ SAMPLE C
■ SAMPLE D

VISCOSE

TABLE 5.3.2

CSP

SAMPLE	Setting	Count Ne.	C.V. (%)	Strength (lbs)	CSP	Corrected CSP	C.V. (%)
A	0.2 mm	21.78	4.83	79.33	1727	1755	6.22
B	0.5 mm	23.7	10.50	70.5	1670	1736	11.70
C	0.8 mm	21.4	6.29	76.5	1637	1662	9.73
D	**1.1 mm**	**21.3**	**6.0**	**83.0**	**1768**	**1791**	**8.43**

From the above results it can be noted that the CSP is more for sample D than sample A (it is little lower i.e. 1727). The count CV and strength C.V. are found minimum for sample A than sample D .

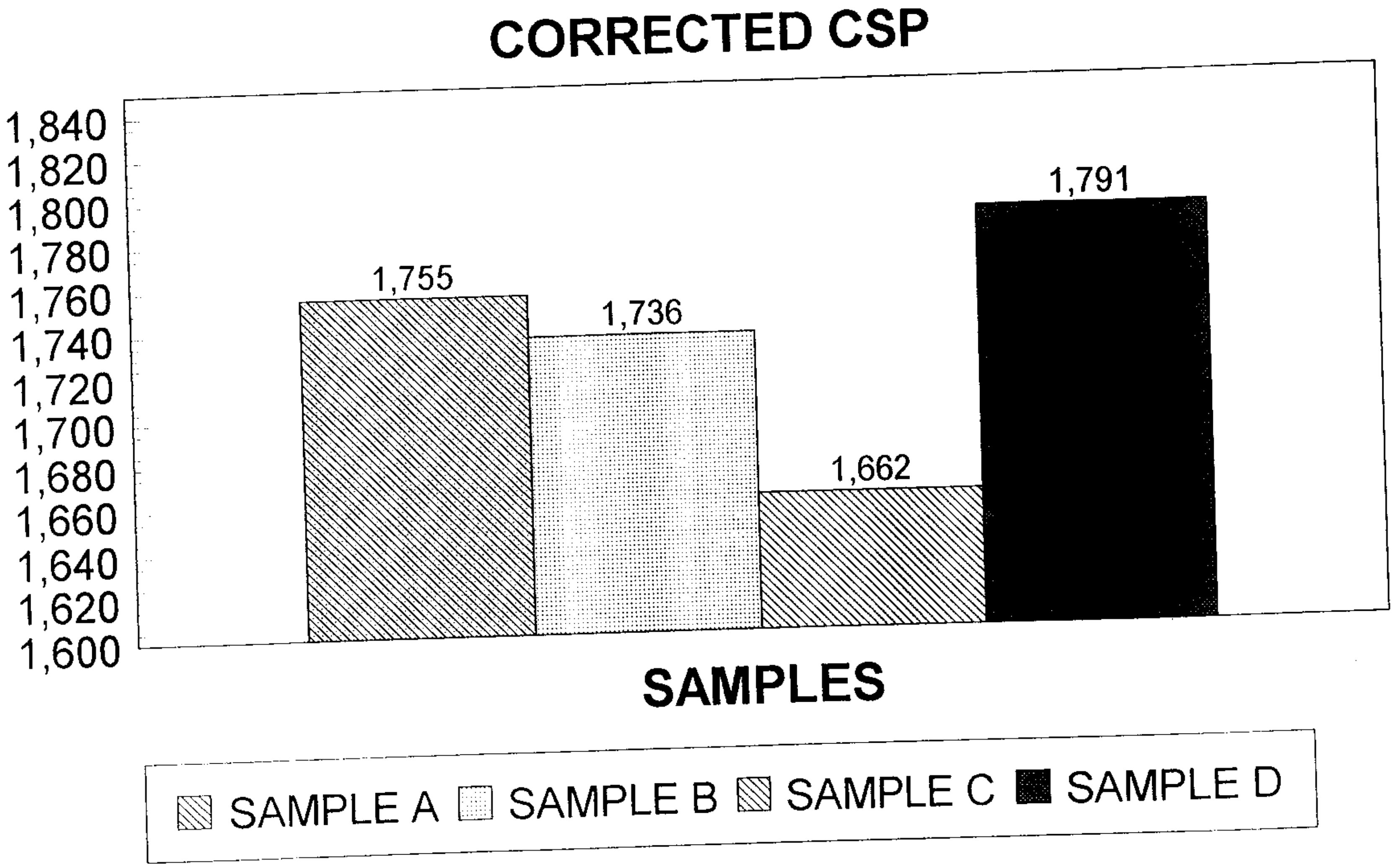

CORRECTED CSP
1,840
1,820
1,800
1,780
1,760
1,740
1,720
1,700
1,680
1,660
1,640
1,620
1,600
1,755
1,736
1,662
1,791
SAMPLES
SAMPLE A
SAMPLE B
SAMPLE C
SAMPLE D

TABLE 5.3.0

SINGLE YARN STRENGTH

SAMPLE	*Setting*	*Strength (gms)*	*Strength C.V.(%)*	*Elongation at break(%)*	*C.V%*	*RKM*
A	*0.2 mm*	*270.36*	*10.23*	*11.26*	*7.99*	*9.16*
B	*0.5 mm*	*234.96*	*16.65*	*10.95*	*17.75*	*7.95*
C	*0.8 mm*	*257.28*	*17.29*	*11.09*	*15.89*	*8.71*
D	***1.1 mm***	***275.40***	***10.25***	***12.02***	***7.84***	***9.32***

It shows that all the results are found to be best for sample D and for sample A they are little poor.

