Impact of Latest Card on Yarn Quality

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ABSTRACT

The main emphasis of project is impact of latest card on yarn quality. For all fiber including the manmade fiber ,good carding is always consider essential for production of good quality of ring yarn ,these requirement is seen to hold good for new commercialized spinning system such as rotor, air-jet & friction spinning also. As a result of these research & development effort the manmade fiber can also be carded at much higher, though somewhat lower than cotton outputs. The high production rate causes problem since there is a strong relationship between increase in production & reduction in quality. The quality of yarn is tested on Ulster tester 5, Uster Classimat, Lea yarn strength tester, Single yarn strength tester for sliver & yarn quality, & two comparison between different card technology i.e.3rd generation card (C 1/3) by Lakshmi Rieter & 4th generation card (DK- 800) by Trumac Trutzchler.

Key word: - IPI %, Strength CV% Report, Classimat report.

INTRODUCTION

Two proverbs of the experts `The card is the heart of spinning mill'& `well carded is half spun.' Demonstrate the significance of carding for the final result of the spinning operation. The considerable influence of the card on the yarn quality Aries from the very complex series of events in the process itself, and also from the pressure to adopt an extremely high production rate on economic ground. This high production rate causes problems since there are strong relationship between increase in production & reduction in quality. Carding is a most important process in spinning. It contribute a lot of the yarn quality the following process parameters & specification are to be selected properly to produce a good quality of yarn with a lower manufacturing cost cylinder wire (wire angle, wire height, thickness,& population) flat tops specification, licker-in wire specification, doffer wire specification. Feed weight draft between feed roller & doffer cylinder grinding, flat top grinding, also licker-in wire life, cylinder wire life, doffer wire life & licker-in speed, flat speed, cylinder speed. Setting between cylinder & flat tops, feed plate to licker-in setting, setting between licker-in to under casing elements like mote knife, combing segment etc. Setting between back stationery flat to cylinder & front stationary flat to cylinder & cylinder under casing. Then setting between cylinder & doffer. Finally comparatively study of card to card like DK - 800 by Trumac& C 1/3 by Lakshmi Rieter & calculated the IPI %. For all fiber, including manmade fiber, good carding is always considered essential for production of good quality ring yarn. This requirement is seen to hold good for new commercialized spinning system such as rotor, air jet & friction spinning also. Toward this end any deficiency regards to card conditions, materials specification or process parameters can lead to serious quality detoriation. Over the years, extensive research has been carried out to understand the complex process of carding so as to increase the production rate & simultaneously to improve the quality of the card sliver.

LITERATURE REVIEW

Back zone

This zone consist of feed roller, feed plate, licker-in, mote knife, combing segment & autoleveller. The feed roller having the diameter of 80 mm is placed above the feed plate. Material is passing through this & feeding to licker-in. The feed plate is of two types long nose & short nose .The licker-in is having the diameter of 9'' is covered with the metallic wire. The wire to be used in the licker-in will be depending upon the kind of the material to be process. Generally the surface speed ratio of 1:2 or 1:2.2 is kept between the cylinder & licker-in for better carding action

Carding zone

This zone is consisting of cylinder, flats, stationary flat, back plate, front plate, under casing. The surface of the back plate should be smooth. The stationary flats are divided in two front & back stationary flats. These flats are not revolving, these flats are giving pre combing to the fiber & helps to improve the carding action. The cylinder having of 50'' diameter & is covered with metallic wire. The no. of wire points & the no. of angle of wire & the height of the wire to be used are depending on the material to be process. The cylinder & flats are revolved at the same direction but the cylinder wire points apposite to the flats wire points. In this stage carding action take place for individualization take place.

The air current produce due to revolving cylinder helps to transfer the fiber from the cylinder to doffer, only 27 to 30 % fiber from the surface of the cylinder gets transfer to doffer at every revolution.

