Effect of Opening Roller Speed and Torque Stop on Open End Yarn Quality

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Abstract

This project work deals to determine effect of opening roller speed & torque stop on yarn quality. For the experiment 29 Tex (20^s Ne),98 Tex (6^s Ne) carded cotton yarn were spun at an open end machine at the speed of 92000 rpm and 64000 rpm, trial where conducted by changing opening roller speed 7500, 7800, 8000, 8200 & 8500 rpm & torque stop green, white color on well-maintained rotor spinning machine of make Schlafhorst Auto Coro 480.

Keyword: – Open End System, CSP, RKM, U%, IPI, Hairiness

Introduction:

Operating principle of the rotor spinning machine

Feed material:- Draw frame sliver is fed to the open end machine.

Feed roller & feed plate:- The draw frame sliver is fed by Feed roller & feed plate.

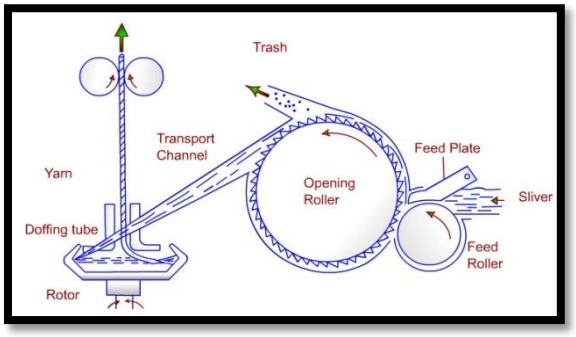


Fig. 1 –Passage of material through open end machine

Opening roller zone:- individualization of fiber, opening & cleaning of fibers.

Transport channel:-after opening zone the fibers are Transport channel.

Rotor:- The fibers are passed through rotor groove, each revaluation of rotor insert one twist in yarn.

Rotor groove:- the twist become a compact by acting a centrifugal force in yarn.

Doffing tube:- called as novel its helps to withdrawal of yarn.

Winding:-Take up the yarn & wind on cross wound package.

Experimental work

MATERIAL:-1)29 Tex (20^s Ne) OE & 98 Tex (6^s Ne) OE count are select for trial .
2) Open-end machine - schlafhorst Auto Coro 480

TRIAL:-1) Opening roller speed :-7500,7800,8000,8200 &8500 rpm.
2) Torque stop:- green, white color.

TESTING:-CSP, RKM, IPI, Hairiness

Machinery, Material& Method:

Table 1: Mixing Properties

Mixing	Cotton variety	Mix %	Mic	Mat ratio	UHML	Uni. Index	SFI	Strength	Elong^{n}	Rd Value	+b
OE57	Mech + Noil	55% +45%	3.01 mg/in	0.79 %	25.29 mm	80.10 %	7.30 %	25 gm./Tex	4.90 %	76.6 %	9.8 %

Table 2: Open End Process Parameter

Count	29 Tex (20^{S} Ne)	98 Tex (6^{S} Ne)
TPM/TPI	1051/26.69	384/9.75
Rotor rpm / dia.	92000 / 33 mm	64000 / 40 mm
Opening roller rpm / dia.	8200 / 60 mm	8000 / 60 mm
Nominal draft	225	65.8
Navel	Spiral	Plain
Torque stop	Green	White
Washer	No	Yes

RESULTS AND GRAPHICAL PRESENTATION:

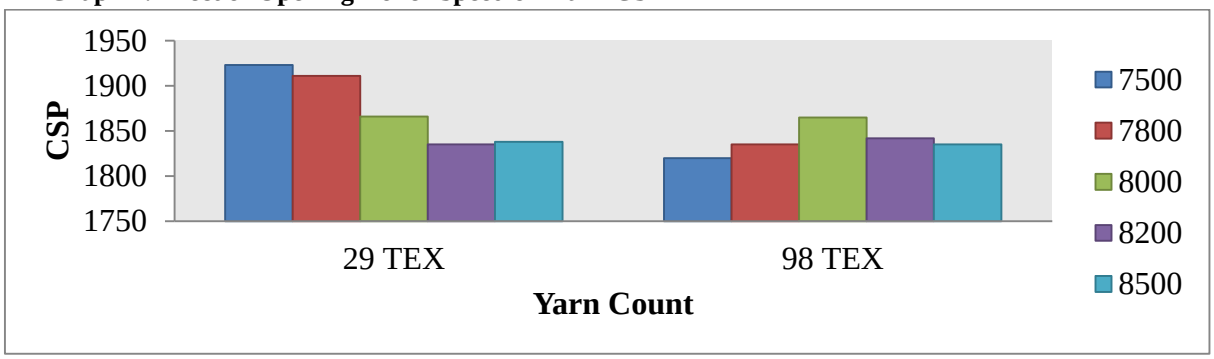
Yarn Test Results of Changing Opening Roller Speed for 29 Tex (20^{S} Ne) 98 Tex (6^{S} Ne)