SINGLE YARN STRENGTH

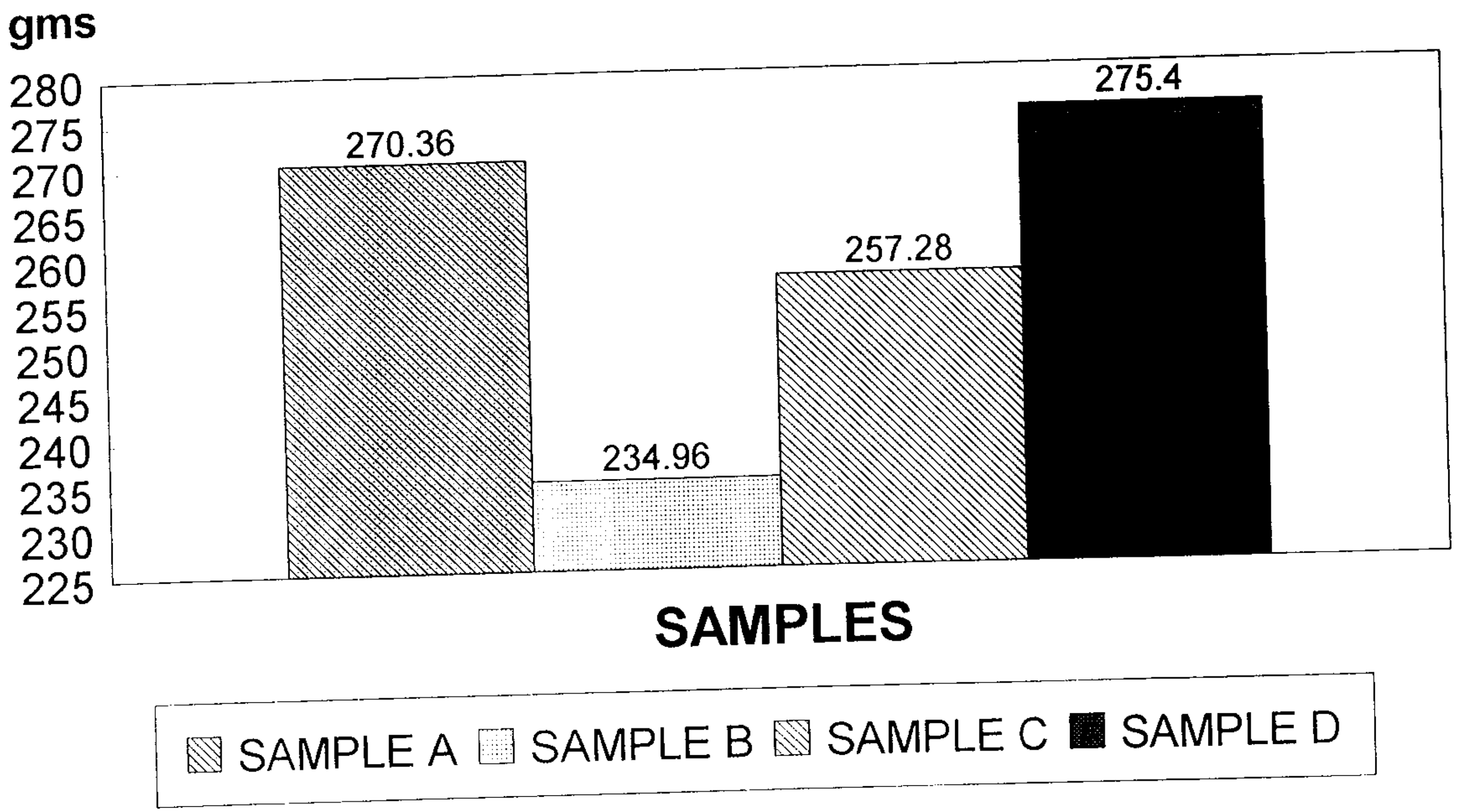


TABLE 5.3.1

TPI

SAMPLE	Setting	Avg	Max.	Min.	C.V.(%)
A	0.2 mm	15.1	16.8	13.3	6.7
B	**0.5 mm**	**16.37**	**19.6**	**14.18**	**9.6**
C	0.8 mm	15.12	16.72	14.04	5.48
D	1.1 mm	14.73	17.71	13.15	8.67

The TPI to be achieved is 17.8. This result is achieved at sample B. The next nearest result is achieved by sample A. But the C.V.% is more in this case.

