Metallic Wire for High-Speed and High-Production Cotton Card

Part 6: Effects of the Stationary Flats on the Yarn Quality

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Kanai Juyo Kogyo Co., Ltd.

by Y. Ogita
K. Yagyu
T. Mitsuyoshi
S. Kanazawa

by J. Hosokawa
(Kyoto Institute of Technology)

— Abstract —

This report is related to the influence of the stationary flat on the quality of yarn.

The carded slivers with and without the stationaty flat are spun into two kinds of yarns. The qualities of yarn shown in the above two cases are compared respectively.

Result

(1) When the stationary flat is used, short fibre contents tend to be increased but the influence on the yarn strength is not so significant.

(2) The stationary flats mounted on both sides of the doffer and the taker-in are the most effective for decreasing the number of neps. thin and thick places and U% of the yarn.

(3) The stationary flats mounted on the taker-in side are effective for decreasing the number of neps and thin places in the yarn, and those on the doffer side are also effective for decreasing U% of the yarn.

(4) It must be noted that the yarn quality is degraded even when the stationary flat is used, if the setting condition is not suitable.

1. Introduction

In high-speed and high-production carding, the mean fibre length of sliver tend to be shorter when the stationary flat is mounted on either side one or on both sides of the taker-in or / and the doffer. However, the number of neps is reduced, and the orientation of fibre and U% of the sliver are improved (1). Essentially the effect of the stationary flat must be evaluated on the quality of the spun yarn.

In this study, the two kinds of slivers carded with and without the stationary flat were spun into yarns. And the yarn qualities such as yarn strength, yarn defect and others in above tow cases were compared respectively.

2. Test-condition

Table 1 shows the conditions in drawing, roving, and fine spinning processes after the carding.

As shown in Table 4, the drawing was repeated twice at a total draft of 8.04 so that the carded slivers of 590 grains/6yd could drafted to the drawing slivers of 447 grains/6yd.

In the roving process, the drawing slivers of 447 grains/6yd were processed to the rovings of 138 grains/15yd at a total draft of 8.3. In the fine spinning process, the rovings were spun into yarns of 20^{s} by using RY type spinning frame at a total draft of 24.6. The yarn was spun under the conditions of the number of twist of 19 T/ in

Table 1 Condition

Process		Weight	Tatal draft	Twist number (T/in)	Delivery speed (m/min)	Flyer and spindle speed (rpm)
Drawing	One head	514 gr/6yd	8.04	——	200	——
	Two heads	447 gr/6yd	8.04	——	200	——
Roving		138 gr/15yd	8.30	1.3	7.3	370
Spinning		(20^{s})	24.60	19	13.4 ~16.0	10,000 ~12,000

Type of frame Drawing : DY2C High-Speed Drawing Frame
Roving : FL6 High-Speed Roving Frame
Spinning : RY Spinning Frame
All is by Toyoda Automatic Loom Works

and of the spindle speed of 10,000 rpm to 12,000 rpm.

On the spinning frame, KS type ring of 51 mm I.D. and Hi-Ni O type traveller of No.3 count were used.

The carding conditions are shown in the previous report (1).

3. Result of spinning test

Tests were practiced under the spinning conditions shown in table 1. When the stationary flats were used, the changes in yarn quality were as follows.

3-1 Changes in yarn strength

The counts of spun yarn were varying in a range from 18's to 21's with scattering the sliver weight around 590 grains/6yd.

The relationship between the yarn strength and the yarn count is shown in Fig. 1 before showing the direct changes in yarn strength.

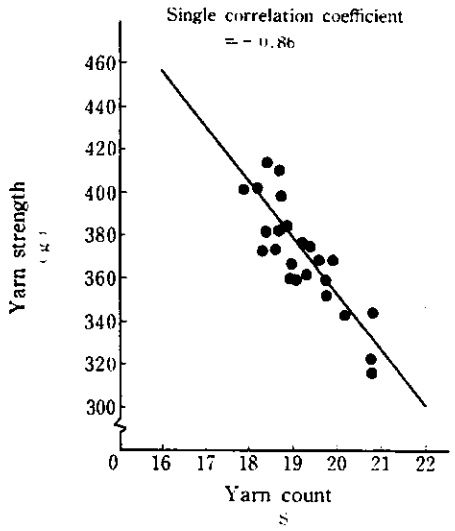

Fig. 1 Relation between yarn strength and yarn count

The single correlation coefficient of −0.86 shown in Fig. 1 indicates fairly close correlation between the two factors mentioned above. Thus, a little variation of the yarn count have a strong influence on the yarn strength.

Therefore, the yarn strength measured is calculated in terms of the strength of the 20's yarn to eliminate the influence of variation of the yarn count thereafter.

Fig. 2 shows the changes in yarn strength with and without the stationary flat.

The yarn strength became higher only by 10g when the stationary flats were mounted on the taker-in side.