1. CSP Results for 29 Tex (20^{S} Ne) and 98 Tex (6^{S} Ne)

Table 3: Effect of Opening Roller Speed on Yarn CSP

Parameters	Results for 29 Tex					Results for 98 Tex				
Opening Roller Speed (rpm)	7500	7800	8000	8200	8500	7500	7800	8000	8200	8500
CSP	1923	1911	1866	1845	1838	1820	1835	1865	1842	1835

Graph 1:Effect of Opening Roller Speed on Yarn CSP



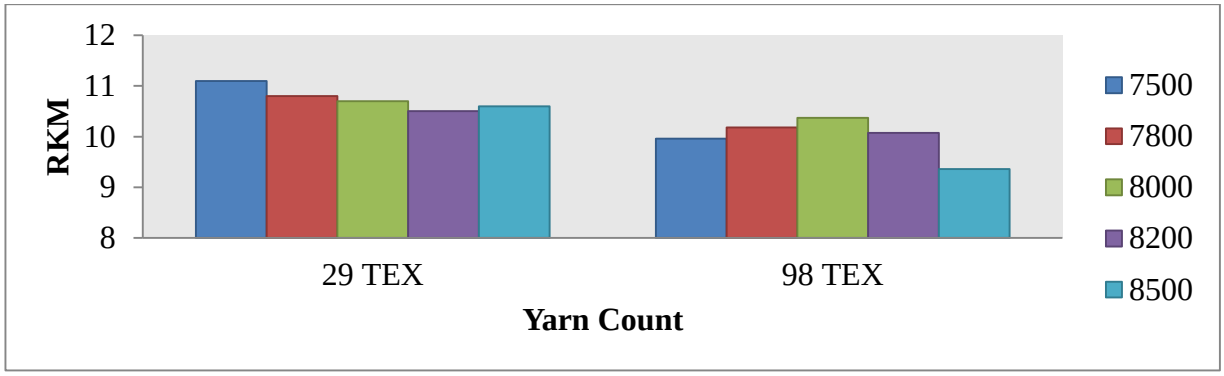
Inference: In graph 1 shows that opening roller speed decreases there is 1.68% CSP is increases. This is may be due to fiber can have more time in opening zone at 8000 rpm speed to open it and it gives better cleaning efficiency and effective back doubling and it reduces number of wrapper fibres.

2. RKM Results for 29 Tex (20^{S} Ne) and 98 Tex (6^{S} Ne)

Table 4: Effect of Opening Roller Speed on Yarn RKM

Parameters	Results for 29 Tex					Results for 98 Tex				
Opening Roller Speed (rpm)	7500	7800	8000	8200	8500	7500	7800	8000	8200	8500
RKM	11.1	10.8	10.7	10.5	10.6	9.64	9.68	9.79	9.38	9.42

Graph 2:Effect of Opening Roller Speed on Yarn RKM



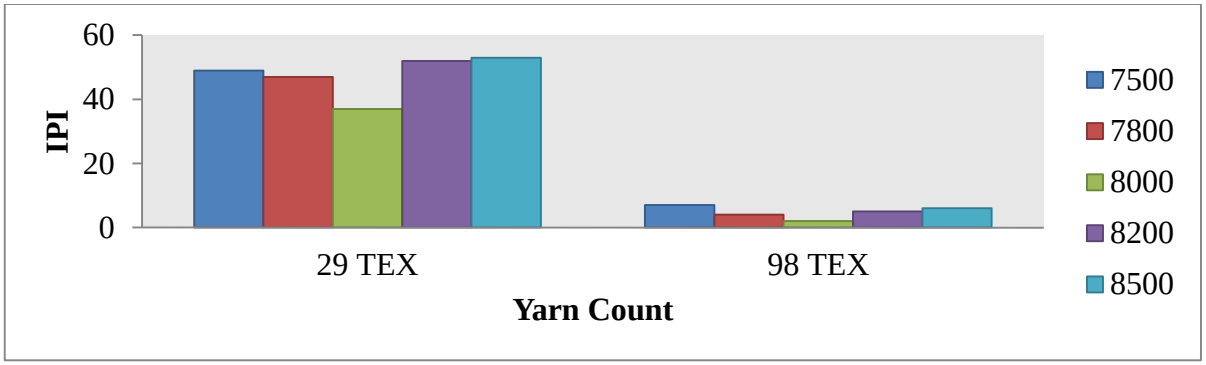
Inference: In graph 2 shows that opening roller speed decreases there is 1.9% RKM is increases. This is may be due to fiber can have more time in opening zone at 8000 rpm speed to open it as per CSP. And in case of 98 Tex (6^S Ne) there is no effect of opening roller speed on yarn RKM.