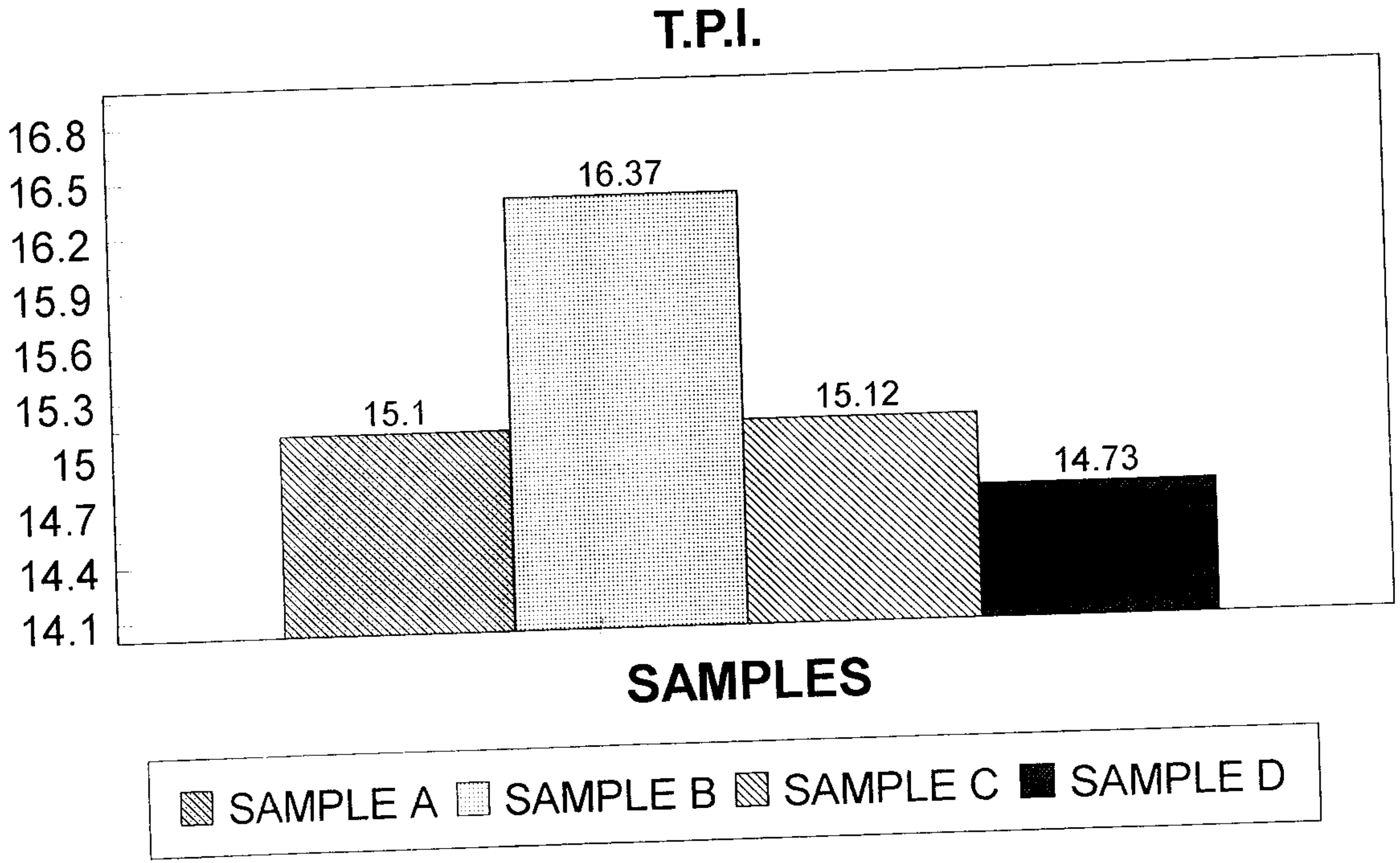
