PROCESSING OF POLYESTER & MICROFIBER

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Processing of Polyester & Microfiber

Fineness of a synthetic yarn is defined in ‘decitex’ or ‘denier’.

- **Decitex**: weight of 10,000 meter yarn, grams
- **Denier**: weight of 9,000 meter yarn, grams

**Decitex Perfilament (dtexpf)**

It is decitex of a yarn, divided by number of filaments, eg.

\[
\frac{\text{decitex}}{170} \quad / \quad f 2(1) \text{ yarn}
\]

- Single yarn: decitex / number of filament

A microfibre is defined as a yarn which contains filaments of less than 1 decitex per filament (dtexpf).

- Conventional filament: 2.6 - 6 dtexpf
- Weight reduced polyester: 1.2 - 1.6 dtexpf
- Microfiber: 0.3 - 1 dtexpf

**Surface Area of 1 m, 100 dtex Yarn (1 m, 100 dtex yarn)**

- The greater the surface area, greater the amount of lubricants in spinning. So more efficient chemicals to remove these lubricants.
- More disperse dye required to achieve the same relative visual strength as on coarse yarns.
- Hence wet rubbing fastness will be lower.
- Due to enlarged surface area, sublimation fastness will be lower.
MICROFIBER EFFECTS

- Softness,
- Absorbancy,
- Rapid cooling moisture transport,
- Anti creasing effect and stability,
- Special touch effect like ‘Moist Touch’.

MICROFIBER PROCESSING

- Light Weight Silks
- Desize, Scour
- Heat seat
- Weight reduction
- Dye
- Dry, Finish

- Peach Skin
- Desize, Scour
- Dry
- Padding,(emerising chemicals)
- Emerize
- Dye

- Woven Sports Wear
- Desize, Scour
- Dry
- Causticis
- Emerize
- Heat set
- Dye
- Dry, Finish
PREPERATION

- Because of large surface area, 2 - 5 times higher amounts of fiber lubricants are loaded compared with conventional coarse fibers. So efficient scouring agent necessary to remove excess amount of oils and waxes.

- Size chemicals should be checked. They could be:
  - Acrylate based,
  - Polyester based,
  - Polyvinyl alcohol based, chemicals.

- FIXECLEAN JT 200% is multifunctional, lubricant and wax emulsifier for PAD application.

<table>
<thead>
<tr>
<th>Recipe</th>
<th>PVA, Acrylate Size</th>
<th>Polyester Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIXECLEAN JT 200%, ml/L</td>
<td>5 - 10</td>
<td>5 - 10</td>
</tr>
<tr>
<td>Na₂CO₃, g/L</td>
<td>-</td>
<td>1 - 2</td>
</tr>
<tr>
<td>NaOH, g/L</td>
<td>1 - 2</td>
<td>-</td>
</tr>
<tr>
<td>EXOLINE PAD</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>pH</td>
<td>10 - 11</td>
<td>8 - 9</td>
</tr>
</tbody>
</table>

- EXOLINE PAD is pick-up enhancer for hydrophobic surfaces, recommended for tightly woven fabrics.

FIXECLEAN JT 200%

- Fiber finish and silicon oil emulsifier, on microfiber, and elastane fibers.
- Blend of emulsifiers.
- Is applicable in stenter padders. Does not require preliminary washing.
- Is prevents yellowing during thermo fixation at 180 - 190 oC.
- In subsequent washing no detergent no wetting agent, is required.
- Usage amount in the padder,

  FIXECLEAN JT 200% 5 - 10 ml/L.
GRESOFF F

- Microfiber contains more spinning oils when compared to regular polyester. For high quality dyeing results, an effective removal of these oils (degreasing) is carried out with GRESOFF F.
- The application may be in a separate operation, or combined with scouring, desizing, etc.
- Application amount: 0.2 - 0.5 g/L, depending on degreasing requirements and operation parameters.

THERMOSOL-DYEING

As microfiber is used mainly to produce lightweight fabrics, which are more susceptible to migration during thermosol dyeing process, an adequate slowing down of disperse dye molecules is required.

THERMODYE AM-C 10 - 20 g/L

Is added as anti-migration agent in the dye bath.

EXHAUST DYEING

How to achieve a high degree of levelness

When compared to regular polyester, with microfiber;

- Dyeing rate increases because of increased surface area.
- Level dyeing is more challenging, especially in certain dyes.
- Very effective levelling agents are required, such as:

  EXOLUBE ERN or EXOLUBE YRN
  + EXOLUBE NC

Application amount 0.5 - 1 ml/L.
EXOLUBE NC

- Versatile levelling, dispersing and lubricating chemical.
- Blend of anionic oil esters, APEO free.
- Effective re-levelling agent for PES fibers.
- Ensures crease-free dyeing.
- Prevents formation/oligomer agglomerates, during the dyeing.
- Application amount 0.5 - 1 ml/L

With EXOLUBE NC

Without EXOLUBE NC
Oligomers

- These are low molecular weight esters, formed during polymerization.
- Generally, oligomers are between 1.5 - 3% of fiber. If polymerization is not controlled properly, it climbs to 6 - 7%.