3. IPI Results for 29 Tex (20^S Ne) and 98 Tex (6^S Ne)

Table 5:Effect of Opening Roller Speed on Yarn IPI

Parameters	Results for 29 Tex					Results for 98 Tex				
Opening Roller Speed (rpm)	7500	7800	8000	8200	8500	7500	7800	8000	8200	8500
Total IPI (-50%,+50%,+280%)	49	47	37	52	53	7	4	2	5	6

Graph 3: Effect of Opening Roller Speed on Yarn IPI



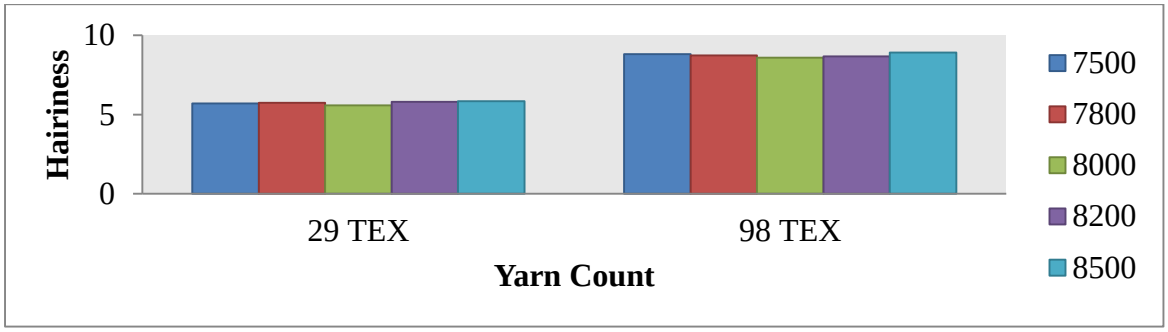
Inference: In graph 3 shows that opening roller speed decreases there is 28.84% IPI is decreases. This is may be due to fiber can have more time in opening zone at 8000 rpm speed to open it and to removing trash, individual fiber are transfer to the rotor. And in case of 98 Tex (6^S Ne) there is no effect of opening roller speed on yarn IPI.

4. Hairiness Results for 29 Tex (20^S Ne) and 98 Tex (6^S Ne)

Table 6: Effect of Opening Roller Speed on Yarn Hairiness

Parameters	Results for 29 Tex					Results for 98 Tex				
Opening Roller Speed (rpm)	7500	7800	8000	8200	8500	7500	7800	8000	8200	8500
Hairiness	5.7	5.75	5.59	5.8	5.85	8.96	8.88	8.59	5.73	8.81

Graph 4:Effect of Opening Roller Speed on Yarn Hairiness



Inference: In graph 4 shows that opening roller speed decreases there is 3.64% hairiness decreases. This is may be due to fiber can have more time in opening zone at 8000 rpm speed, to reduces number of wrapper fibres & lower friction of yarn with the metal parts. And in case of 98 Tex (6^S Ne) there is no effect of opening roller speed on yarn hairiness.

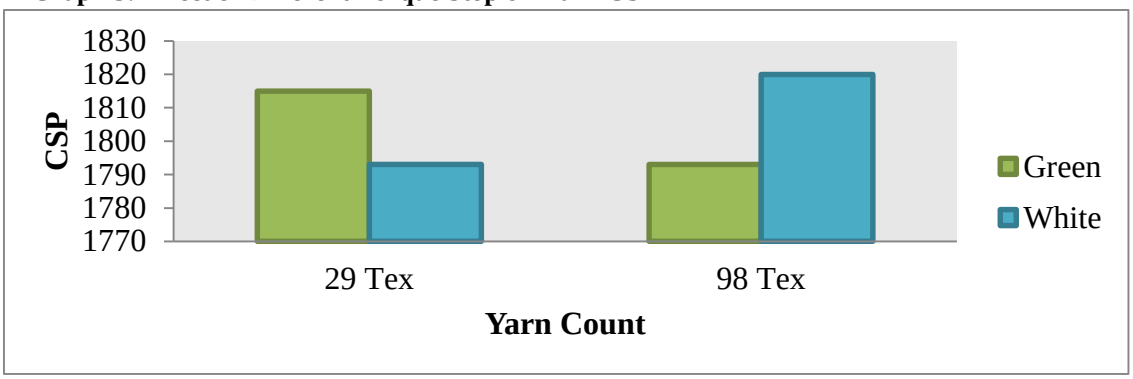
Yarn Test Results of Different Torque Stop for 29 Tex (20^S Ne)& 98 Tex (6^S Ne)

