Application of multiple taker-in system at card

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The Multiple taker-in system card not only ensured a gentler and higher degree of opening but also increased the quality potential of sliver and yarn by transferring the fibres to the cylinder in a form of more even and fine web.

Keywords: Carding, Cotton, Multiple taker-in system

A multiple taker-in system means a card which has more than one taker-in positioned one behind the other and running at increasingly high speeds. It makes extremely gentle opening and eliminates dirt, dust and short fibres in a more precise way. The fibres, therefore, reach the cylinder in the form of a uniformly thin web after being optimally opened by a series of three taker-in running at high speeds. The improved pre-opening of cotton fibres before the cylinder can positively influence the sliver and yarn quality.

Influence of an extra roller under and over taken-in of card, on sliver and the yarn parameters have already been studied*. The effect of carding parameters like taker-in, cylinder and doffer speeds on sliver and yarn quality and processing has also been reported.

The present investigation was aimed at comparing the conventional and multiple taker-in system card at various taker-in cylinder and doffer speeds with a view to study their effect upon sliver and yarn qualities.

Cotton variety MNH-93 of Gossypium hirsutum having 27.06 mm length, 4.5 micronaire value, 90.83x10^3 lb/in^2 strength, 48.92% uniformity ratio and 82.55% maturity was selected for the study.

The processing work was carried out at the Department of Fibre Technology, University of Agriculture, Faisalabad (Pakistan) and Aamer Cotton Mills, Ltd, Jumberkhurd, District Kasur (Pakistan).

The material was fed through the chute feed system at the same rate to the modified card (A1) and conventional cards (A2). The modified card was equipped with three taker-ins. The multiple taker-in system is shown in Fig 1.

The following speeds of both the carding machines were changed to study their effects:

Taker-in speed (B)
B1 = Minimum
B2 = Maximum

Cylinder speed (C)
C1 = 450 rpm
C2 = 500 rpm

Doffer speed (D)
D1 = 30 rpm
D2 = 40 rpm
D3 = 50 rpm
D4 = 60 rpm

The sliver samples of both the cards were prepared using different combinations of taker-in, cylinder and doffer speeds. The sliver samples (60 grains/yd) of both conventional and modified cards were then processed on the same drawing and simplex machines at similar settings and finally the yarns of 24s Ne were prepared at the same ring frame under similar setting.

Fig.1 — Multiple taker-in system at card [Specifications of taker-ins: diameters of first, second and third rollers — 172.5 mm; wire angles of first, second and third rollers — 17°, 20° and 20° respectively; points per inch of first, second and third rollers — 36, 162 and 205 respectively; speed of first, second and third rollers — 621-1373, 800-1730 and 1066-2488 rpm respectively; and teeth length of first, second and third rollers — 5, 5 and 8 mm respectively]
Card sliver irregularity, web neps, cleaning efficiency of card, yarn count strength product value (CLSP), yarn irregularity and imperfections were determined according to the standard methods. The data obtained were analyzed statistically as suggested by Steel and Torrie. Individual comparison of mean values (Table 1) shows the significant difference in the values of card cleaning efficiency, sliver irregularity, web neps, count strength product, yarn irregularity, thick places and neps. The improvement in uniformity is definitely the outcome of enlarged taker-in assembly due to which the stock is pre-opened and cleaned before it is carded by the flats and improved pre-opening of cotton fibres before the cylinder can positively influence the card sliver uniformity. Likewise, Nawaz and Irshad concluded that the additional roller segment at card not only controls the load on flats but also eliminates dust and other impurities which ultimately improve the sliver quality. Several researchers agree that the nep reduction at card is accompanied by the separation of impurities such as trash particles and seed coat fragments. Moreover, the improvement in CLSP might be attributed to better elimination of trash by additional roller and carding segments. The trash particles in cotton can lead to drafting disturbance, yarn breaks and contaminated yarn, resulting in lower strength.

Comparatively better performance of modified card equipped with multiple taker-in system is evident from the data on thick places and neps in yarn. Neps are actually produced in blowroom and the function of a card machine is to eliminate neps, but due to excessive load of fibres on cylinder the most of the neps remain unopened due to poor carding between cylinder and flat assembly. Application of multiple taker-in system controls the load of fibres on cylinder for better carding action which results in less number of neps. Earlier studies confirm that the card having additional rollers before taker-in with a view to reduce card web neps and sliver imperfection would help the production of quality sliver and ultimately good quality yarn.

Table 1 also reveals that the lower speed of taker-in significantly improves the sliver and yarn characteristics, viz. cleaning efficiency, sliver irregularity, web neps, CLSP, yarn irregularity, and imperfections. Nozaki concluded that with the increase in the speed of taker-in, the web neps and the uniformity of sliver are decreased. Similarly, Table 1 shows that the lower speed of cylinder is accompanied by better spinning performance. On the other hand, significant reduction in neps is recorded at the lowest speed of doffer. This finding is in agreement with that of Nozaki who observed that the neps increased with the increase in doffer speed. However, any significant change in thick and thin places is not recorded by increasing the doffer speed.

Replacing the single taker-in by multiple taker-in at the card results in improved efficiency combined with
improved sliver and yarn qualities. In comparison of carding parameters, the lower speeds of taker-in ($B_1$) and cylinder ($C_1$) produced excellent results. Similarly, the lowest doffer speed ($D_1$) has been found to be better for cleaning efficiency and neps; however, the higher doffer speed ($D_3$) produced comparatively better result for sliver/yarn regularity and thick places.

References