A reduced spinning process with the option of handling a higher non-lint content

Cotton Conference, Bremen
March 2018
Yarn manufacturing costs

ITMF International Production Cost Comparison for Rotor Ne20 [USD/kg]

75% of Production costs are raw material costs
Material costs

- Cotton 1.55 $/kg
- Comber noil 1.00 $/kg
- Flat Strips 0.80 $/kg
- Lickerin waste 0.60 $/kg

How much waste can be added without noticeably losing yarn quality?

**Problem:** Short fibers cannot be drafted without causing defects in the yarn.
Four spinning/yarn processes

Question: Which yarn process requires the lowest draft?

- classic ring spinning
- compact ring spinning
- OpenEnd spinning
- Airjet spinning

© Rieter
Yarn fineness is produced by a drafting process carried out in stages.

→ Increase of short fiber content creates more and more defects in the yarn
OpenEnd spinning process

- OE Spinning process completely opens the sliver structure coming from card or draw frame
- Yarn production with virtually no drafting
- In addition, dirt (non-lint) is excreted in this spinning process
  → very insensitive when using short fibers
Yarn fineness is produced by a drafting process carried out in stages.

- Increase of short fiber content creates more and more defects in the yarn.
Trial setup

Virgin cotton

Waste/comber noil
Trial setup

2 Draw Frame Passages

1 Draw Frame Passage

Short Process

<table>
<thead>
<tr>
<th></th>
<th>100%</th>
<th>70%</th>
<th>50%</th>
<th>30%</th>
<th>100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cotton (Central Asia)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comber noil</td>
<td>30%</td>
<td>50%</td>
<td>70%</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Micronaire</td>
<td>3.9</td>
<td>3.7</td>
<td>3.5</td>
<td>3.3</td>
<td>3.1</td>
</tr>
<tr>
<td>UHML HVI</td>
<td>27.4</td>
<td>24.7</td>
<td>23.0</td>
<td>21.1</td>
<td>18.4</td>
</tr>
<tr>
<td>SFC &lt; 12.7mm (w)</td>
<td>7.7</td>
<td>23.1</td>
<td>33.4</td>
<td>43.7</td>
<td>59.2</td>
</tr>
<tr>
<td>Neps AFIS-N</td>
<td>434</td>
<td>542</td>
<td>614</td>
<td>687</td>
<td>795</td>
</tr>
<tr>
<td>Trash Content Shirley</td>
<td>2.1</td>
<td>1.8</td>
<td>1.6</td>
<td>1.4</td>
<td>1.1</td>
</tr>
<tr>
<td>Material cost ($/kg)</td>
<td>1.55</td>
<td>1.39</td>
<td>1.27</td>
<td>1.17</td>
<td>1.00</td>
</tr>
</tbody>
</table>
Drafting system of a Trützschler draw frame

- Draw frames duplicate and parallelize the fiber material (using high draft 6 to 8)
- Clamping distance cannot be reduced to such an extent that fibers of 20mm and shorter can be stretched controlled with high draft
- Low draft makes no sense due to doubling
The applied draft in IDF 2 is just so big that the short-wave sliver defects from the card can be corrected. Corresponding to these boundary conditions, it should be possible to produce an optimal sliver for OpenEnd spinning, with which even high short fiber fractions can be processed to a good yarn quality.
Results Sliver quality

Sliver coefficient of variation (Uster CVm\%):
Results 100% Cotton – Yarn Quality

Yarn Strength

Breaking tenacity [cN/tex]

OE - Yarn count [Ne]

Neps

Neps [1/1000m]

OE - Yarn count [Ne]

Yarn count variation

Yarn count variation [CV_{10m}%]

OE - Yarn count [Ne]

Total IPI

IPI total [1/1000m]

OE - Yarn count [Ne]
Results 70% Cotton/30% Comber noil – Yarn Quality

- **Yarn Strength**
  - Breaking tenacity [cN/tex]
  - IDF 2
  - 2 Draw Frame passages

- **Neps**
  - Neps [1/1000m]
  - IDF 2
  - 2 Draw Frame passages

- **Yarn count variation**
  - Yarn count variation [CV, %]
  - IDF 2
  - 2 Draw Frame passages

- **Total IPI**
  - IPI total [1/1000m]
  - IDF 2
  - 2 Draw Frame passages
Results 50% Cotton/50% Comber noil – Yarn Quality

Yarn Strength

Breaking tenacity [cN/tex]

OE - Yarn count [Ne]

Neps

Neps [1/1000m]

OE - Yarn count [Ne]

Yarn count variation

Yarn count variation [CV₁₀m, %]

OE - Yarn count [Ne]

Total IPI

IPI total [1/1000m]

OE - Yarn count [Ne]
Results 30% Cotton/70% Comber noil – Yarn Quality

- **Yarn Strength**
  - Breaking tenacity (cN/tex)
  - IDF 2
  - 1 Draw Frame passage

- **Neps**
  - Neps [1/1000m]
  - IDF 2
  - 1 Draw Frame passage

- **Yarn count variation**
  - Yarn count variation [CV_{10m}%]
  - IDF 2
  - 1 Draw Frame passage

- **Total IPI**
  - IPI total [1/1000m]
  - IDF 2
  - 1 Draw Frame passages
Results 100% Comber noil – Yarn Quality

Yarn Strength

Neps

Yarn Strength

Neps

Yarn count variation [CV_{total} %]

Total IPI

Yarn count variation [CV_{total} %]
• For the OpenEnd spinning process there is now a perfect preparation process through an integrated draw frame (IDF 2) into the card (TC 15, TC 10) with minimal draft.
• This process enables very good yarn values to be produced with a high proportion of short-fiber and foreign matter contaminated fiber material.

→ there is no reason to use conventional draw frames with doubling anymore to produce OpenEnd cotton yarn.
Questions?