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Some Studies on Draw Frame Scanning Roller Setting on Ring Frame Yarn Quality

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Abstract

The paper mainly focus on impact of scanning roller width and its pressure on machine performance in Draw frame as well as material. For the experiment 15 Tex (40^s Ne) combed cotton yarn were prepared in finisher Draw frame machine with Scanning roller width 6.4mm & 7.9mm and trial were conducted by changing pressure 140kgs & 120kgs and maintained on finisher Draw frame LRSB 851. For the trail LMW line used for 15 Tex (40^s Ne). Blow room to Ring frame material processed through same machinery conditions as well as setting in finisher Draw frame machine used to determine impact of Scanning roller width and its Pressure on Yarn quality. It was found that imperfection (Thin, Thick & Neps) , short term evenness (U%) , and strength of yarn are influenced by the changes in Scanning roller width and its Pressure, improved U% (9.99) is observed for scanning roller width and pressure of 7.9/140, lowest imperfection (149) found for scanning roller width and pressure of 7.9/140. Highest single yarn strength (RKM) (18.55 gm / tex) and improved CSP (2860) observed for scanning roller width and pressure of 7.9/140.

Key words: Scanning roller width & Pressure, yarn properties, yarn quality.

I. Introduction

It has been observed that fiber orientation plays a key role in the performance of ring yarn. There are numerous factors which are responsible for fiber orientation namely fiber straightening, fiber extent, helix angle, relative fiber parallelization coefficient, curved fiber end proportions, migration of the fibers etc. These factors can be controlled by controlling various machine parameters. While processing the fiber in spinning department, draw frame is a very important machine which plays a very important in optimization of the quality of yarn. Specifically the autoleveller is contributing in controlling the quality of end product. Generally two types of autoleveller, open loop and closed loop are used in spinning machineries. Autoleveller is a device which measure the thickness of material and continuously alert the draft according to the required mass per unit length of material. Generally most of the draw frame machine contains open loop autoleveller. Checking of material (mass / unit length) is carried out at feeding side and according to the correction change in break draft or main draft is carried out as shown in fig. 1. In closed loop autoleveller material sensing is carried out at delivery part and correction is made in break draft or main draft as shown in fig. 2. As draw frame is the last machinery where we can do the changes for controlling of mass per unit length of the material for improving the yarn quality.

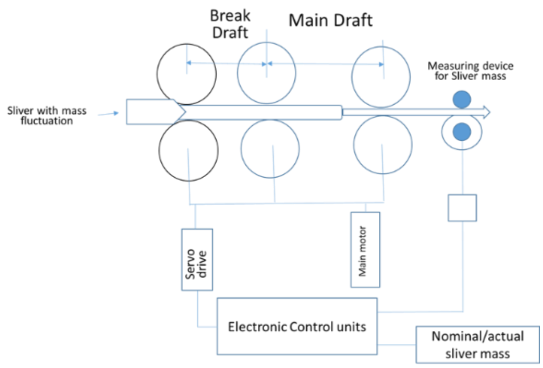

Fig. 1. Open loop Autoleveller

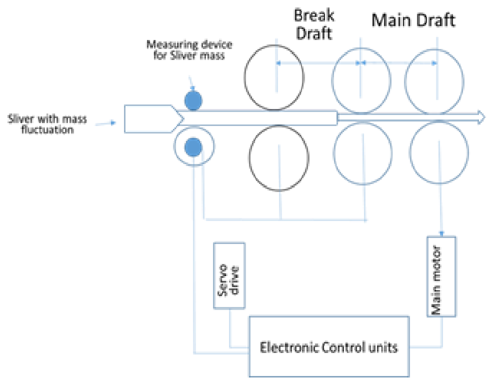

Fig. 2. Closed loop Autoleveller

II. Material and Method

High grade cotton was used in the study. For the trail LMW line was selected 15 Tex (40^s Ne) (MECH 100% Mixing). Blow room to Ring frame material processed through same machinery conditions as well as settings and Finisher Draw frame machine used to determine impact of Scanning roller width and its pressure. Raw material and machine details are given table 1.

In this experiment, trials were conducted at Finisher Draw frame machine by changing Scanning roller width and its Pressure on well-maintained Finisher Draw frame LMW line LRSB 851.In order to study Impact of Scanning roller width and its Pressure on yarn quality viz., yarn imperfection (Thin places -50%, Thick places +50% and neps +200%), single yarn strength (RKM), yarn count strength product (CSP) etc.