Symbol	with or without the stationary flat	Setting condition	Symbol	with or without the stationary flat	Setting condition
—○—	with (Taker-in side)	I	—△—	with (Doffer side)	V
---●---	with (Taker-in side)	II	---▲---	with (Doffer side)	VI
—◎—	with (Taker-in side)	III	—□—	with (Both sides)	VII
---◎---	with (Taker-in side)	IV	---×---	without	VIII

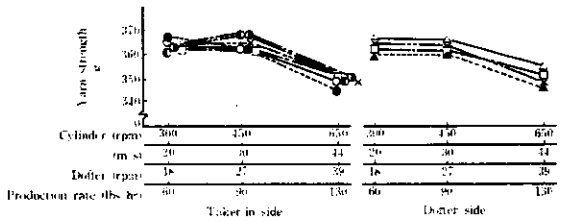

Fig. 2 Changes in yarn strength

The same tendency was recognized when the stationary flats were mounted on the doffer side.

Those results shown above imply that the position of the stationary flat mounted has almost no influence on the yarn strength, moreover the amount of increment in yarn strength is not so much.

The yarn strength came down at the cylinder speed of 650 rpm whether or not any stationary

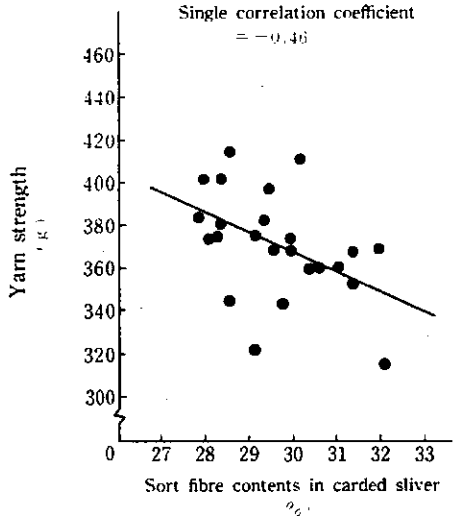

Fig. 3 Relation between yarn strength and short fibre contents in carded sliver

flat is applied. this may be because of increase in short fibre contents in the card slivers and of fatigue of a fibre.

Here, the relationship between the yarn strength and the short fibre contents is shown in Fig. 3.

The short fibre contents have a little influence on the yarn strength.

3-2 Changes in the number of neps in the yarn

The changes in the number of neps in the yarn are shown in Fig. 4. The measurements were made at a measuring range of 200% by using an Uster Eveness Tester.

Symbol	with or without the stationary flat	Setting condition	Symbol	with or without the stationary flat	Setting condition
—○—	with (Taker-in side)	I	—△—	with (Doffer side)	V
---●---	with (Taker-in side)	II	---▲---	with (Doffer side)	VI
—●—	with (Taker-in side)	III	—□—	with (Both sides)	VII
—●—	with (Taker-in side)	IV	—×—	without	VIII

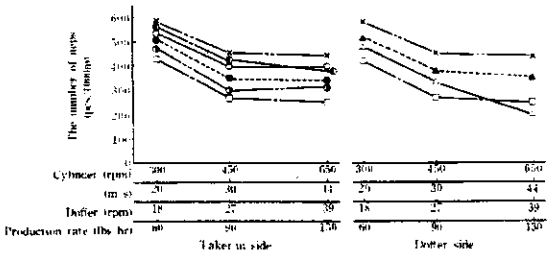

Fig. 4 Changes in the number of neps

As shown in Fig. 4, neps in the yarn are remarkably reduced when the stationary flats are mounted either side of the taker-in or the doffer and the number of neps was smallest when they are mounted on both sides.

when the stationary flats were mounted on the taker-in side, the number of neps was reduced if the clearance between the stationary flats and the cylinder is made narrower gradually from the lower end to the upper end of the back sheet along the cylinder surface such as the setting conditions II and III.

In cases of the setting conditions I and III, the number of neps and the fibre orientation in the card sliver were improved. Contrary to this, those in the spun yarn show the reverse tendency. The reasons to be considerable as follows.

(1) Fatigue of a fibre is increased by the excessive carding action.

(2) The ratio of loose neps in the sliver carded is increased in cases of the setting conditions II and IV and the loose neps may possibly be removed in the drawing process.

From the results in cases of setting conditions IV and VII where the guages on the taker-in side are same, and of the setting conditions VI and VII where the guages on the doffer side are same, it is more effective to mount the stationary flat on the taker-in side than on the doffer side.

There is not so wide difference in the number of neps between the cylinder speed of 450 rpm and of 650 rpm even when stationary flats are mounted on the taker-in side or the doffer side. This is because the ratio of loose neps is more at 650 rpm than at 450 rpm of the cylinder.

3-3 Changes in the number of thin places

Fig. 5 shows the changes in the number of thin places in the yarn are shown as one of IPI values. The measurements were made at a measuring range of −50% by using an Eveness Tester.