Front zone

Front zone consist of doffer, redirecting roller, crush roller, brush roller, calendar roller, coiler, condenser. The doffer is having the diameter of 27'' is covered with metallic wire. The fiber transfer from the cylinder is taking up by the doffer & transfer to crush roller with the help of redirecting roller. The material comes out in a sheet form called as web. This web is then condensed with the help of condenser. The size of the condenser will depend upon the wrapping hank. The condensed web is called as sliver then transferred to the can with the help of coiler.

Speed & settings

Speed

The speed to be set the various parts of cotton card for processing manmade fiber depends on the production capacity of the machine.

The licker-in speed has increased significantly, almost in proportion to the cylinder speed in the modern super high production card. The ratio of surface speed of cylinder & licker-in is thus maintained between 2.5 & 3.0. This ratio is much higher than that used for cotton. A lower ratio of speed would lead to loading of licker-in wire due to its poor stripping by the cylinder.

A higher cylinder speed always results in reduce cylinder load & thus permitted a slightly more acute cylinder wire angle for better opening without adversely affecting the transfer of fiber to the doffer. The doffer speed which is determined the production rate is also lower for manmade fiber because of the inter fiber cohesion is not strong enough to make the web come off easily from the doffer. In the absence of apron doffing, the web is also likely to get rupture due to strong air current generated at higher doffer speed. The doffer speed & the web quality are seen to be interred related.

The flat speed for carding manmade fiber is also kept lower than that cotton so as to remove minimum flat strip waste. In situation where neps level is higher than the normal value or exceptionally low level of nep is required, the flat speed should be raised.

1. Higher cylinder speed help fiber transfer & higher production.
2. Higher cylinder speed improves carding action therefore imperfection is reduced.
3. Higher licker-in speed for coarser & longer fiber, higher speed result in fiber rupture therefore flat waste will be more.
4. Higher flat speed improve yarn quality & at the same time increase the flat waste with the same flat speed higher the carding production, lower the flat waste & vice versa.
5. Very high tension draft will affect the carding U %. It is better to keep the draft between feed & deliver to doffer around 75 to 95. The result is found better with this draft.

Settings

Optimum carding performance can be achieved only if the card setting & speed are properly chosen for handling manmade fiber & there blend having varying characteristic. A well set card not only operate more efficient but also produce a good quality of sliver which, in turn results in a good quality yarn with fewer imperfections & faults. Optimum settings depend on many factors such as type of fiber, fiber length, fiber denier, card speed & the production rate. Sometimes the poor mechanical condition of the card may not permitted the optimum settings to be used & thus give poor performance.

EXPERIMENTAL WORK

DK - 800 Machine

Function

The DK - 800 high production card feed by the tuft feeder with uniformly compact tuft mat referred to as the feed sliver. The card split this feed sliver into individual fiber & position them parallel to each other.

In the process of neps & residual soiling is removed at the outlet from the card. The fiber Web is formed into a sliver that placed into can by means coiler.

Machine balancing

Machine balancing is always required in the event of

- Initial start up.
- Change sliver count.
- Change in production quantity.
- Change of sliver quality.
- Change of material feed.
- Change of other machine setting.

The card is equipped with two regulation & control circuit for ensuring the preset set point memory for different sliver count.

- C.F.D:- Tray on material feed unit.

- C.C.D:- Measuring funnel on the delivery unit.

The C.C.D regulation is used to maintain & inspect sliver count long term. The C.F.D regulation is short term regulation & improves the evenness of the carded sliver & take effect after 1 mtr of sliver.

C 1/3 Machine

Description

Card C 1/3 is rugged, reliable, highly accurate & proven machine. It can be used for carding coarser & fine cotton, synthetic, and rayon fiber.

In combination with the aero feed lapless feed the C 1/3 play an important part in Lakshmi Rieter automated line. The exacting demand on the C 1/3 card may be devised into four main groups.

1. Final elimination of impurities & over short fiber.
2. Initial opening of the tuft down to the individual fiber without determined to staple.
3. Distributing the individual fiber form a regulate web over the entire working width.
4. Initial forming of drafteble sliver.

The production is several time those of a conventional card & lie between 15 & 55 kg/hrs depending on material & sliver count.