Single yarn strength (RKM) were measured on Tensorapid tensile testing machine, yarn U%, imperfection were tested on Uster evenness tester-4 machine. Yarn count strength product is tested on lea strength tester machine.

Table 1. Raw Material Properties

Machinery line	LMW
Mixing	MECH- 100%
Count	15 Tex (40^s Ne)
Cotton Variety	MECH-A 100%
Micronaire	3.51
Uniformity index	82.93
Elongation	5.3 mm
Strength	28.2 gm / tex

III. Results and Discussions

Impact of scanning roller width and pressure on U%:

It observed from Table 2 and figure 3, that decrease in scanning roller pressure with increase in scanning roller width (7.9 / 120), increases the U% (10.33), the increase in U% was near about 2.19%. Improved U% (9.99) is observed for scanning roller width and pressure at 7.9/140 and this may be happen because of the optimum orientation and attenuation of fiber at the correct mechanical draft.

Table 2. USTER result of Impact of scanning roller width and pressure

1	U%	10.01	10.023	9.99	10.33
2	Thin Place / km (-50%)	1.3	1.8	1.8	2
3	Thick Place/ km (+50%)	33.3	40.8	30.3	46.8
4	Neps/ km (+200%)	125.8	147.5	114.5	160.3
5	Neps / km (+280%)	25.3	31.3	20.5	38
6	Total Imperfection/km	160.4	190.1	146.6	209.1
7	Hairiness	4.48	4.41	4.62	4.23

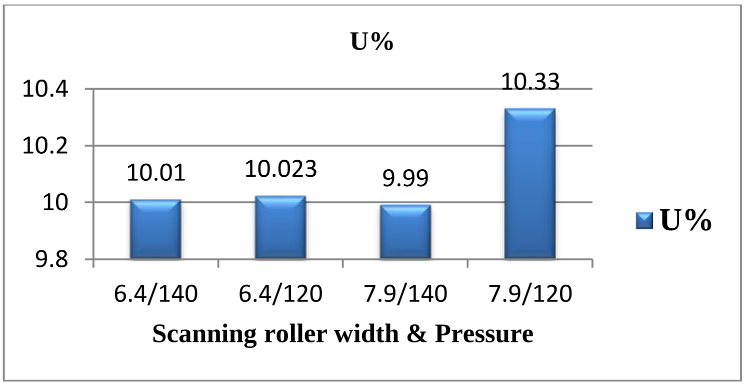

Figure 3: Impact of Scanning roller width & Pressure on U%

Impact of scanning roller width and pressure on Imperfection per km:

Table 2 and figure 4 shows the impact of scanning roller width and pressure on yarn imperfection. Highest imperfection (209.1) were observed for scanning roller width and pressure at 7.9/120, while lowest imperfection observed (146.6) for scanning roller width and pressure at 7.9/140, this probably the correct orientation and attenuation of the fibers for this setting.

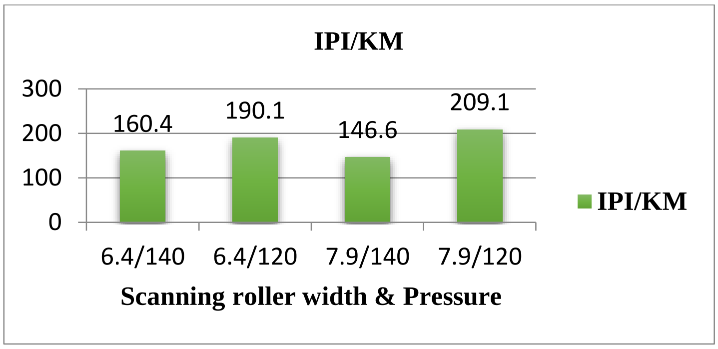

Figure 4: Impact of Scanning roller width & Pressure on IPI/KM

Impact of scanning roller width and pressure on single yarn strength (RKM):

Drop in single yarn strength (RKM) (16.51) seen at 6.4/120 scanning roller width and pressure setting. The impact of single yarn strength (RKM) can be seen in table 3 and figure 5. Stronger yarn (18.55) is observed at 7.9/140 scanning roller width and pressure setting.