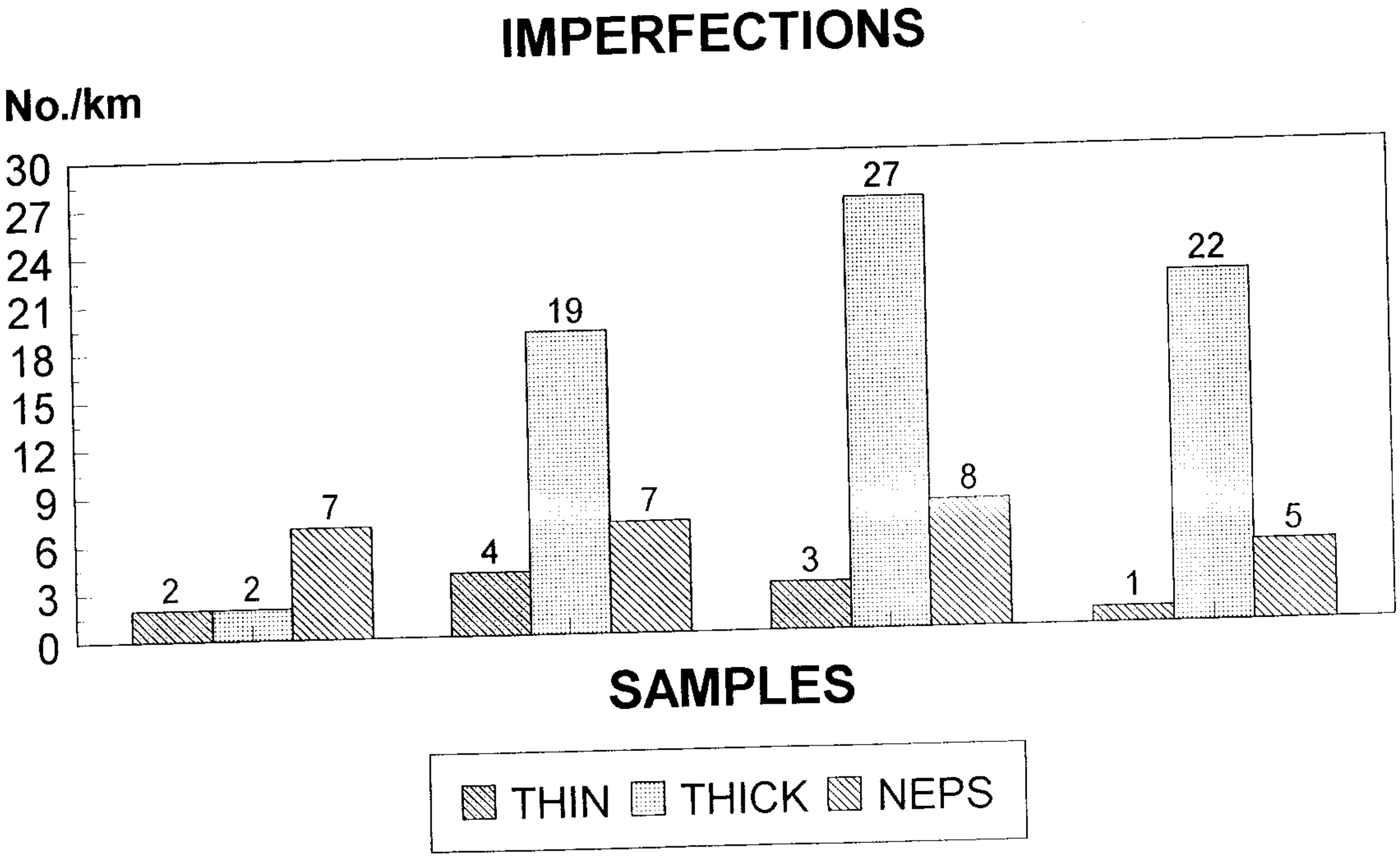

