Worsted spinning technologies

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New/different product needs

1. Innovative thinking to develop new concepts
2. New/different processes to generate different products
3. Adoption
4. Either approach individual aspects of production chain or combinations of factors in chain
New/different products created by:

- Fibre
- Blends
- Physical and chemical modification
- Yarn formation differences
- Adoption of non-conventional methods
- Versatility in finishing
- Fabric geometry and design
Fibre crimp

Effects of fibre crimp:
- shrinkage
- fabric weight
- pilling
- thickness
- air permeability
Fibre length

Effects of longer fibre length:

- reduced breaks in spinning
- improved yarn properties
- pilling
Changes in yarn formation – what they mean for wool products

- Reference is ring spun
- Potential new products for wool
- Fabric appearance critical
- Conservative industry, Western Europe
Yarn requirements

- Constant mass
- cm to cm / km to km
- Robust
- Minimum weak places
- Good appearance
- Function
- Appeal
Processes:

- Combing
- Drawing
- Spinning
- Wind/clear faults
- Twisting
- Fabrication
Spinning

Front drafting roller

Bobbin

Ring/Traveller

Yarn guide

Balloon control ring

Spindle
Limits: spinning production (m/min)

<table>
<thead>
<tr>
<th>Spindle speed (rpm)</th>
<th>10,000</th>
<th>30,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wool (700 TPM)</td>
<td>14.3</td>
<td>na</td>
</tr>
<tr>
<td>Cotton (840 TPM)</td>
<td>11.6</td>
<td>35.4</td>
</tr>
</tbody>
</table>
### Limits: fibre diameter

<table>
<thead>
<tr>
<th></th>
<th>Wool</th>
<th>Cotton</th>
</tr>
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<tbody>
<tr>
<td>Fibre Diameter (Micron)</td>
<td>18</td>
<td>22</td>
</tr>
<tr>
<td>Yarn count, Nm (@ 40 fibres)</td>
<td>78</td>
<td>52</td>
</tr>
<tr>
<td>Min. fabric weight (g/m²)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- plain weave</td>
<td>160</td>
<td>205</td>
</tr>
<tr>
<td>- gaberdine</td>
<td>190</td>
<td>240</td>
</tr>
<tr>
<td></td>
<td>75</td>
<td>90</td>
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## Costing

<table>
<thead>
<tr>
<th>Yarn count and fibre diameter</th>
<th>Yarn price AUD $/Kg</th>
<th>Est. conversion cost AUD$/$kg</th>
<th>Comments</th>
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</thead>
<tbody>
<tr>
<td>1/24 Nm 22 micron</td>
<td>17.00</td>
<td>6.00</td>
<td></td>
</tr>
<tr>
<td>1/56 Nm 18.5 micron</td>
<td>23.50</td>
<td>11.5</td>
<td>Compares with combed cotton ring spun conversion cost of $3.50/kg i.e. ratios of 3.2 to 4.3</td>
</tr>
<tr>
<td>1/72 Nm 18.5 micron</td>
<td>27.70</td>
<td>16.70</td>
<td></td>
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</tbody>
</table>
Self-twist

Add twist

2-ply yarn
Sirospun

THE SIROSPUN™ PROCESS

ROVING GUIDE

REAR ROLLER

PREDRAFTING ZONE CONDENSER

MIDDLE ROLLER

APRON

MAIN DRAFTING ZONE CONDENSER

FRONT ROLLER

YARN BREAK DETECTOR

WORSTED RING SPINNING MACHINE
Solospun
Air-condensed or compact spinning

Standard Ring Spinning

- Draft zone
- Roller nip line
- Spinning triangle
- Yarn

Compact Ring Spinning

- Draft zone
- Compacting zone
- Spinning triangle
- Yarn
Compact spinning system

Courtesy Cognetex SpA – COM4 WOOL
Murata Vortex spinning system

- Drafting part
- Spinning part
- Winding part

- Sliver
- Front rollers
- Nozzle
- Spindle
- Yarn clearer
- Package
Short-staple spinning systems

- Vortex
- Rotor
- Ring

Speed (m/min)
Oerlikon Saurer Winpro S\textsuperscript{4} - 4-ply knitting yarn
Oerlikon Saurer Winpro S⁴
## Comparisons

<table>
<thead>
<tr>
<th></th>
<th>Ring</th>
<th>Compact</th>
<th>Vortex</th>
<th>Solospun</th>
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<tbody>
<tr>
<td><strong>Cost</strong></td>
<td>Hi</td>
<td>Hi</td>
<td>Attractive</td>
<td>Reduced</td>
</tr>
<tr>
<td><strong>Robust</strong></td>
<td>Ave</td>
<td>Ave</td>
<td>Acceptable</td>
<td>Reduced</td>
</tr>
<tr>
<td><strong>Flexibility</strong></td>
<td>Good</td>
<td>Reduced</td>
<td>Limited</td>
<td>Different</td>
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<tr>
<td><strong>Quality</strong></td>
<td>Hi</td>
<td>Hi</td>
<td>Reduced</td>
<td>Questions</td>
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<tr>
<td><strong>Appearance</strong></td>
<td>Hi</td>
<td>Hi</td>
<td>Reduced</td>
<td>Questions</td>
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<tr>
<td><strong>Distribution</strong></td>
<td>Hi</td>
<td>Limited</td>
<td>Small</td>
<td>Questions</td>
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<tr>
<td><strong>Market</strong></td>
<td>Reducing</td>
<td>Stagnant</td>
<td>New-limited</td>
<td>Stagnant</td>
</tr>
<tr>
<td><strong>Fibre needs</strong></td>
<td>Reference</td>
<td>Ring/Long H</td>
<td>Short staple</td>
<td>Ring/Long H</td>
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