Short communications

Effect of mixing high-grade cotton at OE machine on quality of waste-spun yarn

R P Sundaram
Department of Textile Technology, PSG College of Technology, Coimbatore 641 104, India
Received 14 May 1990; revised received 13 August 1990; accepted 11 October 1990

Cotton roving of longer length/high uniformity fibres was mixed in small amount (9.25%) at OE machine with a waste sliver of short length/less uniformity fibres and it was found that this mixing technique helps to produce more even OE yarn without any noticeable increase in imperfection levels and strength.

Keywords: Cotton fibre, Fibre characteristics, Open-end spinning, Waste-spun yarn, Yarn characteristics

Yarn quality and productivity are influenced by the fibre characteristics, technology adopted, processing parameters and machine parameters. Deussen1 listed the various fibre characteristics according to their order of influence on yarn characteristics as shown in Table 1.

The fibre characteristics for producing a particular count have been optimized by various research organizations and efforts are still continuing in this direction to make better use of the available fibres. The required optimized fibre characteristics are achieved by mixing a number of lots. This is done to produce a constant standard of product from variable raw materials, such as by blending lots of different mean fibre fineness to produce a blend with the required fibre fineness, e.g. blending of cottons of different fineness2

\[ Fb = \frac{100}{\left(\frac{P_1}{F_1} + \frac{P_2}{F_2} + \ldots + \frac{P_n}{F_n}\right)} \]

where \( Fb \) is the fineness (mtex) of a blend of \( n \) components; \( P \), the percentage by mass of any one component; and \( F \), the fineness (mtex) of any one component. However, the variation in the individual characteristics should be within certain limits.

The limits for the fibre length are very narrow in the case of ring spinning because of the roller drafting systems. However, the rotor spinning system, in which the required draft is achieved by using opening rollers, gives a scope to process fibres with greater variation in fibre length. Thus, it is relatively easier to produce good quality yarn from less uniformity fibres by adopting OE spinning technology rather than the ring spinning technology. Scheneke3 also showed that the coefficient of variation of fibre length does not have much influence on the yarn strength and unevenness of OE yarn but it influences significantly the uster unevenness value and nep frequency of ring-spun yarn.

Two cotton mixings, namely 10 s mixing (mixing I) and 40 s mixing (mixing II), were selected for this study. The characteristics of the fibres obtained from the above two mixings are given in Table 2. The fibre samples for various tests were collected from the sliver of the two mixings.

Two 10 s OE yarns were produced from these two mixings as shown in the material flow chart (Fig.1) i.e. one from 100% 10 s mixing and another from 90.75% 10 s mixing and 9.25% 40 s mixing. The process and machine parameters used for the production of yarn samples are given in Table 3.
The statistical results (Table 4) show that the difference between the mean counts and strengths are not significant at 1% level. This means that the samples produced are identical in yarn count and there is no real improvement in the yarn strength by having more amount of longer fibres in the feed sliver. This may be due to the fact that, because of the basic structure, the fibres do not affect the strength of the OE yarn as they influence the ring yarn strength.

The difference between the standard deviation of count and strength of the samples is significant at 1%. The calculated ratio for count is 3.52 and that for strength 3.85 as against the 1% level value of 2.58. Hence, it is statistically confirmed that the sample II is more uniform in terms of count and strength compared to the sample I.

On comparing the count CV%, strength CV%, CSP and U% of samples against the norms values for the 10s OE yarn, it is observed that the sample II is within the norms limits whereas the sample I is far inferior. It is because of the fact that longer fibres produce a more even yarn than shorter fibres and this results in better count CV%, strength CV% and imperfection levels. This means that it is possible to produce a standard OE yarn from waste cotton by adopting this mixing technique which is otherwise not possible. When compared with the sample I, the sample II shows 8.5% reduction in total number of imperfections. This reduction in imperfection level is very close to the extent of high-grade cotton (9.25%) mixed with the waste sliver.

Both the samples show less strength and high imperfection levels when compared with the standard norms values. This may be due to inferior waste mixing.

Yarn with less count CV% and strength CV% can be produced using waste cotton by this mixing technique which is otherwise not possible. Imperfection levels can be reduced to the extent of high-grade cotton mixed. Addition of more amount of longer fibres does not improve the strength of the OE yarn, i.e. OE yarn strength does not depend on the fibre length parameter as in the case of ring yarn.

References

Table 4—Yarn characteristics

<table>
<thead>
<tr>
<th>Yarn parameter</th>
<th>Sample I</th>
<th>Sample II</th>
<th>Norms value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count, Ne</td>
<td>10.15</td>
<td>10.44</td>
<td>10</td>
</tr>
<tr>
<td>Count CV%</td>
<td>5.33</td>
<td>2.16</td>
<td>2.5</td>
</tr>
<tr>
<td>Strength, lb</td>
<td>105.3</td>
<td>108</td>
<td>140</td>
</tr>
<tr>
<td>Strength CV%</td>
<td>15.31</td>
<td>5.47</td>
<td>6</td>
</tr>
<tr>
<td>CSP</td>
<td>1068.79</td>
<td>1085.76</td>
<td>1400</td>
</tr>
<tr>
<td>U%</td>
<td>12.3</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Thin places/1000 m</td>
<td>0</td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>Thick places/1000 m</td>
<td>170</td>
<td>162</td>
<td>30</td>
</tr>
<tr>
<td>Neps/1000 m</td>
<td>156</td>
<td>136</td>
<td>125</td>
</tr>
<tr>
<td>Total imperfections</td>
<td>326</td>
<td>300</td>
<td>175</td>
</tr>
</tbody>
</table>

On comparing the count CV%, strength CV%, CSP and U% of samples against the norms values for the 10 s OE yarn, it is observed that the sample II is within the norms limits whereas the sample I is far inferior. It is because of the fact that longer fibres produce a more even yarn than shorter fibres and this results in better count CV%, strength CV% and imperfection levels. This means that it is possible to produce a standard OE yarn from waste cotton by adopting this mixing technique which is otherwise not possible. When compared with the sample I, the sample II shows 8.5% reduction in total number of imperfections. This reduction in imperfection level is very close to the extent of high-grade cotton (9.25%) mixed with the waste sliver.

Both the samples show less strength and high imperfection levels when compared with the standard norms values. This may be due to inferior waste mixing.

Yarn with less count CV% and strength CV% can be produced using waste cotton by this mixing technique which is otherwise not possible. Imperfection levels can be reduced to the extent of high-grade cotton mixed. Addition of more amount of longer fibres does not improve the strength of the OE yarn, i.e. OE yarn strength does not depend on the fibre length parameter as in the case of ring yarn.

References