T.P.I.
16.8
16.5
16.2
15.9
15.6
15.3
15
14.7
14.4
14.1
15.1
16.37
15.12
14.73
SAMPLES
▨ SAMPLE A
▒ SAMPLE B
▨ SAMPLE C
■ SAMPLE D

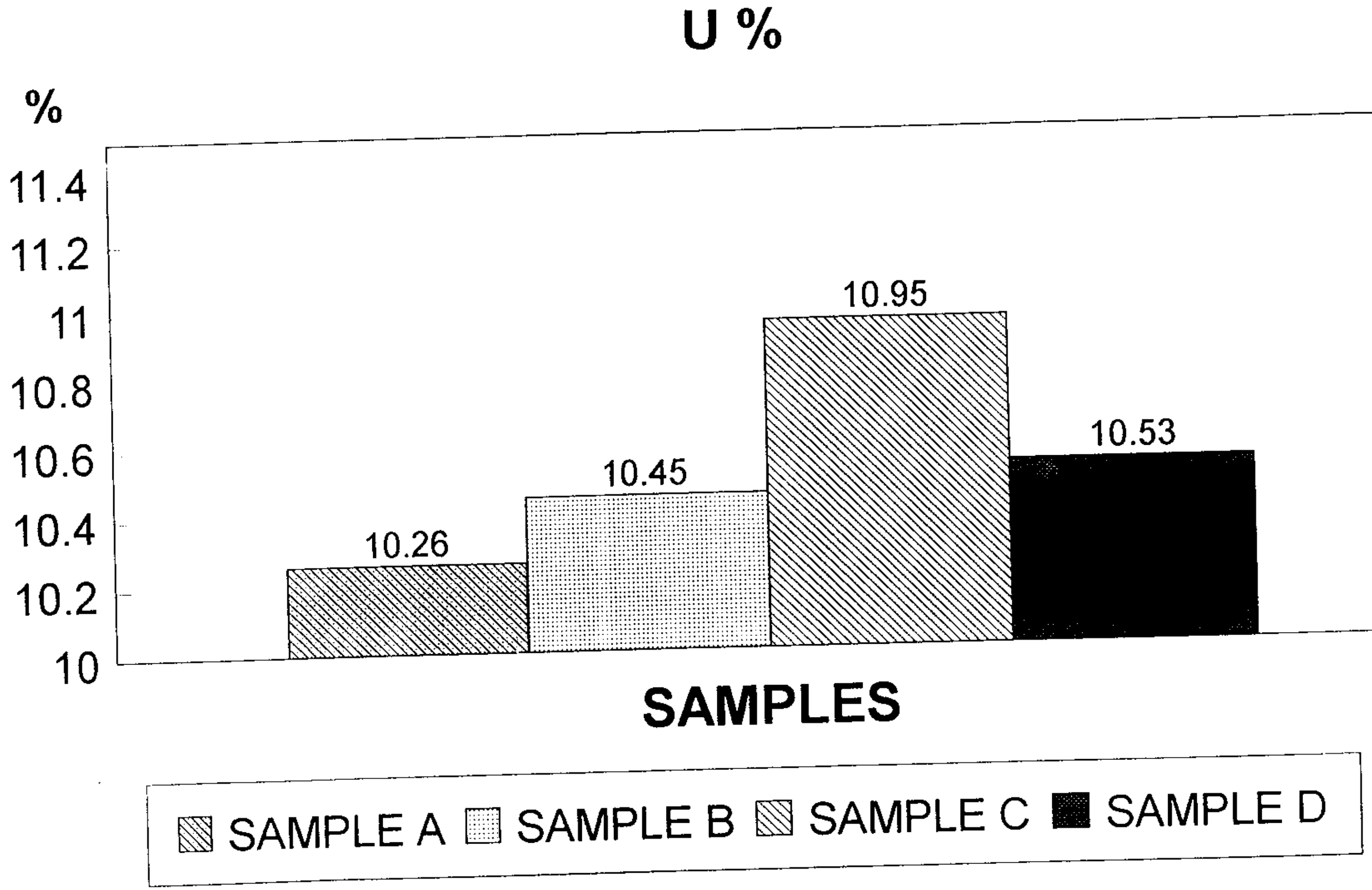
TABLE 5.3.3

IMPERFECTIONS AND U%

SAMPLE	*Setting*	*U %*	*Thin (–50%)*	*Thick (+ 50%)*	*Neps (+280%)*	*Hairiness*
A	***0.2 mm***	***10.26***	***2***	***2***	***7***	***4.69***
B	*0.5 mm*	*10.45*	*4*	*19*	*7*	*4.83*
C	*0.8 mm*	*10.95*	*3*	*27*	*8*	*5.15*
D	*1.1 mm*	*10.53*	***1***	*22*	***5***	*4.75*

From the above data, it is noticed that the U% and the hairiness are found to be minimum for sample A. The thin places and neps are minimum for sample D. But the number of thick places/km is very high in this case. In sample A the number of thick places/km is very less (2/km). Also a small difference is there in the case of thick and thin places. So from these values, sample A can be considered as a better one.


IMPERFECTIONS
No./km
30
27
24
21
18
15
12
9
6
3
0
2
2
7
4
19
7
3
27
8
1
22
5
SAMPLES
▨ THIN
▦ THICK
▨ NEPS


U %
%
11.4
11.2
11
10.8
10.6
10.4
10.2
10
10.26
10.45
10.95
10.53
SAMPLES
SAMPLE A
SAMPLE B
SAMPLE C
SAMPLE D

6. CONCLUSION

COTTON

The sample D which is produced with the setting of 1.1mm from the rotor groove gives better ***U%*** *values. This may be due to the extra time taken by the fibres for better consolidation before it reaches the rotor groove.*

The next important parameter which is influenced by the rotor setting is R.K.M. It reveals that the sample B gives better R.K.M. value than the other samples. The percentage improvement in the value is about 9% when compared to the inferior value.

