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BONAFIDE CERTIFICATE

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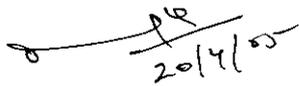
**EFFECT OF MECHANICAL PROCESSES ON COTTON FIBER
CHARACTERISTICS - BLOWROOM AND CARDING**

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20.04.2005

VIVA VOCE held on:.....


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INTERNAL EXAMINER


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Statex Mills

15.04.2005

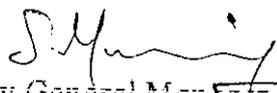
To whomsoever it may concern

This is to certify that the following students of final year B.Tech (Textile Technology) of Kumaraguru college of technology has been under gone project EFFECT OF MECHANICAL PROCESSES BLOWROOM AND CARDING ON COTTON FIBER CHARACTERISTICS from (17.01.2005-07.02.2005).

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திட்டப்பணிச் சுருக்கம்

நூற்பாலையில் முதல்நிலை துகிலியல் இயந்திரங்களைப் பருத்தி இழைக்கு ஏற்படும் மாற்றங்களை ஆராய்தல்

பருத்தி இழையானது பல்வேறு இயந்திரங்கள் வழியாக ப்ராசஸ் செய்யப்பட்டு நூலாக மாற்றப்படுகிறது. இந்த இயந்திரங்களில் ப்ராசஸ் செய்யப்படும்பொழுது பருத்தி இழையில் மாற்றம் ஏற்படும் என்று எதிர்பார்க்கப்படுகிறது. முக்கியமாக முதல்நிலை இயந்திரங்களான ப்ளோ-ரூம் மற்றும் காடிங், பெரும் மாற்றத்தை செய்யும் என்று எதிர்பார்க்கப்படுகிறது. இந்த மாற்றத்தை ஆராய்வது நல்ல தரமான நூலை உற்பத்தி செய்வதற்கும், நூலை வாங்குபவர்கள் எதிர்பார்க்கும் பண்புகளை அடையவும் உகந்ததாக அமையும்.

இந்த ஆய்வில் இரண்டு நூல்களின் (30's மற்றும் 40's) பண்புகள் சோதனைக்கு எடுத்து கொள்ளப்பட்டது. முதல்நிலை இயந்திரங்களால் சில பண்புகள் மட்டும் மாறுபட்டுள்ளன என்பதை புள்ளி விவரக்கணக்கெடுப்பின் மூலம் உறுதி செய்துள்ளோம்

ABSTRACT

Cotton fibers are processed in spinning system from mixing to ring spinning, for converting into yarn. It is expected that, the cotton fiber properties are changing at various stages of spinning, mainly in mechanical processes such as Blow room and Carding, due to opening, cleaning, beating and fiber to fiber individualization processes. Control of fiber properties is important in blow room and carding processes for getting desired good quality yarn, to satisfy the customer needs and compete in the global marketing.

In this project an attempt has been made to study the effect of mechanical processes on changes in cotton fiber characteristics. For sample collection, two mills were chosen in this study. 30^s carded and 40^s combed (MCU 5 and S6) collected at mixing, different stages of Blow room and Carding in each mills. Samples was tested by using Statex HVI, Premier AQURA N, Shirley Trash Analyzer for measuring fiber properties such as 2.5% span length, 50% span length, Uniformity ratio, Fiber fineness, Fiber Maturity, Fiber Strength, Fiber Elongation, Fiber Trash % and neps/grams.

Changes in fiber properties are discussed with help of graphs, in order to know the effect of mechanical processes on each stage and also to see the significant difference of change in fiber properties at every stage. There is not much difference in 2.5% Span length, 50% Span Length ,Fineness, Uniformity ratio, Elongation ,Maturity ratio and Strength properties of MCU -5 fibers, due to the mechanical processes. But significance difference and consistent improvement in Neps level in MCU-5 fibers. In case of S6 fibers, it shows slight significance difference in 2.5% Span length, 50% Span length, Fineness, Uniformity ratio, Maturity ratio and Strength of the fibers. Neps level in S6 fibers are showing significance difference.

TABLE OF CONTENTS

| Chapter No. | TITLE | PAGE No. |
|----------------|---------------------------------------------------------------|-------------|
| | ACKNOWLEDGEMENT | iii |
| | ABSTRACT | iv |
| | LIST OF TABLES | v |
| | LIST OF GRAPHS | vi |
| | OBJECTIVES | 6 |
| 1. | LITERATURE REVIEW | |
| | INTRODUCTION | |
| | 1.1.1. Theory of Opening and Cleaning | 7 |
| | 1.1 BLOWROOM | 7 |
| | 1.1.2. Blow Room methods of Opening and Cleaning | 7 |
| | 1.1.2.1. Opposing spikes | 8 |
| | 1.1.2.2. Beaters | 8 |
| | 1.1.2.3. Air currents | 9 |
| | 1.1.2.4. Separation of the cotton from the air-borne trash | 10 |
| | 1.1.3. Removal of impurities from Cotton | 11 |
| | 1.1.4. Neps generation in Blow room | 11 |
| | 1.2. CARDING | 12 |
| | 1.2.1. Neps removal in Carding | 14 |
| | 1.3 PREVIOUS STUDIES | 15 |
| 2. | 2.0 METHODOLOGY | 17 |
| | 2.1. MATERIALS USED | 17 |
| | 2.1.1 Fibers Used | 17 |
| | 2.1.2 Testing | 17 |
| | 2.1.3 MACHINE DETAILS | 18 |
| 3. | 2.1.3.1 TECHNICAL DETAILS | 18 |
| 4. | 3.0. RESULTS AND DISCUSSION | 24 |
| 5. | 4.0 APPLICATION t-TEST | 48 |
| 6. | 5. CONCLUSION | 55 |
| | 6. REFERENCES | 56 |

| S.No | LIST OF TABLES | PAGE NO |
|------|----------------------------------------------------------------------------------|---------|
| 1. | FIBRE PROPERTIES IS MEASURED BY THE FOLLOWING INSTRUMENTS | 17 |
| 2. | BLOW ROOM LINE SPEED AND SETTINGS | 19 |
| 3. | CARDING MACHINE SPEED DETAILS | 20 |
| 4. | LIST OF FIBRE PROPERTIES FOR MCU-5 (30 ^S Carded) IN DIFFERENT STAGES. | 22 |
| 5. | LIST OF FIBRE PROPERTIES FOR MCU-5 (30 ^S Carded) IN DIFFERENT STAGES. | 23 |
| 6. | LIST OF FIBRE PROPERTIES FOR S6 (40 ^S Combed) IN DIFFERENT STAGES. | 24 |
| 7. | LIST OF FIBRE PROPERTIES FOR S6 (40 ^S Combed) IN DIFFERENT STAGES. | 25 |
| 8. | LIST OF MEAN, VARIANCE AND DEGREE OF FREEDOM VALUES | 26 |
| 9. | LIST OF CALCULATED AND ACTUAL t-TEST VALUES FOR MCU- 5 | 51 |
| 10. | LIST OF CALCULATED AND ACTUAL t-TEST VALUES FOR S6: | 53 |

| S.No | List of Graphs | Page No |
|------|-------------------------------------------------------------------------------------|---------|
| 1. | Effects of mechanical processes on 2.5 % span length of fibers (30 ^s K). | 28 |
| 2. | Effects of mechanical processes on 50%span length of fibers (30 ^s K). | 29 |
| 3. | Effect of mechanical processes on Fineness of fibers (30 ^s K). | 30 |
| 4. | Effect of mechanical processes on Uniformity ratio of fibers (30 ^s K). | 31 |
| 5. | Effect of mechanical processes on Maturity ratio of fibers (30 ^s K). | 32 |
| 6. | Effect of mechanical processes on Elongation of fibers (30 ^s K). | 33 |
| 7. | Effect of mechanical processes on Strength (g/tex) of fibers (30 ^s K). | 34 |
| 8. | Effect of mechanical processes on Neps (neps/gm) of fibers (30 ^s K). | 35 |
| 9. | Effect of mechanical processes on Trash % of fibers 30 ^s K). | 34 |
| 10. | Effect of mechanical processes on FQI of fibers (30 ^s K). | 37 |

| S.No | List of Graphs | Page No |
|-------------|------------------------------------------------------------------------------------|----------------|
| 11. | Effects of mechanical processes on 2.5% span length of fibers (40 ^s C). | 38 |
| 12. | Effects of mechanical processes on 50% span length of fibers (40 ^s C). | 39 |
| 13. | Effect of mechanical processes on Fineness of fibers (40 ^s C). | 40 |
| 14. | Effect of mechanical processes on Uniformity ratio (40 ^s C). | 41 |
| 15. | Effect of mechanical processes on Maturity ratio of fibers (40 ^s C). | 42 |
| 16. | Effect of mechanical processes on Elongation of fibers (40 ^s C). | 43 |
| 17. | Effect of mechanical processes on Strength (g/tex) of fibers (40 ^s C). | 44 |
| 18. | Effect of mechanical processes on Neps (neps/gm) of fibers (40 ^s C). | 45 |
| 19. | Effect of mechanical processes on Trash % of fibers (40 ^s C). | 46 |
| 20. | Effect of mechanical processes on FQI of fibers (40 ^s C). | 47 |

OBJECTIVES

- To study the effect of mechanical processes on the changes in cotton fiber characteristics in Blow room and Carding (Opening, Cleaning, Beating and Fiber to Fiber individualization).
- To test and analyze the fiber properties (Length, Strength, Fineness, Maturity, Trash and Neps) with help of statistics (t-test) & graphs.

1. INTRODUCTION

1.1 BLOWROOM:

1.1.1. Theory of Opening and Cleaning:

The early stages of material preparation generally involved in removal of impurities from fiber mass by mechanical or chemical mass and the blending of mass to produce a homogenous feed to carding .Several machines are usually arranged in sequence to carry out the cleaning and blending of the fiber mass. The type of the machines and the sequence used will depend on the fiber type and the great to be processed.

Ideally the way to remove trash and dirt particles from within a fiber mass is to physically separate the fibers and allow the foreign particles to fall away or to be pulled off the fibers. If fibers have nonparticulate matter on them that needs to be removed this may be removed by scouring the fiber. In situations where there is a high level of particulate impurities, a combination of chemical and mechanical cleaning may be necessary. The chemical used should degrade the physical properties of the impurities without damaging the fiber. In this way then the impurities can be mechanically removed easily.

In an industrial context, fiber mass has to be processed at rates of hundreds of kilograms per hour for manufacturing operations to be economically viable. Cleaning therefore has to be done progressively, since it is not practical to separate hundreds of kilograms per hour of a fiber mass into individual fibers. It is practical to break up the hundreds of kilograms of fiber into progressively smaller and smaller clumps, called tufts, until we obtain sufficiently small tuft sizes that can then be separated into individual fibers at the required production rate. The action of progressively breaking up the fiber into smaller clumps is referred to as opening.

Opening is the breaking up of the fiber mass in to tufts.

During the process of breaking up the fiber mass into the large tufts, these larger tufts in to smaller tufts and so on, fiber of one part of a tuft bundles like past fiber of the other part. Light particles of the impurities such as dust, are freed and can removed by air current. Large particles of leaf, seed, dirt and sand that are lodged between the fibers are loosened and some are sufficiently freed to be removed by beating the tufts against grid bars are perforated.

Cleaning is the removal of unwanted trash by mechanical means.

Through random variation, fiber from differing parts of the same bale as well as between bales of the same batch of the raw materials will differ in properties and the difference is more marked for natural fibers than man-made fibers. It becomes necessary to mix, as thoroughly as possible, the fiber tufts obtained from the various bales processed.

1.1.2. Blow Room methods of Opening and Cleaning:

The actions used in the blow room include one or more of the following:

1.1.2.1. Opposing spikes:

These are found in bale-breakers, bale-openers, and hopper feeders. They usually give a rough pin action which breaks open large tufts of fibers to form smaller tufts. Closer settings usually give better opening and better mixing, but lower output. A higher speed, but thinner, feed may give good opening and maintain a reasonable production rate.

1.1.2.2. Beaters:

These provide an important action and they are responsible, along with air currents, for removing almost all the impurities removed in the blow room. It involves a mechanical means of releasing the particles of trash by striking heavy blows on the cotton. While being struck, the cotton may be impaled on spikes, may be in a restricted space between the beater and grid bars, or may be under the influence of air currents.

1.1.2.3. Air currents:

Besides a sufficiently powerful fan to provide the air currents, it is also necessary to provide air-tight ducting and machine casings, pre-determined air entry places with the means of controlling the rate of airflow, means of separating the air and trash from the cotton, and a suitable air exit with filters to extract impurities collected by the air.

1.1.2.4. Separation of the cotton from the air-borne trash:

There are three main methods of separating the cotton fibers from the trash particles and the air in which both are being conveyed.

The first involves drawing the air through the holes in a moving perforated surface; the fibers are collected by the screen, but some particles of trash pass through the holes along with the air. A higher speed of the screen gives a thinner film of cotton and therefore better dust separation. Perforated cages, condenser delivery boxes, and the Shirley wheel are types of delivery in which this principle is applied.

The second involves the diversion of the air currents. Well-opened cotton tufts have a high aerodynamic drag coefficient in relation to their mass, whereas trash generally has a low drag coefficient related to its mass. Aerodynamic drag forces will arise when there is a velocity difference between the material and the air current. When a loose tuft of cotton is subjected to a rapid horizontal deceleration, the high mass and virtually zero air-drag force on the trash enables it to be dislodged from the tuft of fibers.