Experimental design

The following experiment was carried out in comparatively study of 3rd generation & 4th generation card & there effect on yarn quality.

Table below these is indicated the quality parameter for each stage with the respective yarn result. Following table has compared their technical specification.

Fig. 3 C 1/3 Card

DK-800 Card

Working process parameter

Parameter	Experimental details	Experimental details
Card type	DK-800	C 1/3
Delivery hank	0.130	0.130
Draft	90	
F.B.K. Pressure	200 Pascal	4-5 bar
Delivery speed	140 mtr/min	30-40 mtr/min
Fed roller speed	9 rpm	6.5 rpm
Licker-in speed	1078 rpm	700-750 rpm
Cylinder speed	514 rpm	320-350 rpm
Doffer speed	220 mm/min	150-180 mm/min

Table.2 working process parameter

Technical details

Parameter	DK-800	C 1/3
Make	Trutzschler	Lakshmi Rieter
Technical detail		
Raw material	Polyester & viscose	Polyester & viscose
Blend ratio in %	48/52	48/52
Production	200-300 kg/shift	80-120 kg/shift
Feature	High speed machine	Highly accurate & reliable

Sliver count range	0.06-0.197	0.08-0.16
Draft	60-158	80-190
Waste %	1-2 %	2-4 %
Can quantity	4000 mtr	4000 mtr
Flat drive	Separate motor	Main motor drive
No. of flat	88	110
Pulley dimension		
Main motor dia	190 mm	127 mm
Licker-in pulley dia	1455 rpm	1430 rpm
Cylinder pulley dia	254 mm	254 mm
Doffer pulley dia	318 mm	477 mm
Licker-in dia	254 mm	254 mm
Cylinder dia	1200 mm	1290 mm
Doffer dia	700 mm	680 mm

Table. 3 Technical details

Important setting of card DK - 800 & C 1/3

Gauges	**DK-800**	**C 1/3**
Feed roller to licker-in	38/40	38/40
Back bottom plate to licker-in	40/70	---
Licker-in to mote knives	---	8
Licker-in to cylinder	7-10	8-12
1st back stationary flat to cylinder	16/18	14/16
2nd back stationary flat to cylinder	14/16	12/14
3rd back stationary flat to cylinder	12/14	12/14
Cylinder to flat	10/12	12/10/10
Cylinder to doffer	4-7-9	6
1st front stationary flat to cylinder	12/14/16	12/14
2nd front stationary flat to cylinder	12/14/16	12/14
3rd front stationary flat to cylinder	12/14/16	12/14
Front top plate to cylinder	22/26/40	22/26/40
Doffer to cloth roller	10	10/12
Plain roller to plain roller	8/10	---
Calendar roller to calendar roller	4	7

Table. 4 Important setting

Working Process parameter of draw frame

Draw frame (Breaker)

Make: -Rieter
Model: - RSB - 1
Deli hank: - 0.118
Deli rate: - 450 mtr/min
Gauge: - 46 - 50
Trumpet: - 4.6
Doubling: - 8
M/C no: - 14

Draw frame (finisher)

Make: -Rieter
Model: - RSB D - 40
Deli hank: - 0.121
Deli rate: - 410 mtr/min
Gauge: - 48 - 52
Trumpet: - 4.6
Doubling: - 8
Break draft: - 1.40

M/C no: - 1

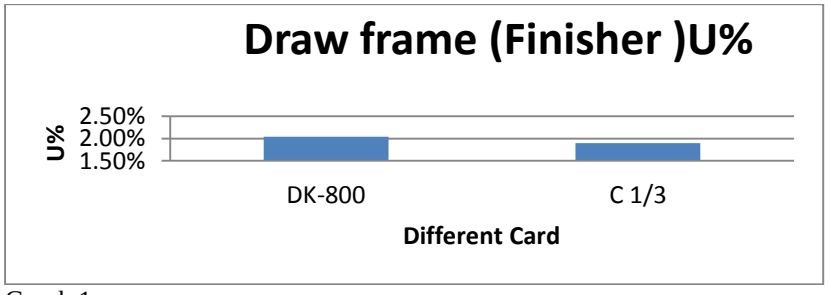
Working process parameter of speed frame