5. CSP Results for 29 Tex (20^S Ne) and 98 Tex (6^S Ne)

Table 7: Effect of Different Torque Stop on Yarn CSP

Parameters	29 Tex		98 Tex	
Torque Stop Color	Green	White	Green	White
CSP	1815	1793	1793	1820

Graph 5: Effect of Different Torque Stop on Yarn CSP



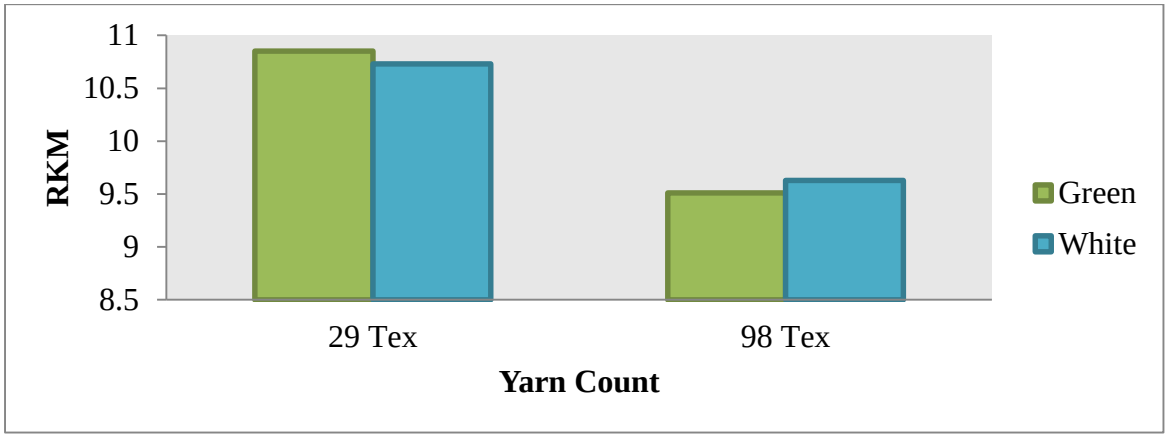
Inference: The graph 5 shows there is 1.23% improvement in yarn CSP valve by using green torque stop. This is may be due to white torque stop responsible for somewhat fiber rupture in opening zone. Due to more no. of fibers in yarn cross-section there is fiber rupture in green torque stop, there is no impact of green torque stop on CSP, so white torque stop is suitable for 98 Tex yarn.

6. RKM Results for 29 Tex (20^S Ne) and 98 Tex (6^S Ne)

Table 8: Effect of Different Torque Stopon Yarn RKM

Parameters	29 Tex		98 Tex	
Torque Stop Color	Green	White	Green	White
RKM	10.85	10.73	9.51	9.63

Graph 6: Effect of Different Torque Stopon Yarn RKM



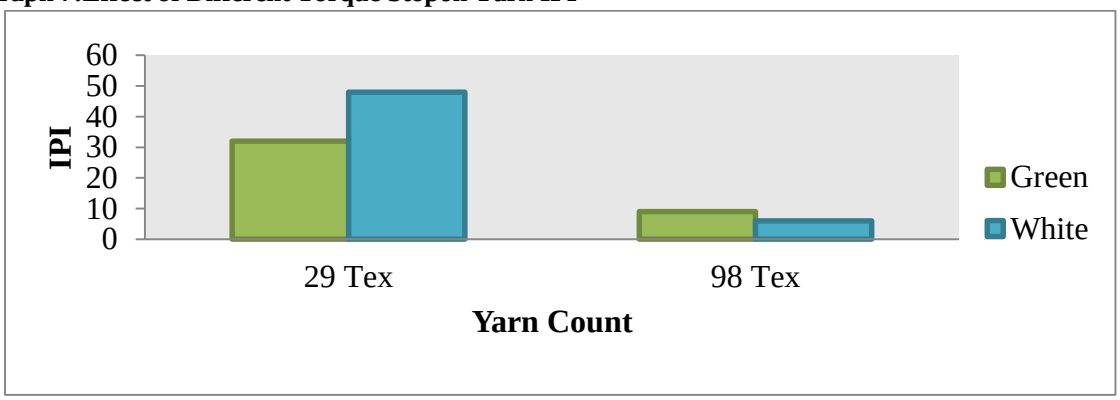
Inference: The graph 6 shows 1.11% improvement in yarn RKM value by using green torque stop this may be due to improvement in yarn CSP, so green torque stop is suitable. And the use of white torque stop is increase 1.11% yarn CSP because green torque stop in 98 Tex yarn.