The third method makes use of the different buoyancy of the fibers and trash under the influence of air currents and gravity. The cotton tufts are directed vertically downwards and a stream of air crosses this path horizontally. The near-zero drag force on the trash enables it to continue vertically downwards under the influence of inertia and gravity, whereas the air-drag on the fibers provides horizontal acceleration there by separating them from the trash.

1.1.3. Removal of impurities from Cotton:

The removal of dust and trash is largely dependent on the degree of fiber individualization which can be achieved in processing.

Most of the removal of impurities takes place in the blow room, the objectives of which are to open, clean, blend and mix the fibers, and in conventional blow rooms to form a lap.

Further removal of impurities takes place in carding and (if used) in combing, and there may be some dust removal at the draw frame.

1.1.4. Neps generation in Blow room:



With the present system of beating of cotton for effective cleaning, a certain amount of nep generation in the blow room is inevitable. It is true that in blow room, it is at the same necessary to ensure that the cleaning that is achieved is not done at the cost of excessive nep generation. Neps, once generated are difficult to remove and are likely to result in yarns and fabrics of inferior appearance, which will have poor scale value. Since, it is necessary to ensure that nep generation in blow room is kept under check with such cottons.

- In general, a 100% increase in neps in the blow room can be taken as normal and represents satisfactory performance.
- Polishing of grid bars, adjustment of air currents so as to avoid rolling of fibers avoiding excessive beating at any point, minimizing addition of

soft waste, elimination to the extent possible of immature cottons from the mixing are some of the steps helpful in minimizing nep generation.

- As expected the trash content in lap increased as the number of beating points was reduced, but the effect of blow room treatment was not very much reflected in terms of the trash content of card sliver, the card being able to make up for interior cleaning at blow room.

1.2. CARDING:

Carding is the action of reducing tufts of entangled fiber in to a filmy web of individual fiber by working the tufts between closely spaced surfaces clothed with opposing with sharp points.

It can be easily resent that carding is most effective with very small, well-opened tufts i.e., containing only few tens of fiber. Although the opening and cleaning stages produces tufts on the order of a few milligrams, further opening is required to obtain a uniform feed of suitably small tufts for carding. Beater and feed roller system can be used for intensive opening. Small tufts attached to the sharp points of the beater can be easily removed by a second saw tooth wire covered beater rotating in the opposite direction at a higher surface speed.

The 'Front of the tooth' of the faster beater would be working on the 'back of the tooth' of the slower beater and would strip the tufts from the latter. The principle is that point of tooth to back of tooth gives a stripping action. To disentangled the fibers of the tufts now attached to the faster moving surface, a stationary or much slower moving surface, covered in sharp points, is required to be in close proximity with the faster surface. The motion of the slower surface may be in the same or opposing direction, but the sharp points would be angled to oppose those

of the faster moving surface. Thus the point of tooth to point of tooth gives the carding action. For the individual fibers attached to the faster moving surface, point of tooth to point of tooth may also be used as stripping action to build a web of fibers. (Based on Ref :03)

Whereas the blow room only opens the raw material to flocks, the card must open to stage of individual fibers. This is essential to enable the elimination of impurities and performance of the other operations.

Elimination of foreign matters occurs mainly in the region of the taker-in. Only a small part of the contaminants is carried along with the flat strippings, or faults out at other positions. The degree of cleaning achieved by the modern cards is very high, the range of 80-95%. Thus, the overall degree of cleaning achieved by the blow room and carding room together is as high as 95-99%. Card sliver still contains 0.05-0.3% foreign matter.

In addition to free dust, which can be sucked away as in the blow room, the card also removes a large proportion of the micro particles that are bound to the fibers. Significant fiber / metal or fiber / fiber friction is needed in order to loosen the particles. Both are available at the card in considerable measure: the card is good dust removing machine.

Short fibers only can be eliminated if they are pressed in to the clothing. Since that is not possible with metallic clothing, only the flats can be considered in this context. The ability to select short as opposed to long fibers is based on the fact that long fibers have more contact with the clothing of the main cylinder than the short fibers. Thus longer fibers are continually caught and carried along by the main

cylinder. Short fibers, on the other hand, offer fewer surfaces to the clothing of the main cylinder; they therefore stay caught in the flats clothing, press into it and leave the machine in the flat strippings.

Elimination of short fibers in the card must, however, be viewed in proportion. It is actually very small, as can be readily demonstrated. The card eliminates 1-2% flat strippings; approximately half of the strippings are made up of short fibers. The card therefore eliminates less than 1% short fibers.

The card is often attributed the effect of parallelizing. This is not completely justified, since the fibers in the web are not parallel, although they do have, for the first time, a degree of longitudinal order. A parallel condition is achieved on the main cylinder, but it disappears during the formation of the web between the cylinder and the doffer. Thus, the card can be given the task of creating partial longitudinal orientation but not that creating parallelizing.

1.2.1. Neps removal in Carding:

While the number of neps increases from machine to machine in the blow room, card reduces the remaining number to small fraction. It often falsely assumed that neps are eliminated at card; in fact, they are mostly opened out. Only a fraction of the neps leave the machine unopened via the flats strippings. An improvement in disentangling of neps is obtained by: Closer space between the clothings; sharper clothings; optimal (not too low) speeds of the taker-in; low doffer speeds; lower throughput.

1.3 PREVIOUS STUDIES:

Use of high volume testing instruments (HVI) for selection of cotton and preparation of mixing is increasingly becoming popular in our industry because of their high speed of testing. However, not much use is made of HVI as process control tool in the mills. Hence, a project was under taken by BITRA to find out if HVI could be used for estimating the fiber damage at different stages of spinning. For this purpose, cotton samples collected at mixing, blow room lap, card sliver and finisher drawing sliver stage were compared for fiber properties by both HVI and conventional testing. Spin lab HVI equipment was used for the studies. (ref:01) 50% Span length, uniformity ratio and bundle tenacity show a significant and consistent improvement from card to drawing sliver in card mixing in HVI while no such trend is found in baer sorter and stelometer results. In combed mixing also, bundle tenacity by HVI increases from card to comber and from comber to drawing, while no such increase is found in stelometer results. The crimp removal in drawing and the reduced short fiber content in the clamped beard contribute to the increase in tenacity from card to drawing sliver in HVI. HVI results do not agree well with that of baer sorter in regard to incidence of fiber breakages in blow room.

The influence of fiber openness in the blow room on processibility of cotton and yarn quality has been studied. The change in settings of beater at three different stages of blow room changes the openness of fibers. It is observed that the blow room cleaning efficiency changes with the openness of fiber and the manner in which opening takes places is also important. The changes in fiber openness at blow room do

not appreciably influence the yarn irregularity. With the increase in openness at blow room the yarn tenacity and total imperfections improved but at very high openness, these parameters deteriorate sharply. The optimum degree of opening is found to be 0.622, Which has be obtained to, the settings of 7mm ,6mm and 6mm at porcupine, fine krischner and scutcher krischner beater respectively.(ref :02)

The effects of fiber dyeing, drying, opening and carding during mélange yarn preparation on length and tensile properties of fibers has been studied using three different of Indian cottons, namely S6,DCH32 and MCU5. It is observed that dyeing, drying, opening and carding affect the fiber quality: the effect however varies with the fiber variety.(Ref: 03)

2.0 METHODOLOGY:

2.1. MATERIALS USED

2.1.1 Fibers Used:

MCU-5 and S6 cotton fibers were chosen for this study. These fibers are used to spin 30^sk and 40^sc respectively.

| Name of the Mill | Cotton Fiber Used | Count Spun |
|------------------|-------------------|-------------------|
| Statex Mill | MCU- 5 | 30 ^s k |
| Sangeeth Textile | S6 | 40 ^s c |

2.1.2 Testing:

2.1.2.1 FIBRE PROPERTIES IS MEASURED BY THE FOLLOWING INSTRUMENTS

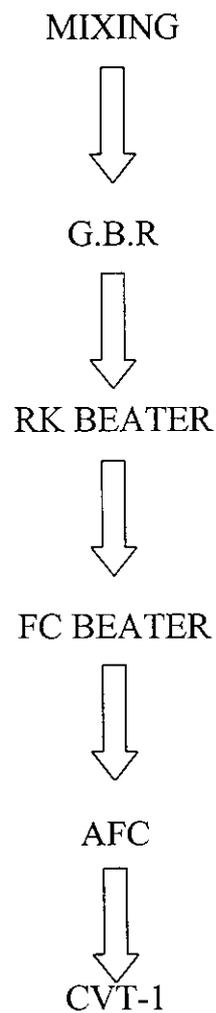
| S. No | Instruments | Parameters Tested |
|-------|------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| 1. | HVI (High Volume Instrument) | 2.5% span length, 50% span length, Uniformity Ratio, Strength, Fineness, Maturity Ratio, Elongation and Short Fiber Content. |
| 2. | Premier AQURA N | Neps/gms |
| 3. | Shirley Trash Analyzer | Lint%, Trash %, Invisible Loss. |

2.1.3 MACHINE DETAILS:

The Blow room machines, speed of the various parts and setting details used for producing 30^s carded yarn are given below.

2.1.3.1 TECHNICAL DETAILS:

a. BLOW ROOM LINE (TRUTZSCHLER) for 30^s carded:



b. BLOW ROOM LINE SPEED AND SETTINGS:

| S. No | PARTS | SPEED (rpm) | SETTING (thou) |
|-------|------------------|-------------|----------------|
| 1. | Inclined lattice | 54.6 | 4 |
| 2. | Bale opener -1 | 496 | 4 |
| 3. | Bale opener -2 | 600 | 4 |
| 4. | Evener Roller | 492 | 4 |
| 5. | Stripper Roller | 729 | 3.5 |
| 6. | AFC Beater | 436 | 4 |
| 7. | AFC Grid bar | ---- | 4/4 |
| 8. | RK Beater | 566 | 3.5 to 5.5 |
| 9. | RK Grid bar | ---- | 4/4 |
| 10. | FC Beater | 620 | 3.5 to 5.5 |
| 11. | FC Feed roller | 6.5 mpm | 3 |
| 12. | FC Grid bar | ---- | 3 |

The Carding machines speed of the various parts and setting details used for producing 30^s carded yarn are shown below.

c. CARDING MACHINE SPEED DETAILS:

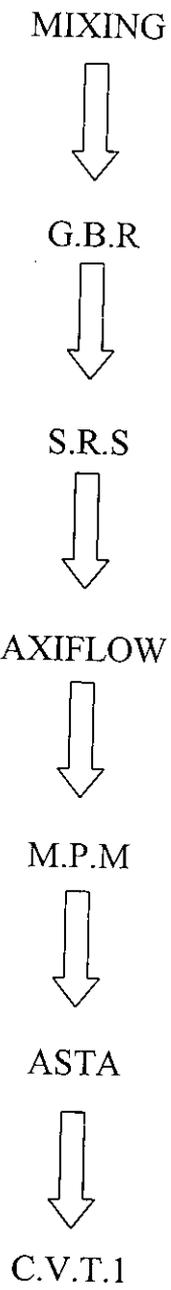
| S.No | PARTS | SPEED (rpm) |
|-------------|--------------|--------------------|
| 1. | CYLINDER | 458 |
| 2. | LICKER -IN | 969 |
| 3. | FLATS | 16"/min |
| 4. | DOFFER | 140mts/min |

d. CARDING MACHINE SETTING DETAILS:

| S.No | PARTS | SETTINGS (thou) |
|-------------|--------------------------|------------------------|
| 1. | CYLINDER - LICKERIN | 8 |
| 2. | FEED PLATE - LICKERIN | 1 |
| 3. | CYLINDER - FLAT | 10, 8, 8 |
| 4. | CYLINDER - DOFFER | 5 |

The Blow room machines, speed of the various parts and setting details used for producing 40^s combed yarn are shown below.

e. BLOW ROOM LINE (TRUTZSCHLER) for 40°Combed:



f. BLOW ROOM LINE SPEED AND SETTINGS:

| S.No | PARTS | SPEED (rpm) | SETTING (thou) |
|------|------------------|-------------|----------------|
| 1. | Inclined lattice | 54.6 | 4 |
| 2. | Bale opener -1 | 496 | 4 |
| 3. | Bale opener -2 | 600 | 4 |
| 4. | GBR | 482,591 | 4 |
| 5. | SRS | 550 | 4 |
| 6. | AFC Beater | 432 | 4 |
| 7. | AFC Grid bar | ---- | 4/4 |
| 8. | MPM | 275 | 3.5 to 5.5 |
| 9. | ASTA | 450 | 4/4 |
| 10. | CVT – 1 | 800 | 4 |

The Carding machines speed of the various parts and setting details used for producing 40^s combed yarn are shown below.

g. CARDING MACHINE SPEED DETAILS

| S.No | PARTS | SPEED (rpm) |
|-------------|--------------|--------------------|
| 1. | CYLINDER | 460 |
| 2. | LICKER -IN | 970 |
| 3. | FLATS | 17"/MIN |
| 4. | DOFFER | 140MPM |

f. CARDING MACHINE SETTING DETAILS:

| S.No | PARTS | SETTINGS (thou) |
|-------------|--------------------------|------------------------|
| 1. | CYLINDER - LICKERIN | 8 |
| 2. | FEED PLATE – LICKERIN | 2 |
| 3. | CYLINDER – FLAT | 10,9,9 |
| 4. | CYLINDER – DOFFER | 4 |

3.0. RESULTS AND DISCUSSION:

The results of 2.5 % Span length, 50% Span length, maturity ratio, Uniformity ratio, Elongation, Strength, Neps/grams, Trash % of the MCU-5 and S6 fibers are given in the following tables 5.1, 5.2,5.3 & 5.4.