Make: - Zinser (Saurer Schalafhorst)
Model: - ST 68 I
Deli hank: - 1.21
Deli rate: - 28.73 mtr/min
T.P.I:- 0.89
Flyer speed: - 970 rpm
No. of spindle: - 120
Drafting system: - 3 over 3

Working process parameter of ring frame

Make: - KTTM Kirloskar
Model: - RXI 240
Gauges: - 44/60
Break draft: - 1.20
T.P.I:- 25.36
Twist: - Z
T. M: - 3.78
Spacer: - 2.8
Traveler: - 3/0
Front cots: - 85'
Spindle speed: - 16673 rpm
Top arm load: - red
Front roller speed: - 205 rpm
Deli speed: - 17.38 mtr/min
Ring dia: - 38 mm
Shaper wheel: - 42/2
B.D.C.P:- 64
C.P.D.C:- 45
T.C.A/ T.C.B:- 47/77
T.C:- 44
D.C.A &D.C.B:- 43/127
D.F.C:- 135.

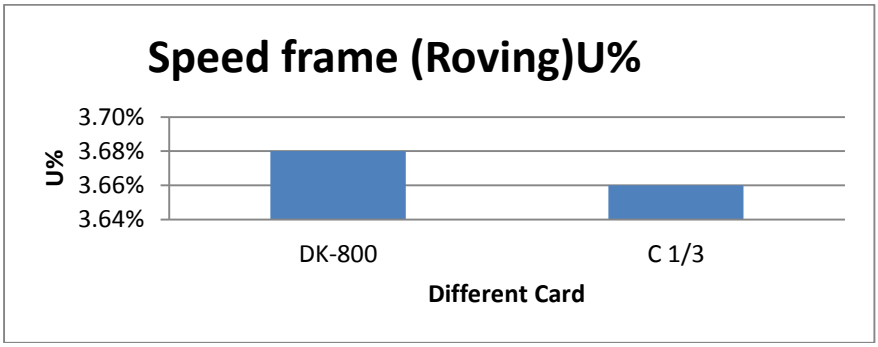
GRAPHICAL REPRESENTATION



Graph.1

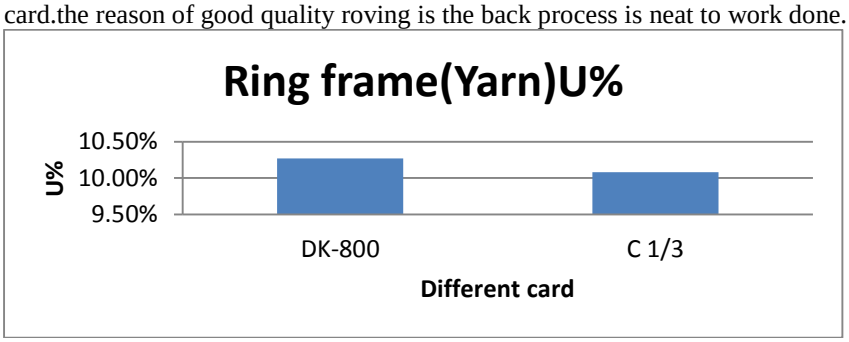
Graph 1 show that the U% of the draw frame finisher sliver of DK-800 & C 1/3 card.

The U% of the DK-800 card is 2.04 % & C 1/3 card is 1.90 %. From this result the C 1/3 card U % has better as compared to the DK-800 card from this result it was observed that the quality of card sliver was good this may due to the card setting of C 1/3 card is closer setting than DK-800 card and the delivery speed of C1/3 also low i.e. 30-40 mtr/min therefore the good quality of sliver is formed.