7.IPI Results for 29 Tex (20^S Ne) and 98 Tex (6^S Ne)

Table 9:Effect of Different Torque Stopon Yarn IPI

Parameters	29 Tex		98 Tex	
Torque Stop Color	Green	White	Green	White
Total IPI (-50%, +50%, +280%)	32	48	9	6

Graph 7:Effect of Different Torque Stopon Yarn IPI



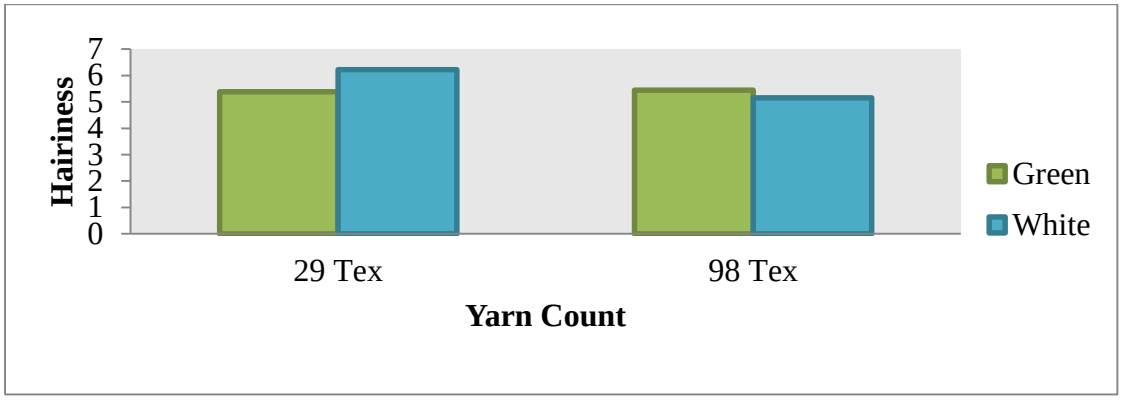
Inference: The graph 7 shows 33.33% reduction in yarn IPI by using green torque stop on 29 Tex yarn as per the opening roller speed, so the green torque stop is suitable for 29 Tex yarn. And 50 % reduction in yarn IPI by using white torque stop in 98 Tex yarn as per the opening roller speed.

8. Hairiness Results for 29 Tex (20^S Ne) and 98 Tex (6^S Ne)

Table 10: Effect of Different Torque Stopon Yarn Hairiness

Parameters	29 Tex		98 Tex	
Torque Stop Color	Green	White	Green	White
Hairiness	5.39	6.22	5.45	5.15

Graph 8: Effect of Different Torque Stopon Yarn Hairiness



Inference: The graph 8 shows 13.34% reduction in yarn hairiness by using green torque stop on this may be due to smooth surface & minimum area for passing yarn, so the green torque stop is suitable for 29 Tex yarn.The use of white torque stop is decrease up to 3.88% yarn hairiness, Due to more space of passing yarn in white torque stop & due to more no. of fibers in yarn cross-section.

Conclusion

From the above investigation it is confirmed that, as the opening roller speed is increases up to 8000 rpm the yarn quality parameters are found to be improved. As the opening roller speed increases up to optimum level the fibres are more opened and individually fed in to the transport duct so far it will improves the yarn quality by removing the trash & dust. For the finer 29 Tex (20^S Ne) yarns the opening roller speed has a more effect on the yarn quality but in case for the coarser 98 Tex (6^S Ne) counts there is no so much effect of opening roller speed on the yarn quality. Similarly, the opening roller speed, Torque Stop also gives more effect on fine 29 Tex (20^S Ne) OE yarn & little effect on coarser 98 Tex (6^S Ne) OE yarn, so its prove that the green torque stop is suitable for 29 Tex yarn and the white torque stop is suitable for 98 Tex yarn. The benefits from this project is 13.34% hairiness is minimize in 29 Tex (20^S Ne) OE yarn& due to the reduction of opening roller speed there is saving around 4 kW power/day in alok industry. The project was implemented for 29 Tex (20^S Ne) OE yarn.

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