3.1. LIST OF FIBRE PROPERTIES FOR MCU-5 (30^S Carded) IN DIFFERENT STAGES:

| STAGES | 50% Span length | 2.5% Span length | Fineness $\mu\text{g / inch}$ | Uniformity ratio |
|---------------------|-----------------|------------------|-------------------------------|------------------|
| MIXING | 14.90 | 31.2 | 3.69 | 47.7 |
| G.B.R (M.B.O) | 15.30 | 31.3 | 3.71 | 48.9 |
| R.K (BEATER) | 15.00 | 31.1 | 3.69 | 48.3 |
| F.C (BEATER) | 14.7 | 31.3 | 3.70 | 47.0 |
| A.F.C (BEATER) | 14.9 | 31.3 | 3.68 | 47.7 |
| TRUTZSCHLER CARD | 15.4 | 31.0 | 3.56 | 49.5 |
| LC 300 A | 15.2 | 31.0 | 3.61 | 49.1 |

3.2. LIST OF FIBRE PROPERTIES FOR MCU-5 (30^S Carded) IN DIFFERENT STAGES:

| STAGES | Maturity ratio | Elongation % | Strength g/tex | Neps /g | Trash % | FQI |
|-------------------------|-----------------------|---------------------|-----------------------|----------------|----------------|------------|
| MIXING | 0.78 | 5.0 | 23.84 | 374 | 5 | 75.0 |
| G.B.R (M.B.O) | 0.78 | 5.0 | 23.28 | 444 | 3.5 | 74.8 |
| R.K (BEATER) | 0.76 | 4.9 | 23.84 | 440 | 4 | 73.7 |
| F.C (BEATER) | 0.74 | 4.9 | 23.50 | 645 | 3 | 69.0 |
| AFC (BEATER) | 0.76 | 5.0 | 23.86 | 404 | 3 | 73.42 |
| TRUTZSCHLER CARD | 0.73 | 4.9 | 23.68 | 84 | 2.5 | 74.77 |
| LC 300 A CARD | 0.73 | 4.9 | 23.40 | 81 | 2 | 71.9 |

3.3. LIST OF FIBRE PROPERTIES FOR S6 (40^S Combed) IN DIFFERENT STAGES:

| STAGES | 50% Span length | 2.5% Span length | Fineness μg /inch | Uniformity ratio |
|-------------------------------|------------------------|-------------------------|------------------------------------------------|-------------------------|
| MIXING | 13.7 | 28.3 | 4.05 | 48.8 |
| G.B.R (M.B.O) | 13.8 | 28.2 | 4.05 | 48.9 |
| S.R.S (BEATER) | 13.6 | 28.6 | 4.13 | 47.7 |
| A.F.C (BEATER) | 13.4 | 27.9 | 4.14 | 48.1 |
| M.P.M (MULTIMIXER) | 13.4 | 28.4 | 4.10 | 47.3 |
| ASTA (BEATER) | 13.9 | 28.4 | 4.14 | 49.1 |
| C.V.T-1 | 13.3 | 28.3 | 4.12 | 47.0 |
| TRUTZSCHLER CARD | 13.1 | 27.7 | 3.98 | 47.3 |

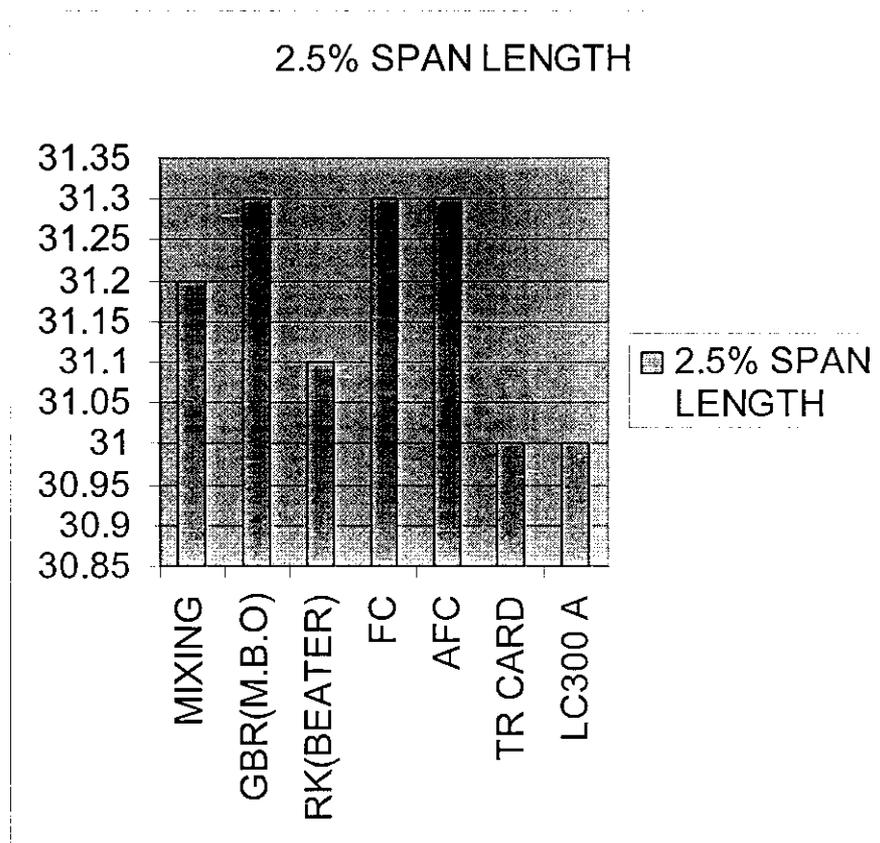
3.4. LIST OF FIBRE PROPERTIES FOR S6 (40^S Combed) IN DIFFERENT STAGES:

| STAGES | Maturity ratio | Elongation % | Strength g/tex | Neps /g | Trash % | FQI |
|-------------------------------|-----------------------|---------------------|-----------------------|----------------|----------------|------------|
| MIXING | 0.80 | 5.0 | 22.37 | 279 | 5 | 60.50 |
| G.B.R (M.B.O) | 0.80 | 5.0 | 22.38 | 342 | 4 | 61.00 |
| S.R.S (BEATER) | 0.80 | 5.0 | 22.62 | 325 | 3.5 | 59.58 |
| A.F.C (BEATER) | 0.80 | 5.0 | 21.62 | 323 | 3 | 55.98 |
| M.P.M (MULTIMIXER) | 0.78 | 5.0 | 22.72 | 386 | 2 | 57.91 |
| ASTA (BEATER) | 0.79 | 5.0 | 22.30 | 367 | 2 | 59.14 |
| CVT-1 | 0.80 | 5.0 | 21.16 | 484 | 2 | 52.59 |
| TRUTZSCHLER CARD | 0.76 | 5.0 | 21.84 | 51 | 2.5 | 54.63 |

The results of 2.5 % span length, 50% span length, Uniformity ratio, Maturity ratio, Elongation, Strength, Neps/gram and Trash% of the MCU-5 fiber are shown in the following graphs.

3.1.1 Effect of mechanical processes on 2.5 % SPAN LENGTH of fibers (30^s K).

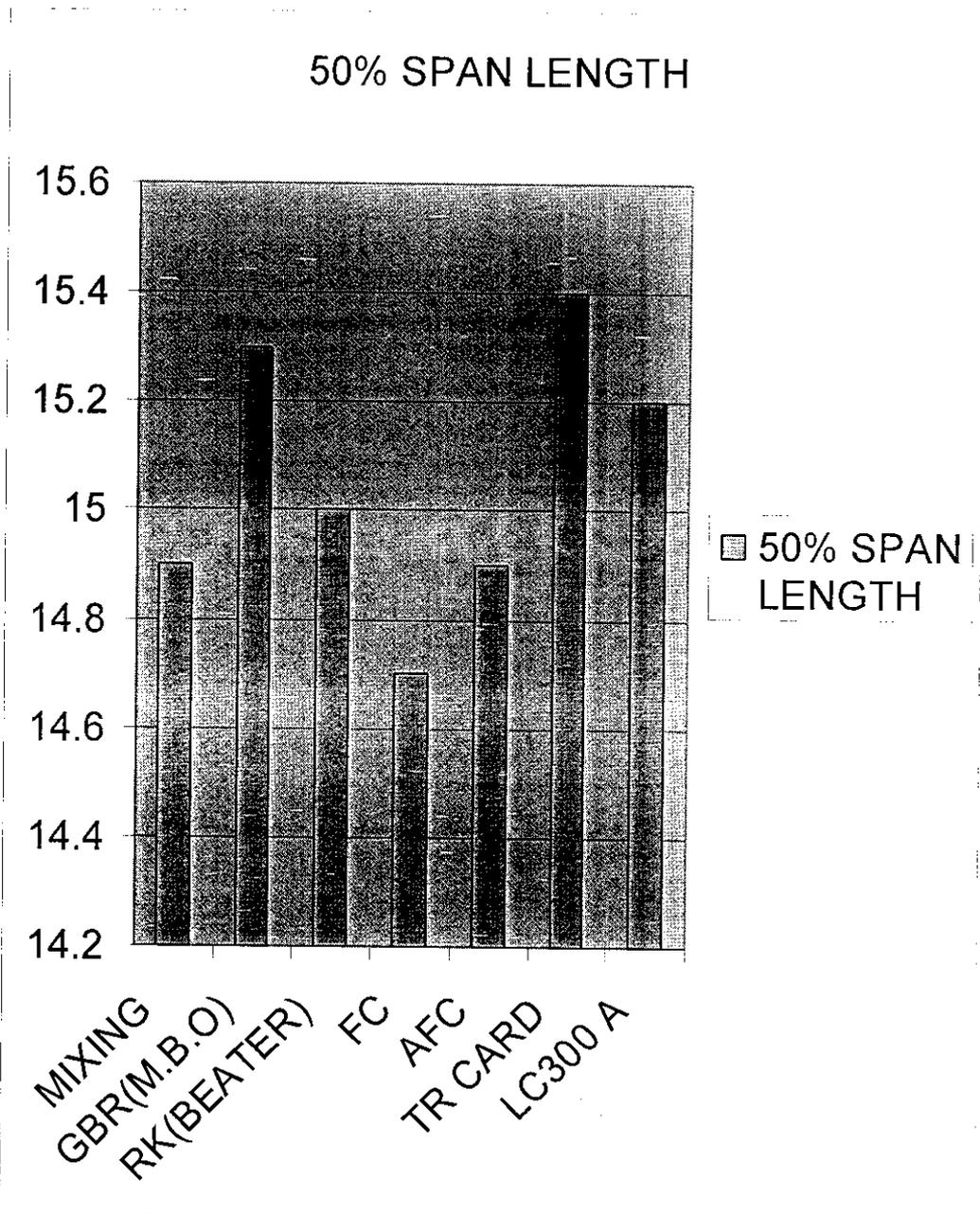
50 % SPAN LENGTH of fibers (30^sk)



There is no significance difference in 2.5% Span length.

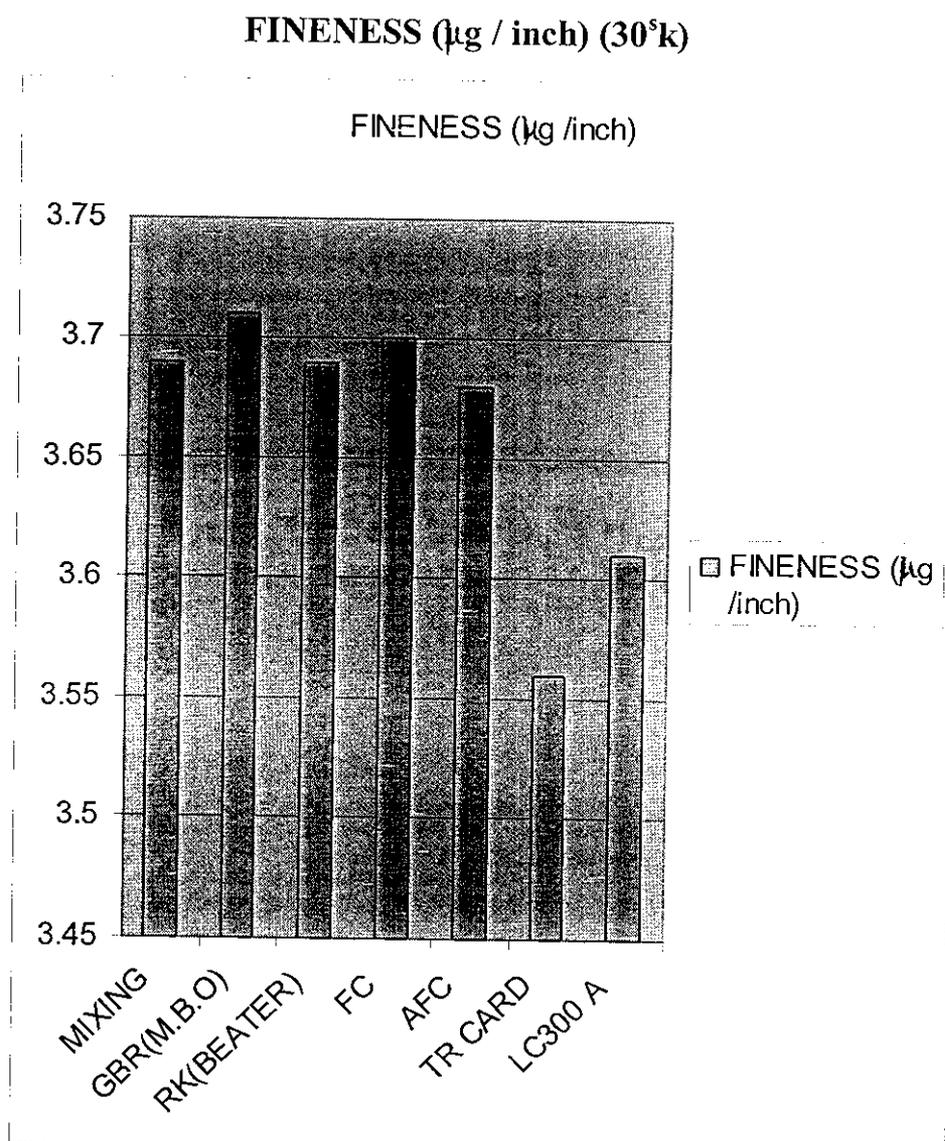
3.1.2 Effect of mechanical processes on 50%SPAN LENGTH of fibers (30^s K).