Problem Caused

- White powder deposits on bobbins, dyeing spinning and winding machines.
- Agglomeration with dispers dyes, and hence dye spots, unlevelness and poor rubbing fastness.

Oligomers in dyeing

- Oligomer formation is catalysed by;
  
  Carrier dyeing,
  High temperature dyeing,

- 130 °C dyeing generates more, compared to 120 °C,

  Longer staying time at 130 °C,

- Oligomer formation is reduced by,

  Discharging dye bath at high temperature,
  Efficient dispersing agent for oligomers,
  Reductive clearing with a dispersing agent.

MEGACLEAR 4 - 11
Reduction cleaner in acidic bath.
In dye bath, after cooling down to 90 °C
No additional dispersing agent.
MEGACLEAR 4 - 11 2 - 3 ml
Acetic acid x ml/L
Temp. 85 - 90 °C
Time 20 min
pH 4
After the addition of MEGACLEAR 4 - 11, pH should be 4

MEGACLEAR 12
Reduction cleaner in alkaline bath, at 95 °C
No H2S odor around application area.
No fading on wet dyed fabrics.
MEGACLEAR 12 1 g/L
NaOH, fl 3 g/L
EXOLUBE N C 1 g/L
Temp. 95 °C
Time 20 min
At the end of the process, pH should be 11-12
One Bath Dyeing-Reduction Clearing MEGACLEAR 4 - 11

Short processing times, saving 3 cycles.
Labor, energy, chemical, water costs are low.

Two Bath Alkaline Reduction Clearing - MEGACLEAR 12

Better rubbing, sublimation fastness property.
Superior oligomer cleaning.

MEGACLEAR 4 - 11 cleansing effect matches with NaOH – Hydrosulphite (70 °C), with much shorter operation times and more economical recipes.

MEGACLEAR 12 guarantees better cleaning effect with respect to NaOH – Hydrosulphite (70 °C) system. In case of super-microfiber / Lycra® blends, two subsequent reduction clearings is advised to reach a higher degree of fastness level.
DYEING MACHINES CLEANING

In case of unremoved dark spots on fabric or dust on package tops or changing from dark to light colors, dye machine should be cleaned with;

MEGACLEAR 12  1 g/L
NaOH, fl  2 - 3 g/L

JETCLEAN or

JETCLEAN OLG  2 g/L
Temp  135 °C
Time  30 minutes

Hot wash and neutralise

JETCLEAN / JETCLEAN OLG

• Both compounds have catalysing effect on MEGACLEAR 12 and also they solubilize oligomers.

• Foaming potential of these compounds is not depressed above 70 °C as conventional scouring agents.

• JETCLEAN OLG contains more oligomer solubilizers. It is double concentrated.
**FINISHING**

During drying of PES fibers with the softeners, fastness properties deteriorates, due to migration of dispers dyes, from the core of the fiber into the softener.

*Degree of deterioration proportionally increase with;*

- Decreasing diameter of fiber,
- Increasing drying temperature,
- Decreasing particul dia of silikon softener,
- Increasing amount of cotton in PES/CEL blends,
- Increasing emulsifier amount in silicones.

On 100 % PES, drying is rapid, emulsifier on the surface is limited.

On cotton blends, drying is slower, water with emulsifier and dispers dye, migrates to the surface, at longer period but fastness properties get worse.

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**UNIPES COMFORT and UNIPES RELAX**

- These products are concentrated polyester resins,
- Non-ionic,
- They impart soft hand with drape on PES,
- Polyester becomes antistatic and hydrophilic,
- Effective stain reducing action,
- Durable to home laundering,

In dyeing,

Levelling,

Anti-crease

Oligomer reduction.

<table>
<thead>
<tr>
<th>Dyeing</th>
<th>Finishing</th>
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<tbody>
<tr>
<td><strong>UNIPES COMFORT</strong> or</td>
<td>Exhaust: 2 - 3 ml/L</td>
</tr>
<tr>
<td><strong>UNIPES RELAX</strong></td>
<td>1 ml/L</td>
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<tr>
<td></td>
<td>Padder: 10 - 20 ml/L</td>
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</table>

For durability, drying is above 160 °C.
**UNIPES RELAX** is more durable to laundry. (After 25 wash cycles, wicking height of 15 cm s approached in 30 minutes.)

Application area of these products:

- Sportswear
- Ladies wear
- Polyester suede
- Polyester blankets
- Ladies lingerie
- Microfiber towels