Table 3: Single Yarn Strength and Elongation

1	RKM	17.46	16.51	18.55	17.99
2	RKM CV%	7.59	8.28	6.86	6.88
3	ELONG %	4.26	4.51	4.73	5.67
4	ELONG CV%	11.86	9.31	11.45	19.4
5	S .Y .S	257.8	243.7	273.9	265.5

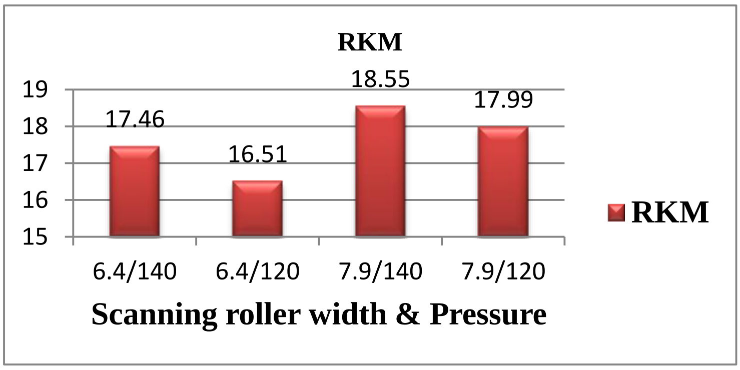

Figure 6: Impact of Scanning roller width & Pressure on RKM

Impact of scanning roller width and pressure on count strength product (CSP):

The Impact of scanning roller width and pressure on count strength product (CSP) shown in table. 4 and figure. 6. Decrease in CSP (2742) were found for scanning roller width 6.4 mm and 120 Kgs. Improved CSP is observed at 7.9mm scanning roller width at 140 Kgs scanning roller pressure.

Table 4. Impact of scanning roller width and pressure on Strength

1	Nominal count	**40^s Ne CW**			
2	Scanning roll Width (mm) & pressure (kg)	**6.4/140**	**6.4/120**	**7.9/140**	**7.9/120**
3	Actual count	41.17	42.53	40.96	41.22
4	Count cv%	1.21	1.06	1.05	1.04
5	Strength	67.74	64.04	67.14	69.03
6	Strength cv%	2.71	2.71	3.32	5.49
7	CSP	2788	2733	2750	2842

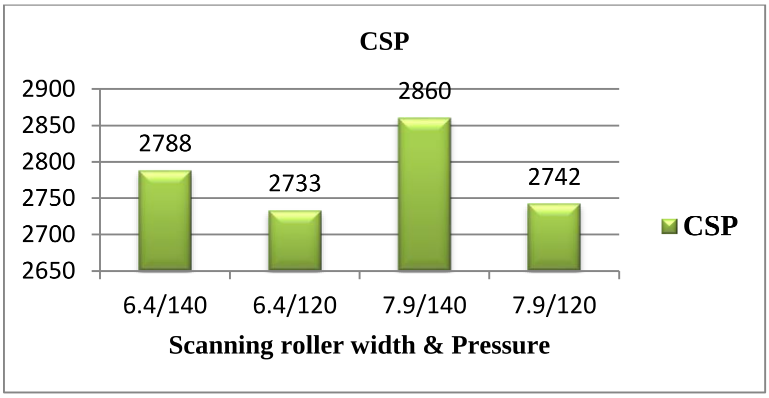

Figure 6: Impact of Scanning roller width & Pressure on CSP

Impact of scanning roller width and pressure on Classimate faults:

From table 5 and 6, it has been observed that scanning roller width of 7.9 mm and scanning roller pressure of 140 Kgs performance is better than other setting of scanning roller width and pressure, as the orientation and attenuation of the fibers for the said setting.

Table VI. USTER Classimate report

1	7 Class	13.2	17.1	15	14
2	8 Class	13.2	17.1	16	16
3	4 Class	9.6	13	22	11
4	5 Class	473.2	512.5	370	473
5	16 Class	496.1	542.6	407	498
6	Long Thick	13.2	46.1	10	11
7	Long Thin	16.9	20.1	21	27

Table-VII Impact of scanning roller width and pressure

1	Nominal count	40^S Ne CW			
2	Scanning roll Width (mm) & pressure(kg)	6.4/140	6.4/120	7.9/140	7.9/120
3	CSP	2788	2733	2750	2842
4	U%	10.01	10.023	9.99	10.33
5	S .Y .S	257.8	243.7	273.9	265.5
6	LONG THICK	13.2	46.1	10	11
7	LONG THIN	16.9	20.1	21	27

IV. Conclusion:

As overall Yarn quality (U%, IPI, CSP, RKM) with Scanning roller width 7.9mm & Pressure 140kgs found to better in comparison with regular setting, (Scanning roller width 6.4mm & Pressure 140kgs).

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