50 % SPAN LENGTH of fibers (30^sk)



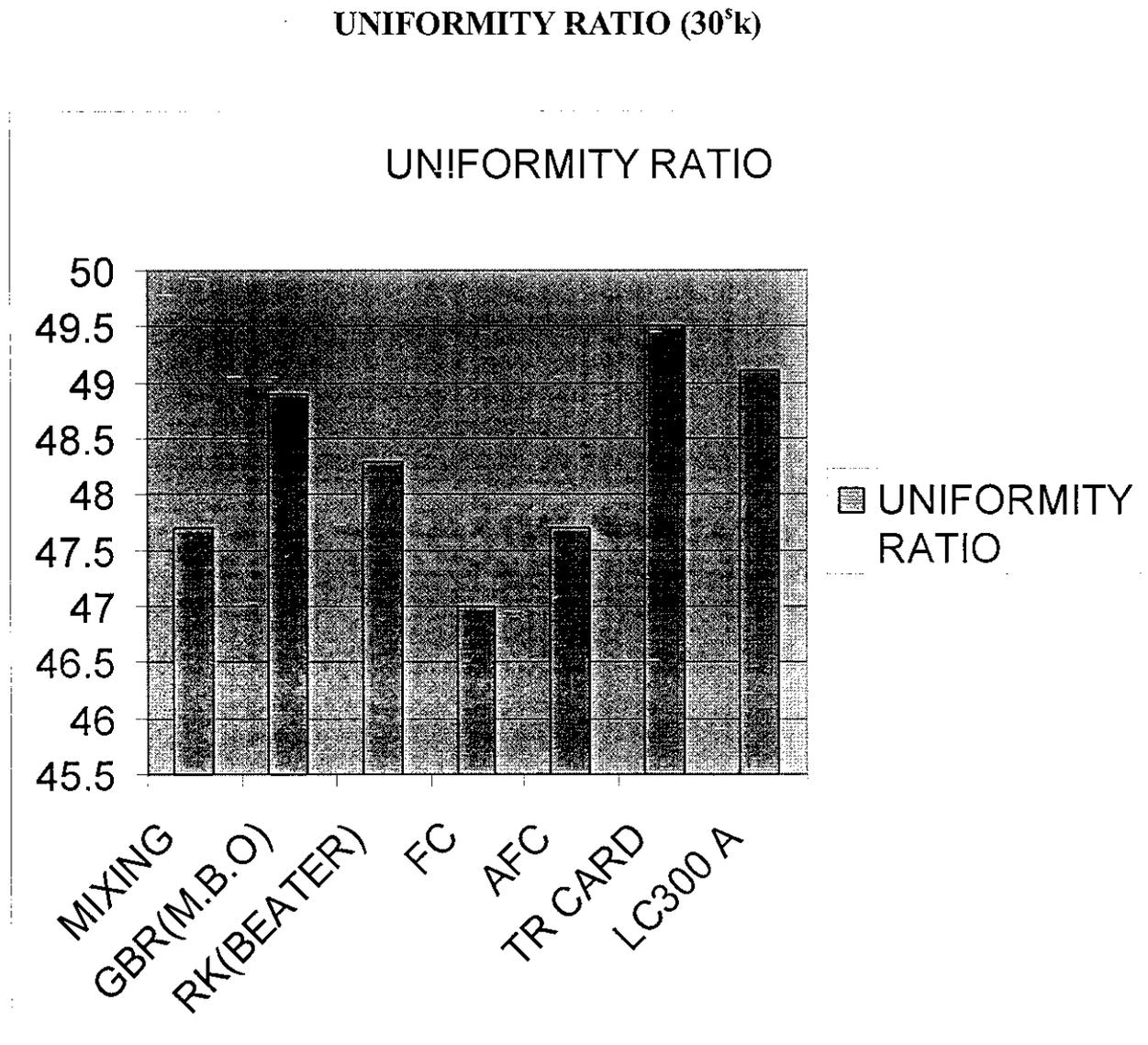
There is no significance difference in 50% Span length.

3.1.3. Effect of mechanical processes on Fineness of fibers (30^s K).



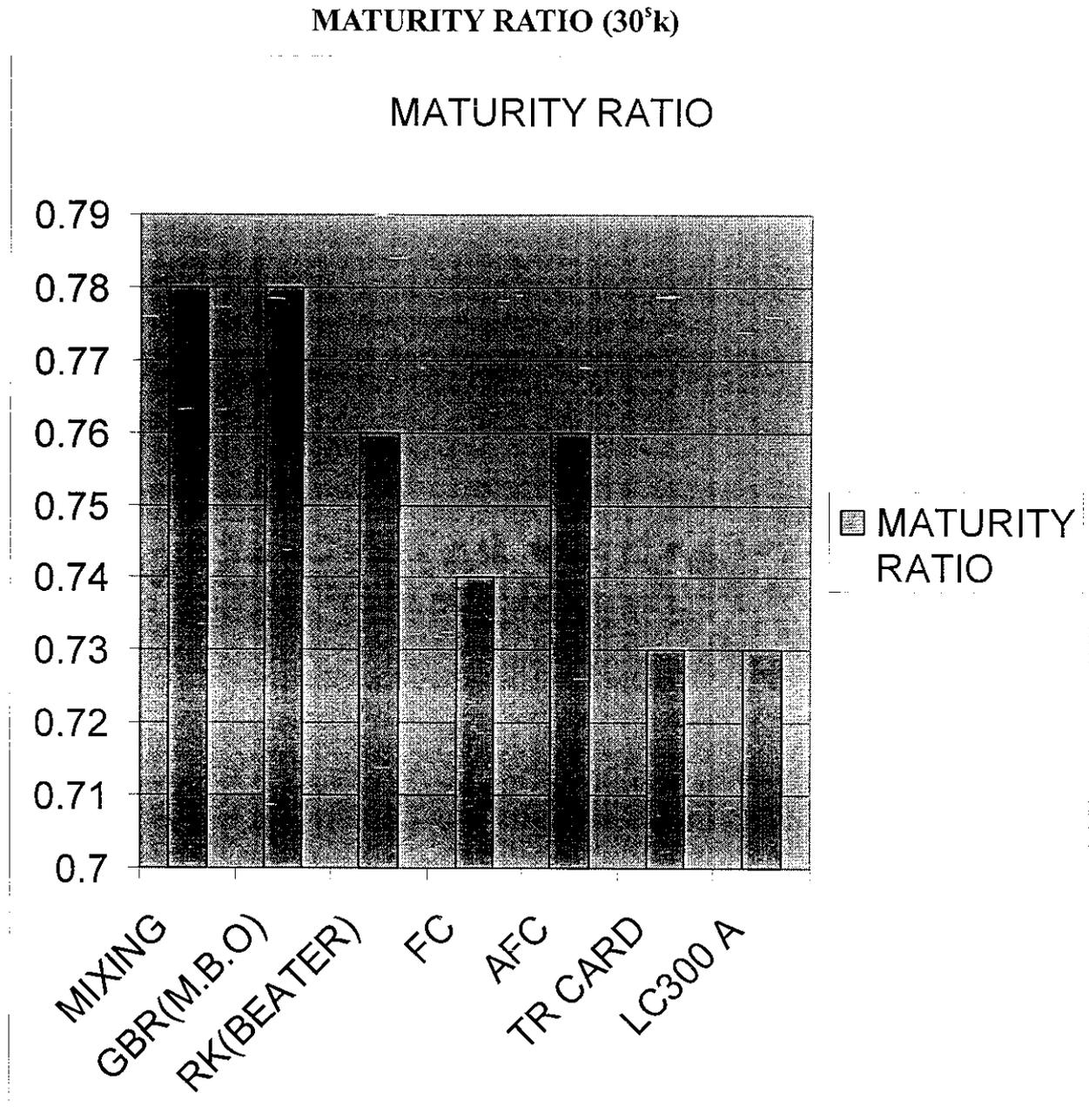
There is no significance difference in Fineness.

3.1.4. Effect of mechanical processes on Uniformity ratio of fibers (30^s K).



There is no significance difference in Uniformity ratio.

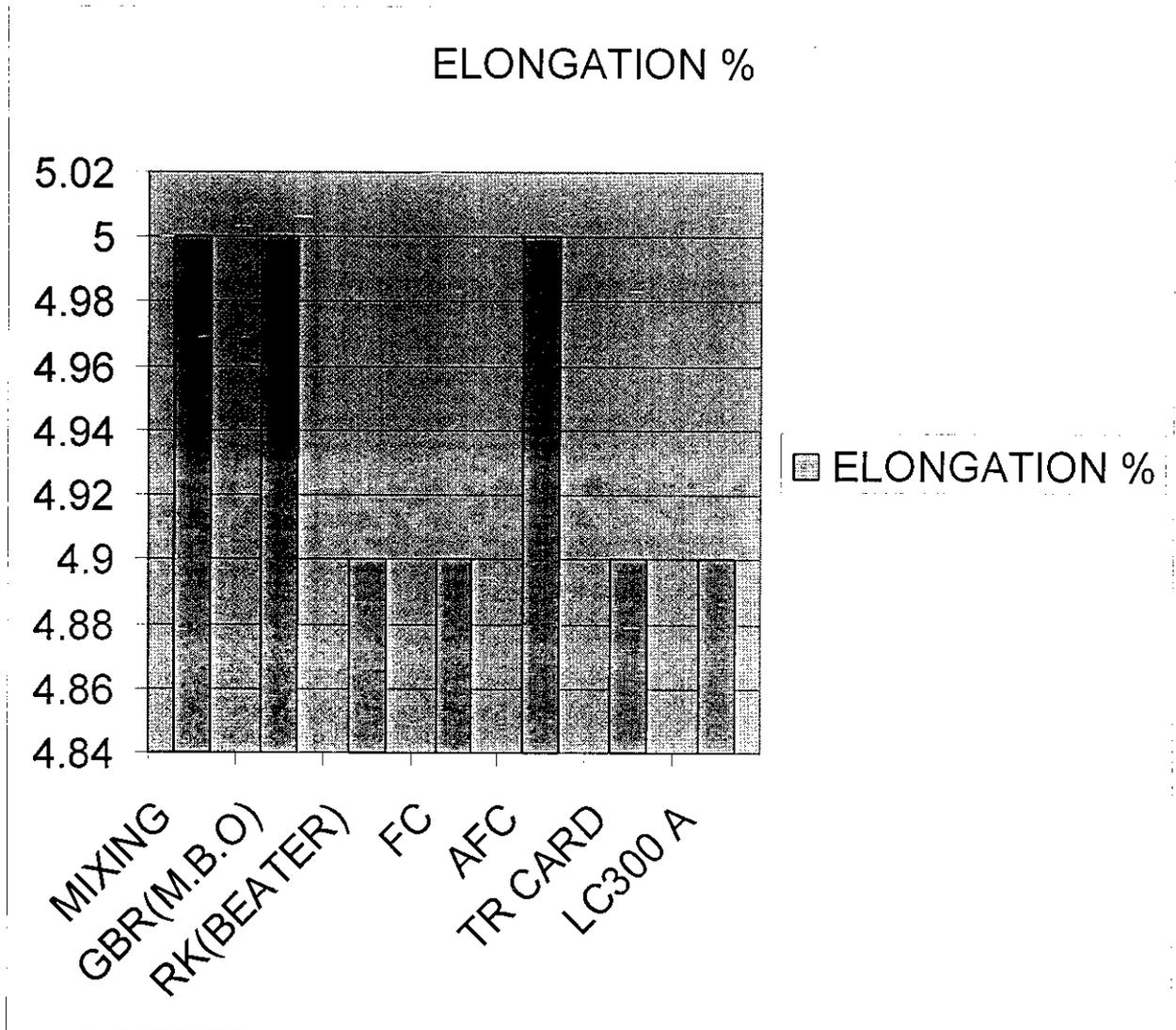
3.1.5 Effect of mechanical processes on Maturity ratio of fibers (30^s K).



There is a significance difference in Maturity ratio. It is mainly due to the removal of short fibers and immature fibers in R.K- FC- AFC- TRCard.