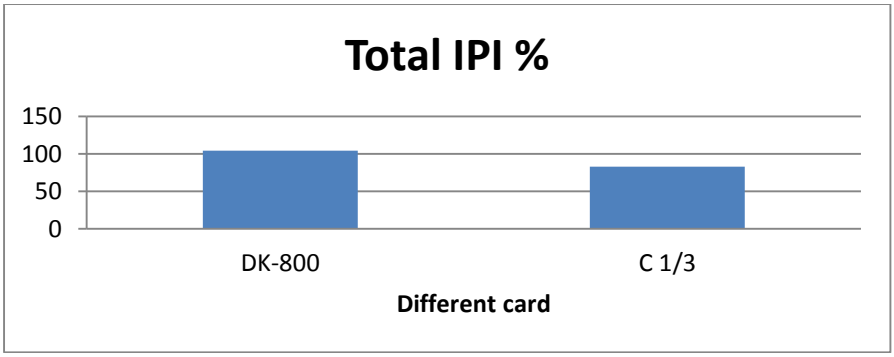
Graph. 2

Graph 2 shows that the U% of the speed frame roving sample of DK-800 & C 1/3card. The U% of the DK-800 card is 3.68 % & C 1/3 card is3.66 %. From this result the C 1/3 card U % has better as compared to the DK-800 card.the reason of good quality roving is the back process is neat to work done.



Graph. 3

Graph 3 shows that the U % of the ring frame yarn of DK-800 & C 1/3 card. The U% of the DK-800 card is 10.27 % & C 1/3 card is 10.08 %. From this result the C 1/3 card U % has better as compared to the DK-800 card. From this result it was observed that the delivery speed is low then individualization timing is more in C 1/3 card.



Graph. 4

Graph 4 shows that the imperfection % of the ring frame yarn of DK-800 & C 1/3 card. The total IPI % of the DK-800 card is 104& C 1/3 card is 82. From this result the C 1/3 card IPI % has better as compared to the DK-800 card. This may due to the lower speed of C 1/3 card then the more individualization timing are done

RESULT & DISCUSSION

Particular	**DK-800**	**C 1/3**
Mixing		
Material used	Polyester & viscose	Polyester & viscose
Blend ratio in %	48/52	48/52
Carding hank	0.130	0.130
Draw frame (Breaker)		
Deli hank	0.118	0.118
Draw frame (Finisher)		
Deli hank	0.121	0.121
U%	2.04%	1.90 %
CV% in 1 mtr	0.69 %	0.47 %

Speed frame		
Deli hank	1.21	1.21
U%	3.68 %	3.66 %
CV % in 1 mtr	2.11 %	3.07 %
Ring frame		
U %	10.27 %	10.08 %
CV % in 10 mtr	2.93 %	2.38 %
Thin -50%/km	2.3	5.5
Thick +50%/km	38.5	21.5
Neps +200%/km	63.3	55
Total IPI	104.1	82
Hairiness	3.72	4.06
Winding		
Long thick fault	5.0	14.9
Short thick fault	261.5	240
Long thin fault	125	206
Total cut/100 km	44.5	57
Neps cut	10	0
Short cut	27	28
Long cut	1	2
Thin cut	3	2
Off cut	0	0
Count CV% report		
Avg count	45.12	45.72
Avg strength	77	77
Count CV %	2.08 %	1.77 %
Strength CV %	5.01 %	4.5 %
Avg C.S.P	3456	3512
Single yarn strength	271	260
Elongation	9.92	9.56

Table. 5 Result & discussion

CONCLUSION

This project study of mainly based on comparatively study of different 3rd generation & 4th generation card of different manufacturer has various model of card machine. The comparatively study of DK-800 & C 1/3 card we have concluded as follows: The U % of draw frame finisher sliver of card DK- 800 machine is more 2.04% as compared to the card C 1/3 machine is 1.90%. Then U % of speed frame roving sample of card DK- 800 machine is also more 3.68% as compared to the C 1/3 card is 3.66%. U % of the ring frame yarn of DK-800 & C 1/3 card. The U% of the DK-800 card is 10.27 % & C 1/3 card is 10.08 %. Finally the IPI % in the yarn is more in DK- 800 machine is 104 & reduce the imperfection in the yarn for same count is compared to C 1/3 card is less IPI % is 82. Hence we have say the quality of material processed through the C 1/3 card is better results than DK- 800 card.

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