Symbol	with or without the stationary flat	Setting condition	Symbol	with or without the stationary flat	Setting condition
—○—	with (Taker-in side)	I	—△—	with (Doffer side)	V
---●---	with (Taker-in side)	II	---▲---	with (Doffer side)	VI
—●—	with (Taker-in side)	III	—□—	with (Both sides)	VII
—●—	with (Taker-in side)	IV	—×—	without	VIII

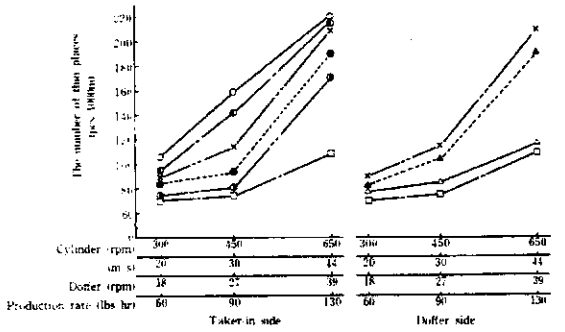

Fig. 5 Changes in the number of thin places

As shown in Fig. 5, the number of thin places was minimum when the stationary flats were mounted on both sides of the taker-in and the doffer.

When the stationary flat is mounted only on the taker-in side, the number of thin places in the

yarn are reduced when the clearances between the stationary flats and the cylinder are made narrower gradually from the lower end to the upper end of the back sheet along the cylinder surface, such as the setting conditions II and IV.

Contrary to this, in cases of the setting conditions I and III the number of thin places is increased in comparison with those without the stationary flat. This is because the carding action is strengthened by applying the setting conditions I and III.

From the results in cases of the setting conditions IV and VII (with the same setting on the taker-in side) and in cases of the setting VI and VII (with the same setting on the doffer side), it is more effective for decreasing thin places in the yarn to mount the stationary flat on the taker-in side than on the doffer side.

3-4 Changes in the number of thick places

The changes in the number of thick places in the sliver are shown in Fig. 6. The measurements were made at a measuring range of +50% by using an Eveness Tester.

Symbol	with or without the stationary flat	Setting condition	Symbol	with or without the stationary flat	Setting condition
—○—	with (Taker-in side)	I	—△—	with (Doffer side)	V
---●---	with (Taker-in side)	II	---▲---	with (Doffer side)	VI
-·-●-·-	with (Taker-in side)	III	-·-□-·-	with (Both sides)	VII
—●—	with (Taker-in side)	IV	—×—	without	VIII

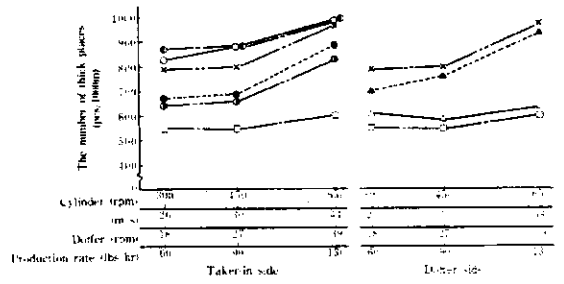

Fig. 6 Changes in the number of thick places

The changes in the number of thick places show the same tendency as that of thin places.

When the stationary flats were mounted on both sides of the taker-in and the doffer, the number of thick places was minimum.

Position of stationary flats mounted has almost no influence on the thick places.

3-5 U% of the yarn

As shown in Fig. 7, it is most effective for improving U% of the yarn to mount the stationary flats on both sides of the taker-in and the doffer.

Symbol	with or without the stationary flat	Setting condition	Symbol	with or without the stationary flat	Setting condition
—○—	with (Taker-in side)	I	—△—	with (Doffer side)	V
---●---	with (Taker-in side)	II	---▲---	with (Doffer side)	VI
-·-●-·-	with (Taker-in side)	III	-·-□-·-	with (Both sides)	VII
—●—	with (Taker-in side)	IV	—×—	without	VIII

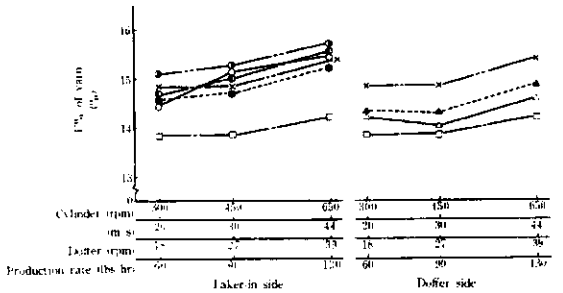

Fig. 7 Changes in U% of yarn

When the stationary flats are mounted only on the taker-in side, the influence of changes in setting is not remarkable.

Contrary to this, when the stationary flats are mounted only on the doffer side, U% of the yarn is improved. U% of the carded sliver has significant influence on the U% of the yarn.

Sammary

From the results of the tests for the influence of stationary flat on the yarn quality, the followings are concluded.

(1) The application of stationary flat tends to increase the short fibre contents in carded sliver, but its influence on the yarn strength is not so significant.

(2) For the number of neps, thin and thick places and U% of the yarn, it is the most effective when the stationary flats are mounted on both sides of the taker-in and the doffer.

(3) The stationary flats mounted on the taker-in side are effective for reducing the number of neps and thin places in the yarn, and those on the doffer side also effective for decreasing U% of the yarn.

(4) It must be noted that the yarn quality is

lowered even when the stationary flat is used if the setting is not suitable.

Reference

(1) Hosokawa, etc;Text of the 38th lecture meeting of Text. Mach. Soc., (401-1), 1985