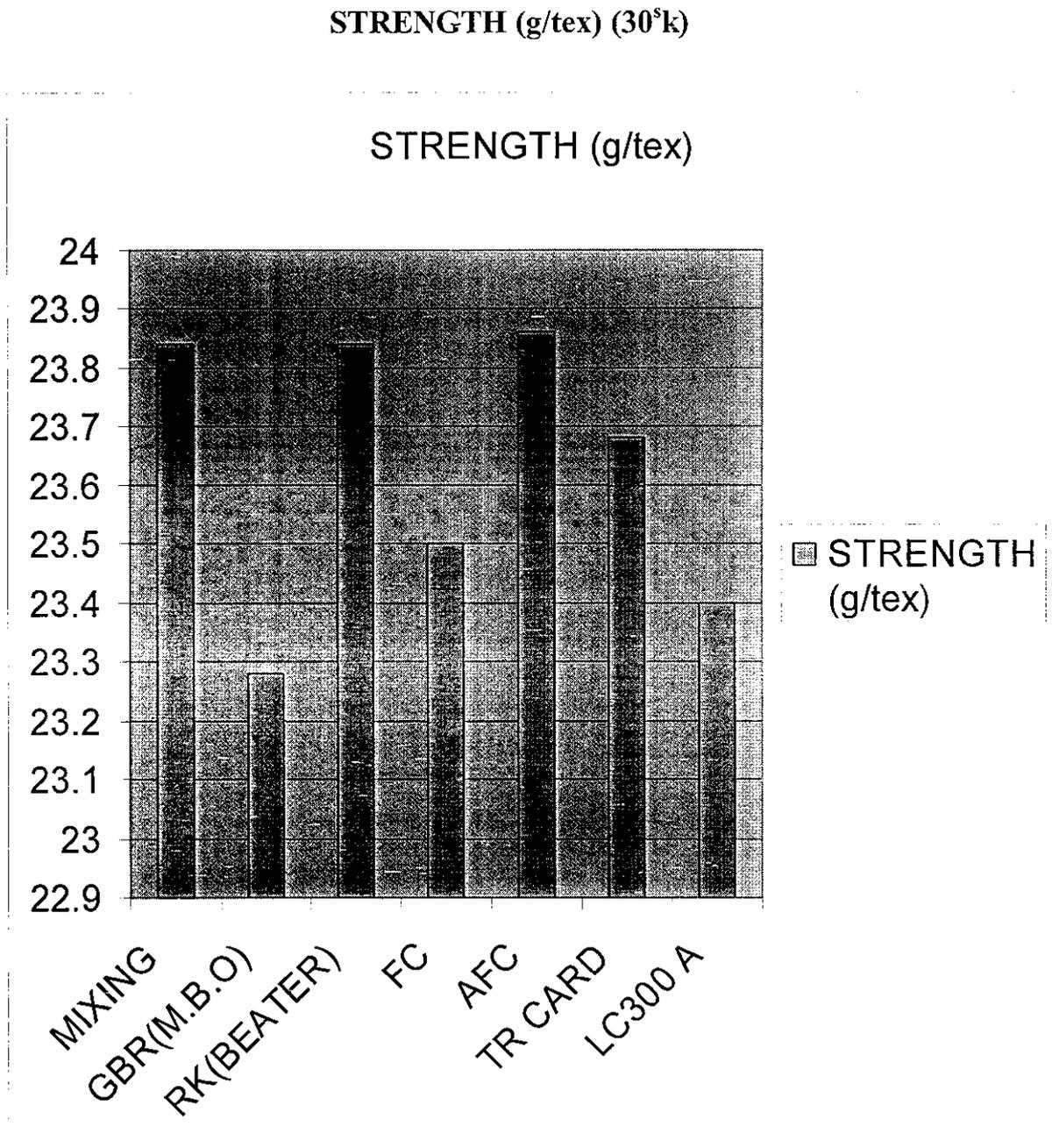
3.1.6. Effect of mechanical processes on Elongation of fibers (30^s K).

ELONGATION % (30^sk)



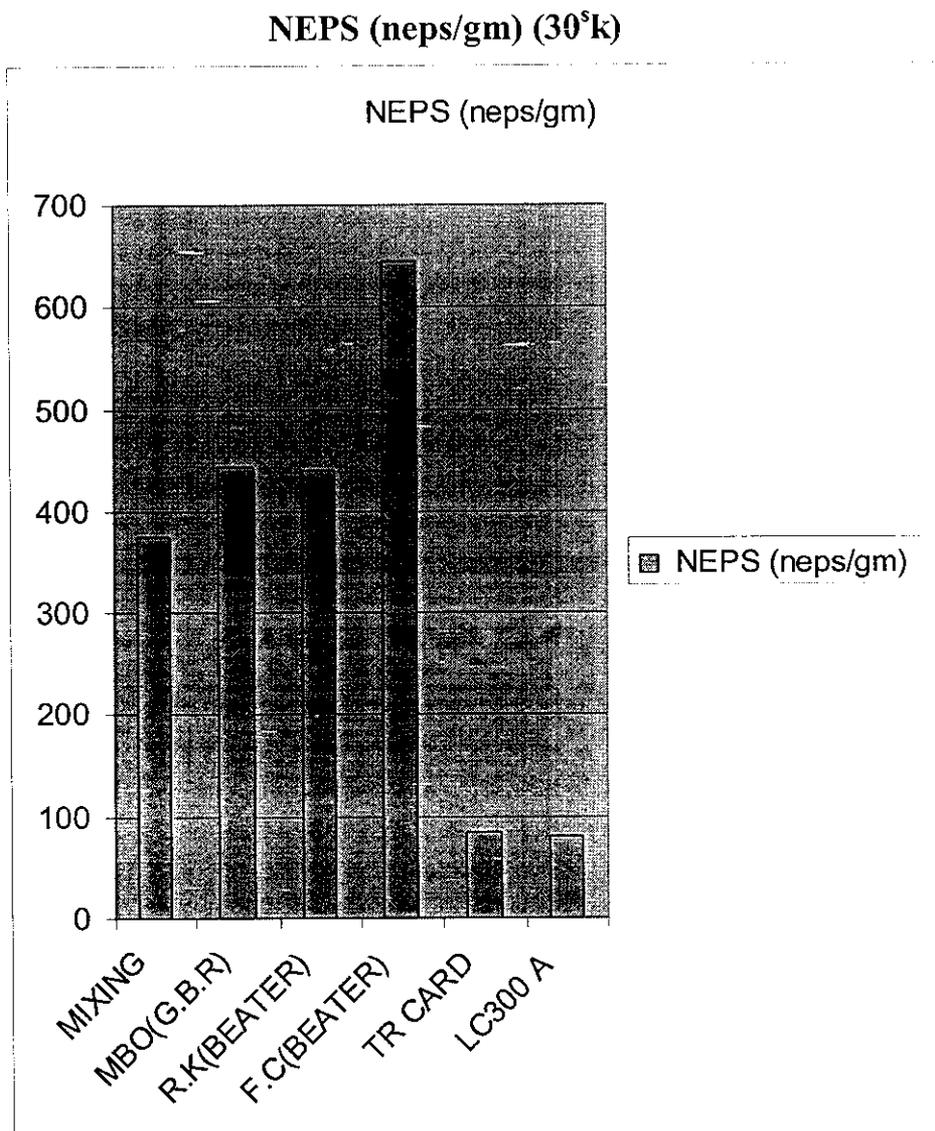
There is no significance difference in Elongation.

3.1.7. Effect of mechanical processes on Strength (g/tex) of fibers (30^s K).



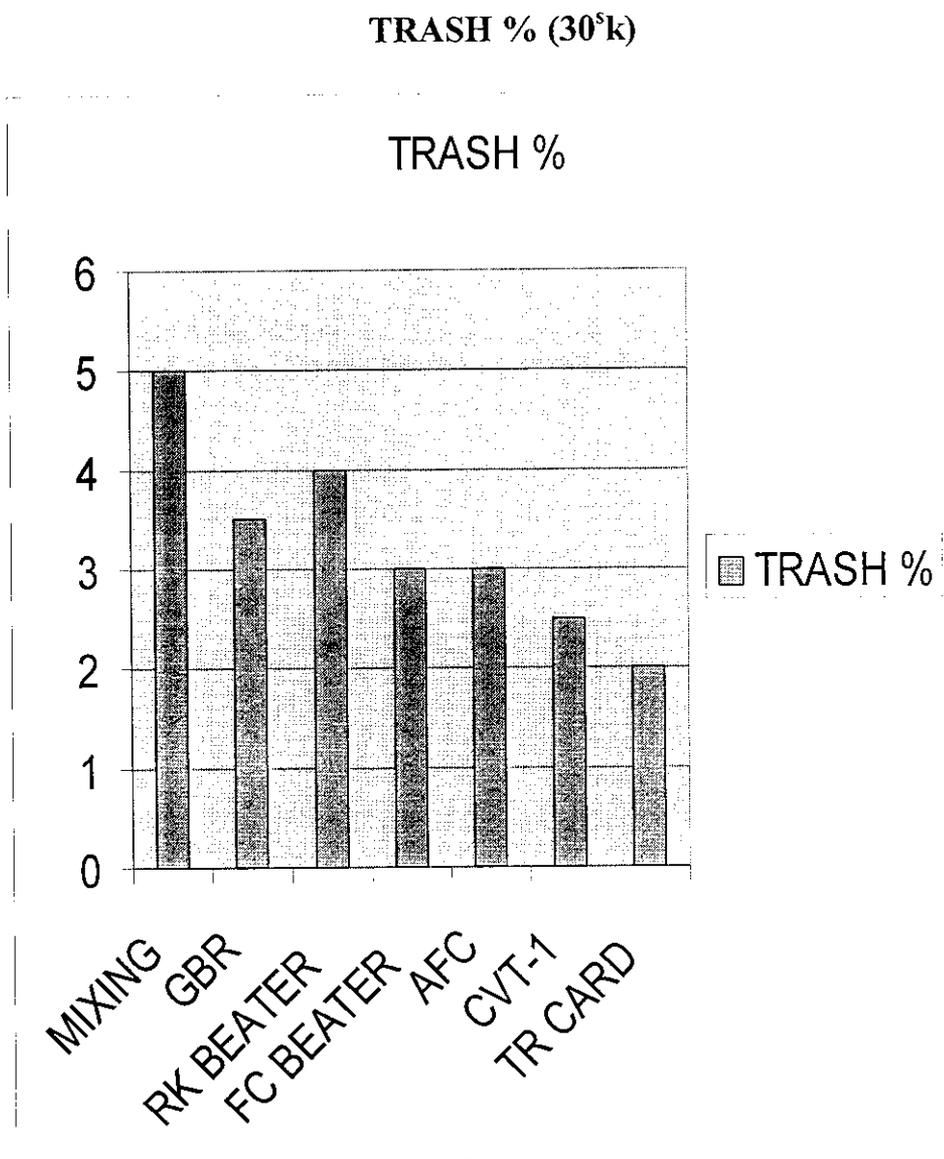
There is no significance difference in Strength.

3.1.8. Effect of mechanical processes on Neps (neps/gm) of fibers (30° K).

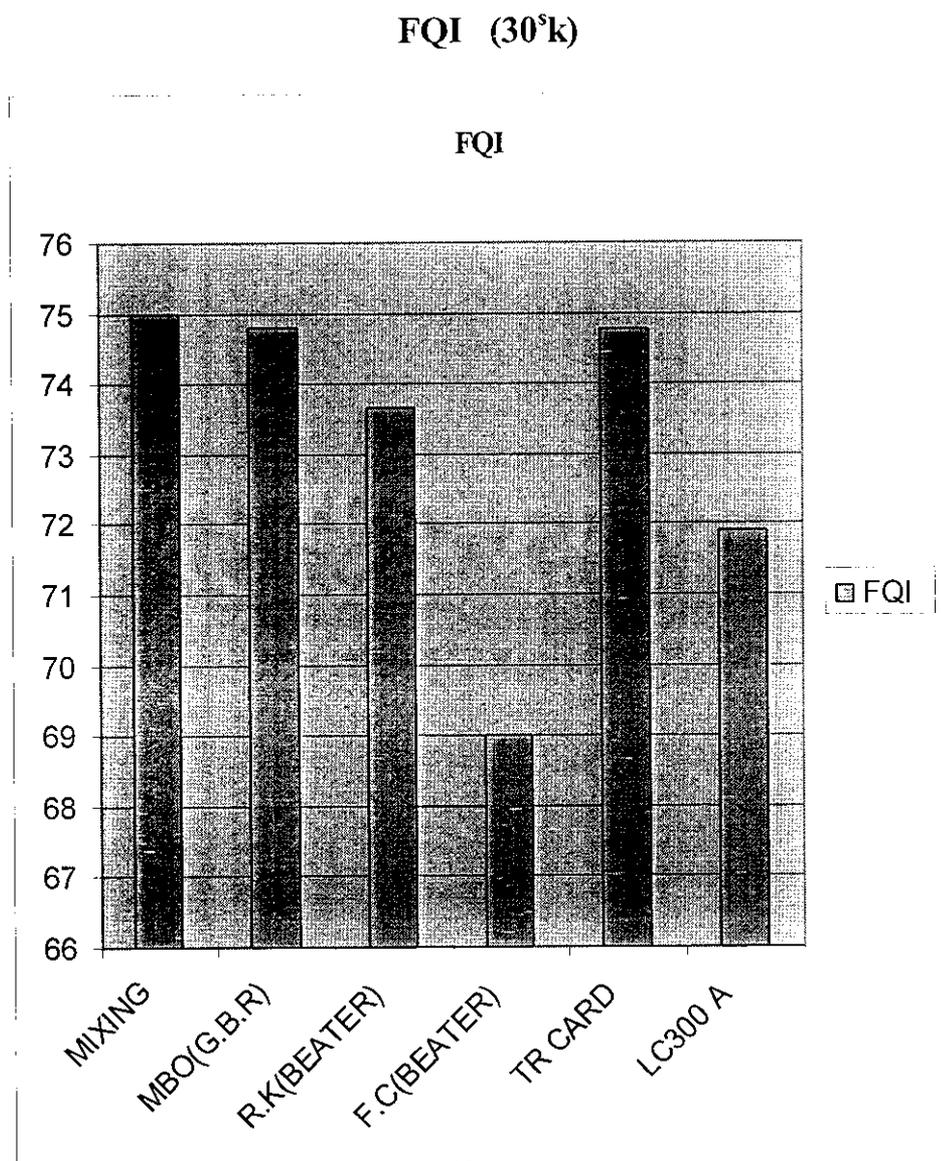


There is a significance difference in Neps level. Neps level gradually increasing from G.B.R to A.F.C due to heavy beating points. But decreases in carding mainly, due to the removal of neps in carding.