VISCOSE

As far as viscose is concerned, sample D which is produced with 1.1mm setting gives better R.K.M. (i.e. about 14 %) and U% values.

From this we conclude that, wider the gap between the fibre striking point and the rotor groove, better will be the yarn values.

7. APPENDIX

PROCESS PARAMETERS

COTTON

MIXING

Cotton : 20 %
Flat strips : 30 %
Comber noil : 20%
Droppings : 20%

TOTAL : 100%

FIBRE PARAMETERS

Cotton type : V 797
Staple length : 24.4 mm
Strength : 17.2 gm/tex
Fineness : 5.1 mg/in
U.R. : 47.3%
Trash content : 13 %

BLOW ROOM

OPENING AND CLEANING LINE:

Make of the machines : TRUTZSCHLER-NSE
Year : 1985
Lap hank : 0.00109s Ne.

CARDING

Make : NSE 1984
Sliver hank : 0.11s Ne
Cylinder speed : 320 rpm
Licker in speed : 810 rpm
Flats speed : 7 ½ inches/min
Doffer speed : 18 rpm

SETTINGS

Feed roller to licker in - 18 thou
Licker in – licker in under casing - 4 mm
Licker in – cylinder - 7 thou
Cylinder – cylinder under casing - 60 thou
Cylinder – Doffer – 4 thou
Cylinder – flats – 11 thou

DRAWING

Make – LR DO / 6
Number of doublings – 5
Number of passages –2
Delivery speed – 300 mpm
Sliver hank – 0.13s Ne

ROTOR SPINNING

Make – Schlafhorst autocoro
Fibre – Cotton waste mixing
Count – 10^s Ne
Sliver hank - 0.13s Ne
T.M. – 5.4
T.P.I / T.P.M. – 17.71 / 697
Rotor speed – 60000 rpm
Rotor dia - 40mm
Take-up speed – 89 mpm
Opening roller speed –6500rpm
Opening roller specification – OB 20
Rotor groove -- T
Navel -spiral type

ROTOR SPINNING

Make – Schlafhorst autocoro

Fibre – 100 % Viscose

Count – 20^s Ne

Sliver hank - 0.135s Ne

Draft – 148

T.M. – 4.0

T.P.I / TPM – 17.89 / 704

Rotor speed – 60,000 rpm

Rotor dia - 40 mm

Take-up speed – 85.23 mpm

Opening roller speed – 6500 rpm

Opening roller specification – OB20

Rotor groove - “T”

Navel - spiral type

VISCOSE

FIBRE PARAMETERS

Make – GRASIM
Cut length – 32 mm
Denier – 1.2 D

BLOWROOM

Make – Trumac 1995
Lap length – 60 m
Lap weight - 19.5 Kg
Lap hank - 0.0018 s Ne

CARDING

Make - LCC
Hank – 0.136s Ne.
Cylinder speed – 320 rpm
Licker – in rpm - 810 rpm
Flats speed – 7 $^{1}/_{2}$ inches / min
Doffer speed – 15 rpm

DRAWING

Make – LR DO / 2 S
Number of passages – 1
Number of doublings – 8
Delivery speed – 250 mpm
Delivery hank – 0.135s Ne

REFERENCE

C.A.Lawrence and K.Z.Chen, Textile Progress, Vol. 13, Rotor Spinning

B.Kevton, Investa, 1980, 11, No.4., September 14.

N.Miyamoto, M.Shiraki and K.Mitsuya, Patent Application

P.Grosberg and K.H.Ho. Appl. Polymer Symp.

Schubert & Salzer Marchinenfabrik AG. BP.1,529, 404.

W.Schaeffler, G.Schaeffler and W.Donath, Patent Application. GB 2, 044, 808A.

Dr.Eric Dyson, Rotor Spinning

J.Ripken, Melliand Textilber, 1980.