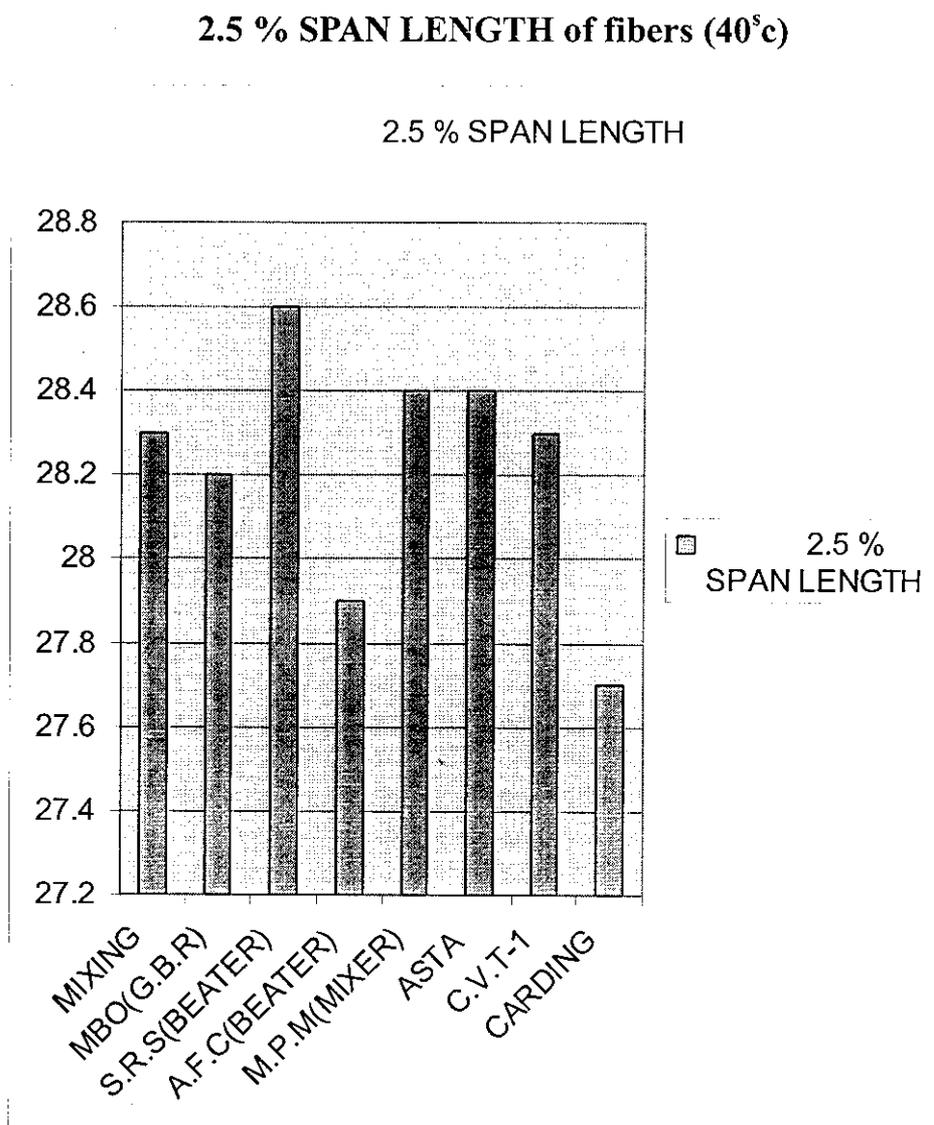
3.1.9. Effect of mechanical processes on Trash % of fibers (30^s K).



3.1.10. Effect of mechanical processes on FQI of fibers (30^s K).



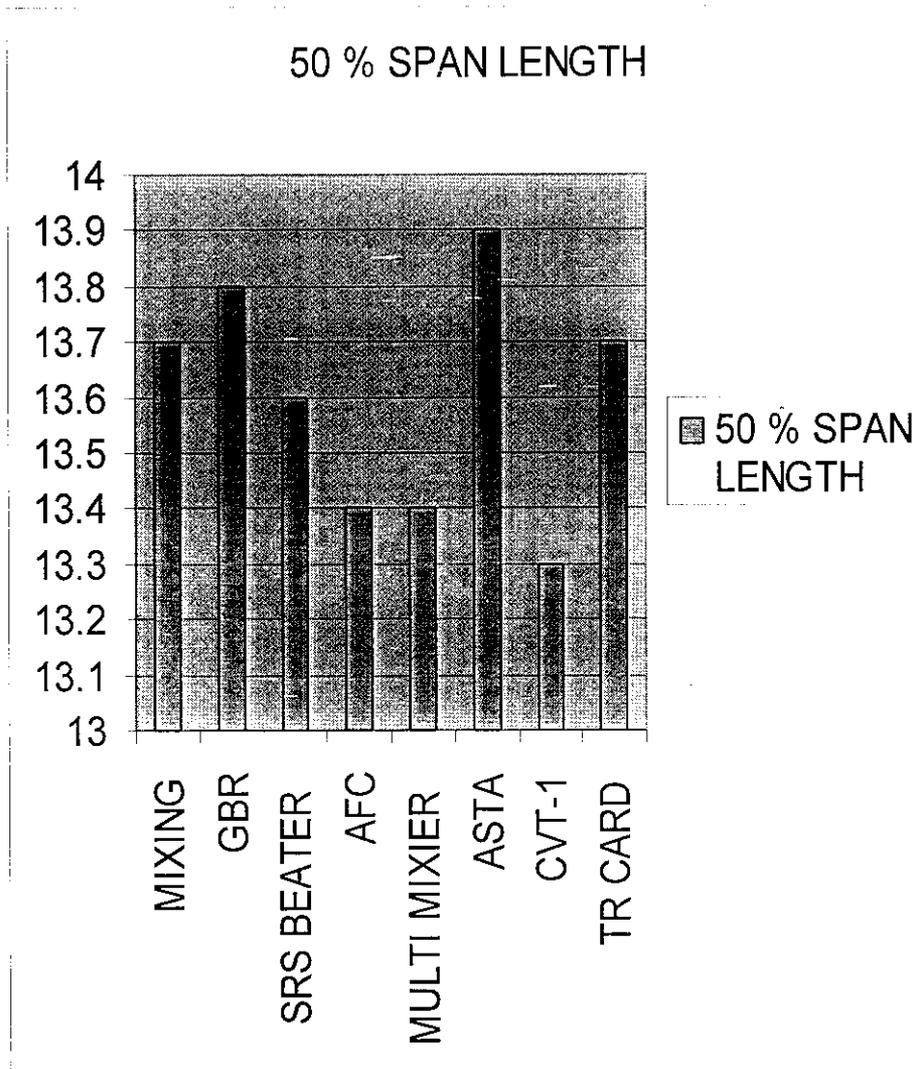
3.1.11. Effect of mechanical processes on 2.5% span length of fibers (40^s C).



There is a significance difference in 2.5% Span length. It is expected that it is mainly due to removal of short fibers and immature fibers in the SRS- AFC- MPM & CVT-1, TR Card.

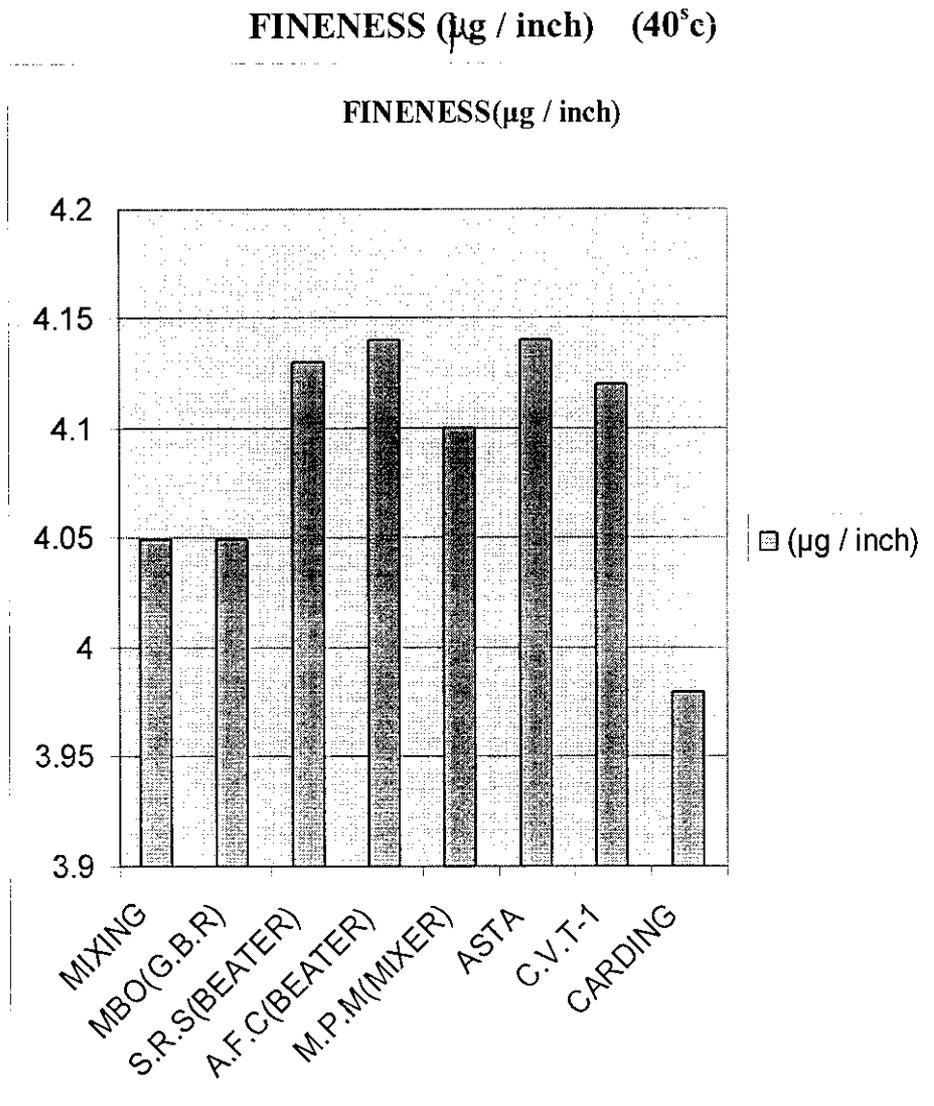
3.1.12. Effect of mechanical processes on 50% span length of fibers (40^s C).

50 % SPAN LENGTH of fibers (40^sc)



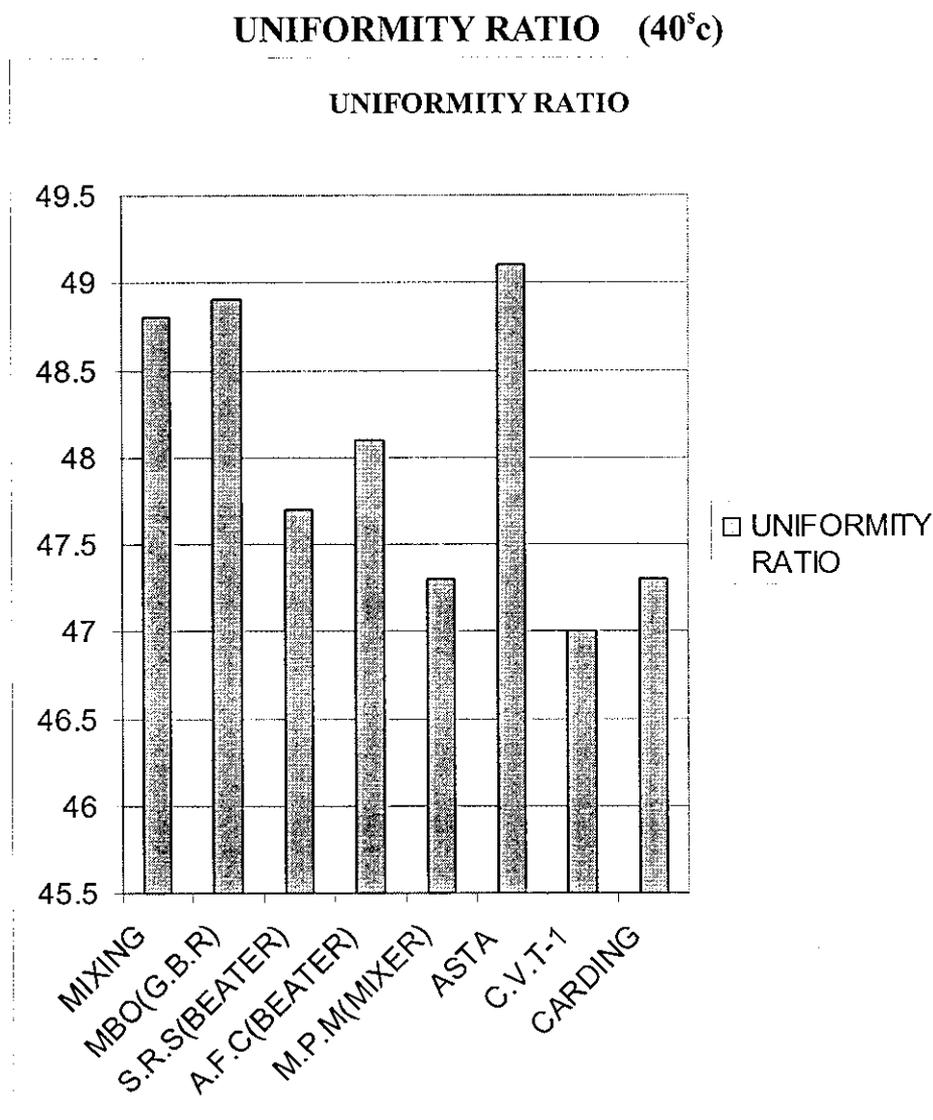
There is a significance difference in 50% Span length in Multi Mixer and CVT1. It is expected that it is mainly due to removal of short fibers and immature fibers in MPM and CVT1.

3.1.13. Effect of mechanical processes on Fineness of fibers (40^s C).



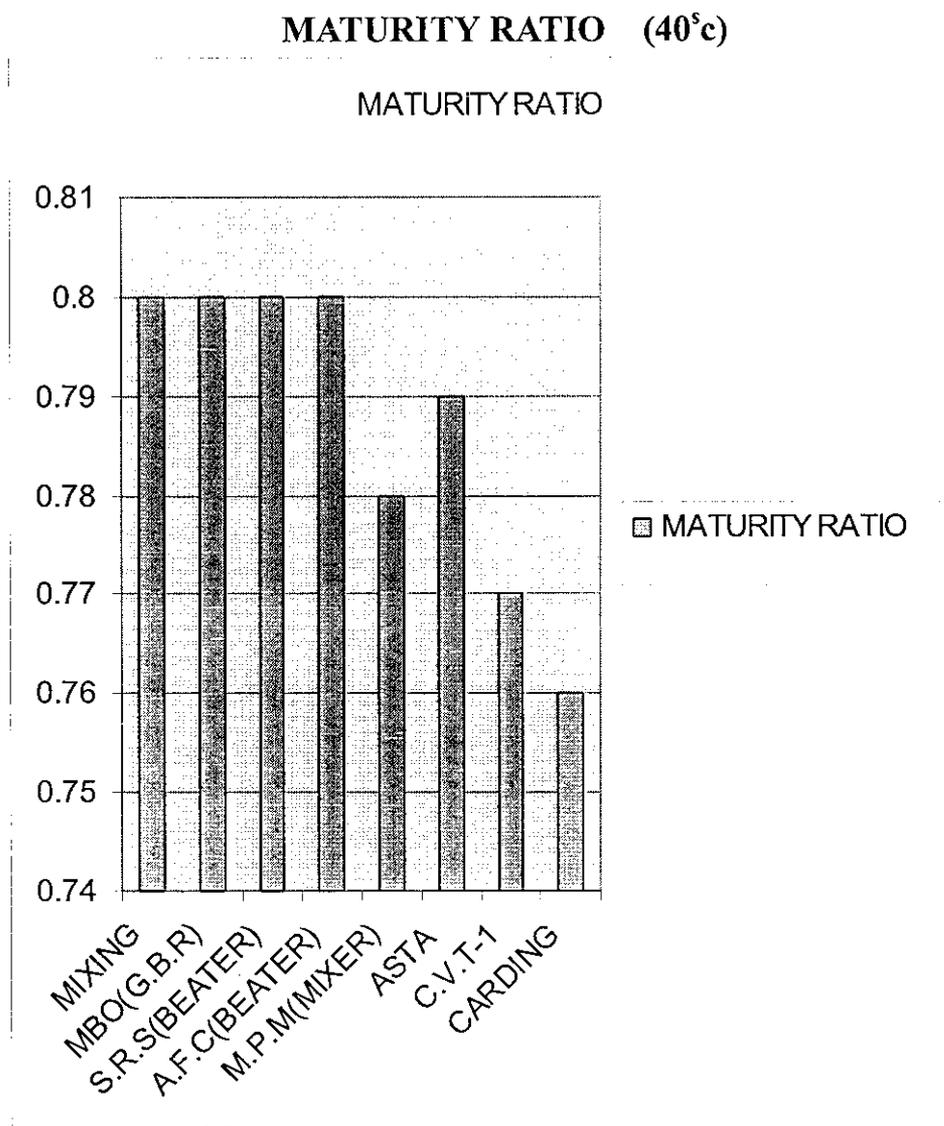
There is a significance difference in fineness. It is expected that ,it's mainly due to the removal of impurities. (MPM -ASTA -CVT - TRCard)

3.1.14. Effect of mechanical processes on Uniformity ratio (40^s C).



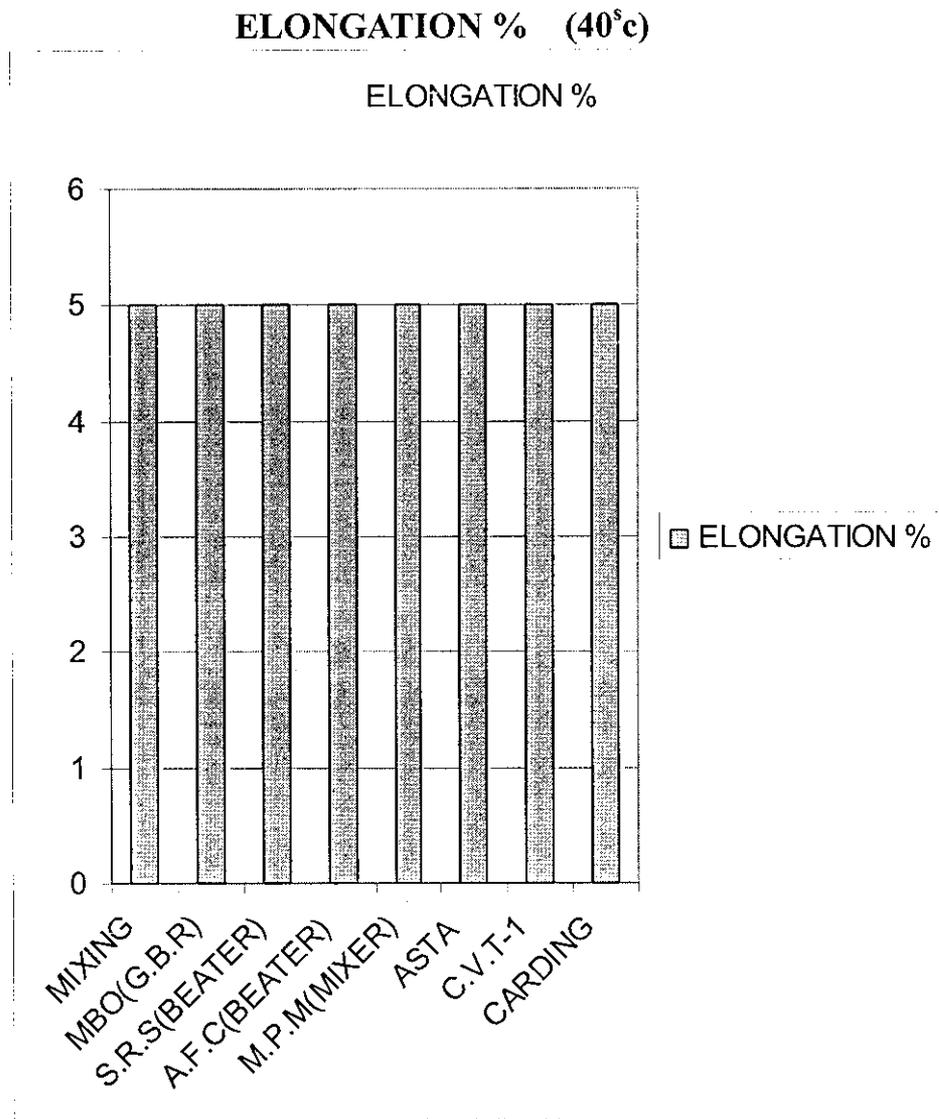
There is a significance difference in Uniformity ratio; due to changes in 2.5% span length and 50% span length.

3.1.15 Effect of mechanical processes on Maturity ratio of fibers (40^s C).



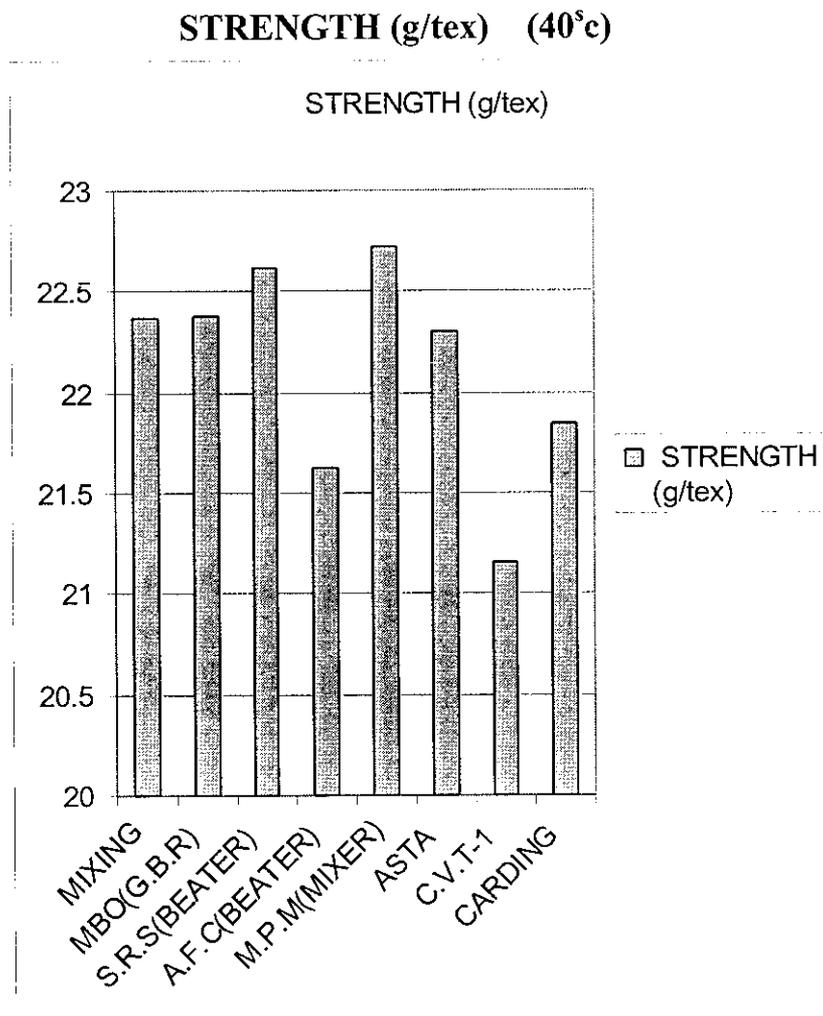
There is a significance difference in Maturity ratio. It is mainly due to the removal of short fibers and immature fibers in ASTA- CVT-1.

3.1.16. Effect of mechanical processes on Elongation of fibers (40^s C).



There is no significance difference in Elongation.

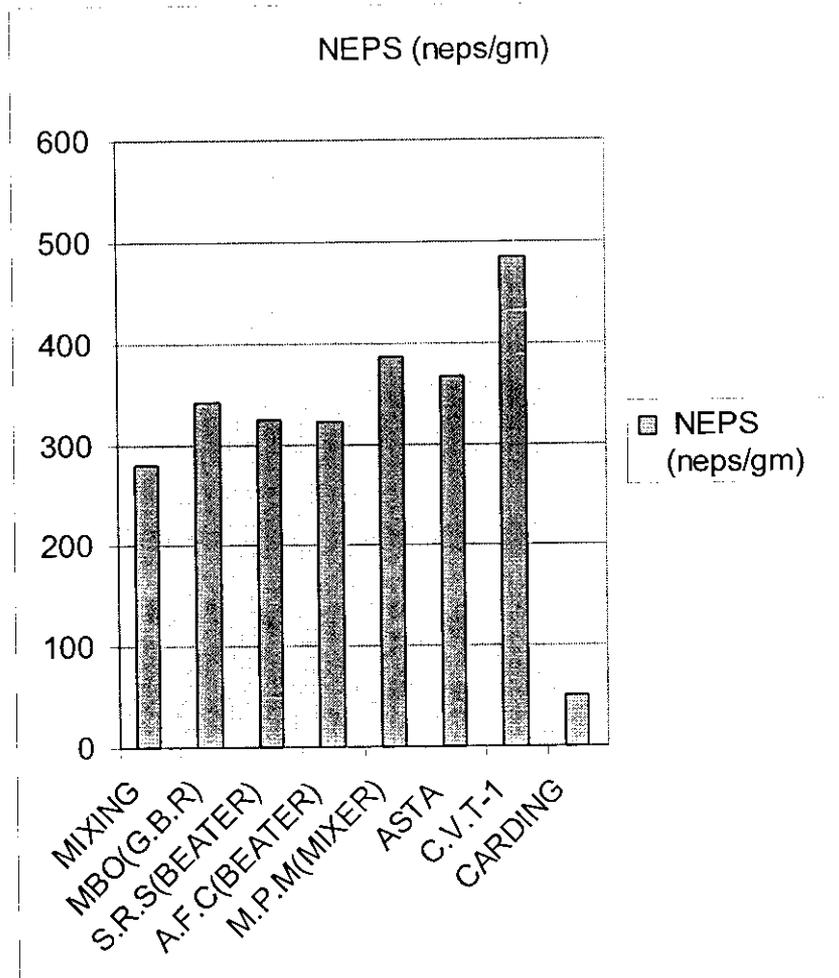
3.1.17 Effect of mechanical processes on Strength (g/tex) of fibers (40^s C).



There is a significance difference in Strength.

3.1.18 Effect of mechanical processes on Neps (neps/gm) of fibers (40^s C).

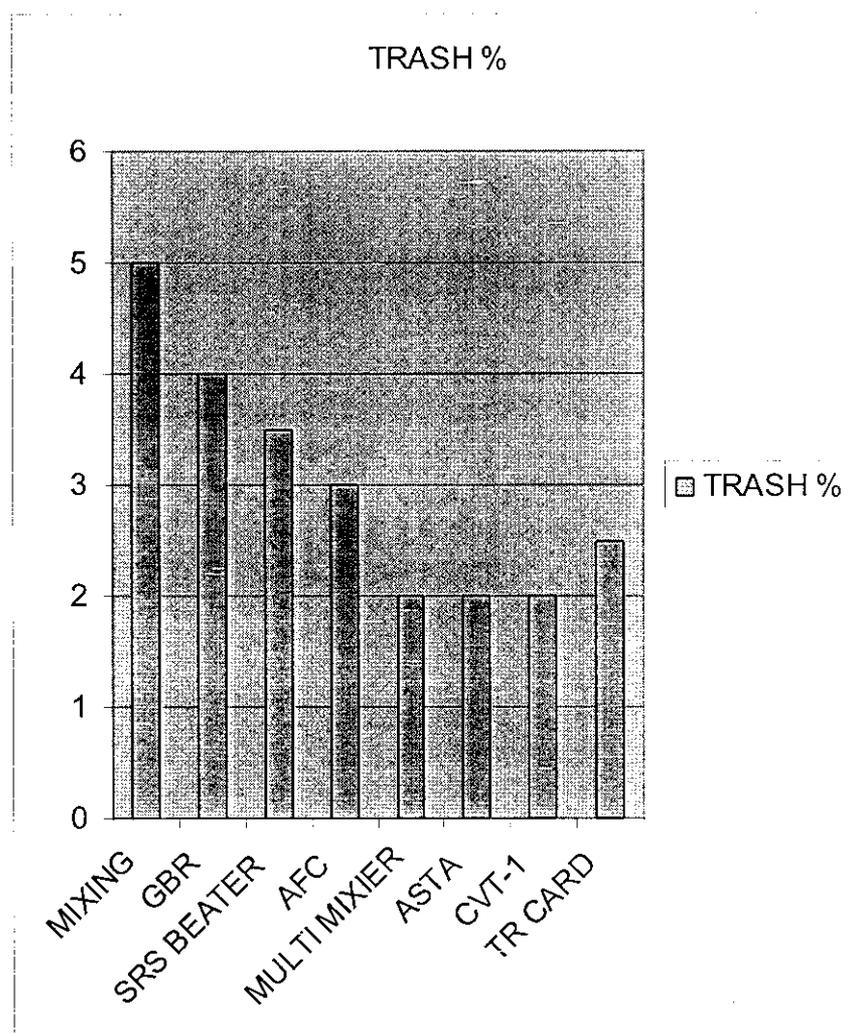
NEPS (neps/gm) (40^sc)



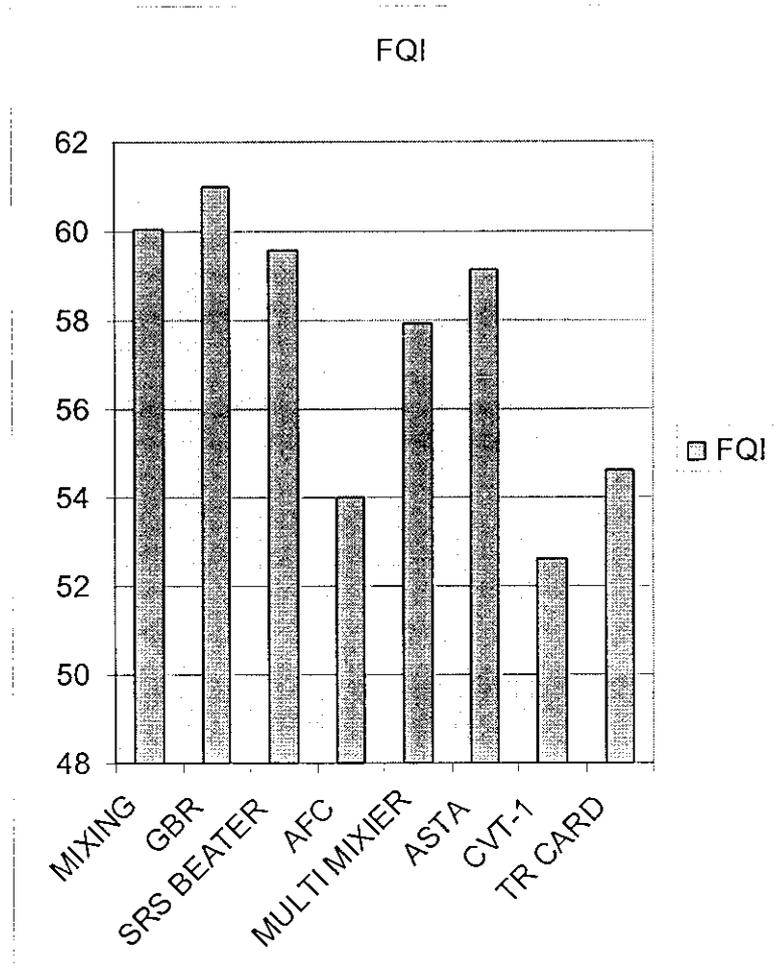
There is a significance difference in Neps level. Neps level gradually increasing from G.B.R to CVT-1 due to beating action. But decreases in carding mainly, due to the removal of neps in carding.

3.1.19. Effect of mechanical processes on Trash % of fibers (40^s C).

TRASH % (40^s c)



3.1.19. Effect of mechanical processes on FQI of fibers (40^s C).



4.0 APPLICATION t-TEST:

4.1. LIST OF CALCULATED AND ACTUAL t-TEST VALUES FOR MCU- 5:

| Stages | 2.5% Span length(mm) | | 50% Span length(mm) | | Fineness (μ /gm) | | Maturity ratio | |
|--------------------------|----------------------|------|---------------------|------|-----------------------|------|----------------|------|
| | t calc. | t 5% | T calc. | t 5% | t calc. | t 5% | t cal c. | t 5% |
| Mixing - GBR | 0.196 | 2.31 | 1.040 | 2.31 | 0.633 | 2.31 | 1.355 | 2.31 |
| GBR - RK | 0.371 | 2.31 | 0.923 | 2.31 | 0.527 | 2.31 | 0.714 | 2.31 |
| RK - FC (BEATER) | 0.447 | 2.31 | 1.249 | 2.31 | 0.336 | 2.31 | 1.436 | 2.31 |
| FC - AFC (BEATER) | 0.000 | 2.31 | 0.632 | 2.31 | 1.898 | 2.31 | 0.879 | 2.31 |
| AFC - TR CARD | 0.678 | 2.31 | 1.186 | 2.31 | 5.800 | 2.31 | 1.706 | 2.31 |
| AFC - LC 300 A | 0.636 | 2.31 | 1.156 | 2.31 | 5.600 | 2.31 | 1.630 | 2.31 |

| Stages | Uniformity ratio | | Elongation (%) | | Strength (g/tex) | | Neps (neps/g) | |
|--------------------------|------------------|------|----------------|------|------------------|------|---------------|------|
| | t calc. | t 5% | t calc. | t 5% | t calc. | t 5% | t calc. | t 5% |
| Mixing - GBR | 1.355 | 2.31 | 0.000 | 2.31 | 1.450 | 2.31 | 3.94 | 2.31 |
| GBR - RK | 0.714 | 2.31 | 1.582 | 2.31 | 1.582 | 2.31 | 4.72 | 2.31 |
| RK - FC (BEATER) | 1.436 | 2.31 | 0.000 | 2.31 | 0.697 | 2.31 | 1.770 | 2.31 |
| FC - AFC (BEATER) | 0.879 | 2.31 | 1.582 | 2.31 | 0.516 | 2.31 | 34.12 | 2.31 |
| AFC - TR CARD | 1.706 | 2.31 | 1.582 | 2.31 | 0.294 | 2.31 | 161.7 | 2.31 |
| AFC - LC 300 A | 1.673 | 2.31 | 1.582 | 2.31 | 0.226 | 2.31 | 163.8 | 2.31 |

4.2. LIST OF CALCULATED AND ACTUAL t-TEST VALUES FOR S6:

| Stages | 2.5% span length(mm) | | 50% span length(mm) | | Fineness (μ /gm) | | Maturity ratio | |
|------------------------------------|-------------------------|---------|------------------------|---------|--------------------------|---------|-------------------|---------|
| | t calc. | t 5% | t calc. | t 5% | t calc. | t 5% | t calc. | t 5% |
| Mixing - GBR | 1.600 | 2.31 | 0.970 | 2.31 | 0.613 | 2.31 | 0.970 | 2.31 |
| GBR - SRS | 1.947 | 2.31 | 1.406 | 2.31 | 0.527 | 2.31 | 1.116 | 2.31 |
| SRS - AFC (BEATER) | 3.810 | 2.31 | 0.879 | 2.31 | 0.316 | 2.31 | 0.280 | 2.31 |
| AFC - MPM (BEATER) | 2.728 | 2.31 | 0.000 | 2.31 | 1.628 | 2.31 | 0.930 | 2.31 |
| MPM - ASTA (MULTIMIXER) | 0.000 | 2.31 | 3.516 | 2.31 | 5.800 | 2.31 | 2.363 | 2.31 |
| ASTA - CVT 1 | 0.597 | 2.31 | 3.112 | 2.31 | 5.600 | 2.31 | 1.381 | 2.31 |
| CVT 1 - TR CARD | 9.490 | 2.31 | 1.860 | 2.31 | 5.300 | 2.31 | 0.296 | 2.31 |

| Stages | Uniformity ratio | | Elongation % | | Strength (g/tex) | | Neps (neps/gm) | |
|------------------------------------|------------------|---------|--------------|---------|------------------|---------|----------------|---------|
| | t calc | t 5% | t calc. | t 5% | t calc. | t 5% | t calc. | t 5% |
| Mixing - GBR | 0.0 | 2.31 | 0.000 | 2.31 | 0.276 | 2.31 | 3.74 | 2.31 |
| GBR - SRS | 0.000 | 2.31 | 0.000 | 2.31 | 1.514 | 2.31 | 4.94 | 2.31 |
| SRS - AFC (BEATER) | 1.000 | 2.31 | 0.000 | 2.31 | 4.640 | 2.31 | 1.880 | 2.31 |
| AFC - MPM (BEATER) | 1.587 | 2.31 | 0.000 | 2.31 | 1.648 | 2.31 | 5.99 | 2.31 |
| MPM - ASTA (MULTIMIXER) | 0.793 | 2.31 | 0.000 | 2.31 | 1.768 | 2.31 | 4.53 | 2.31 |
| ASTA - CVT1 | 3.164 | 2.31 | 0.000 | 2.31 | 3.768 | 2.31 | 38.74 | 2.31 |
| CVT1 - TR CARD | 0.793 | 2.31 | 0.000 | 2.31 | 1.964 | 2.31 | 157.87 | 2.31 |

5. CONCLUSION

The following conclusion has been made from this study:

1. There is no significance difference in 2.5% Span length, 50% Span Length Fineness, Uniformity ratio, Elongation and Strength properties of MCU -5 fibers, due to the mechanical processes.
2. There is a significance difference in Maturity ratio of MCU-5 fibers. It is mainly due to the removal of short fibers and immature fibers in R.K- FC- AFC- TRCard.
3. There is a significance difference in Neps level in MCU-5 fibers. Neps level gradually increasing from G.B.R to A.F.C due to heavy beating points. But decreases in carding mainly, due to the removal of neps in carding.
4. There is a significance difference in 2.5% Span length, 50% Span length, Fineness, Uniformity ratio, Maturity ratio and Strength of S6 fibers mainly in the following machines such as SRS- AFC-MPM & CVT-1.
5. There is no significance difference in Elongation of S6 fibers due to the mechanical processes.
6. There is a significance difference in Neps level in S6 fibers. Neps level gradually increasing from G.B.R to CVT-1 due to beating action. But decreases in carding mainly, due to the removal of neps in carding.

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