**WHICH INK DO I USE?**

Basic Textile Ink Chemistries
- Fiber Reactive
- Acid
- Disperse including “Dye Sub” and Direct Disperse
- Pigment

Selection of Ink
- Based on Fabric
- Based on Processing Capabilities
- Based on End Use
- Processing Points
- Tricks of the Trade

**What’s In Digital Textile Ink?**
- Water
- Dye/Pigment
- Humectant
- Viscosity/Rheology Modifiers
- Dispersants/Surfactants
- Binder (if pigment)
- Antimicrobial Agent

**Selection Of Ink Based on Fiber**
- Reactive Inks
  - Cotton
  - Rayon
  - Linen
  - Other plant fibers
  - Silk
- Acid Inks
  - Nylon
  - Silk
  - Wool
  - Leather

**Selection Of Ink Based On Fiber (cont’d)**
- **Disperse Inks**
  - Polyester
  - Nylon (in some cases)
  - Acetate (in some cases)
- **Pigment Inks**
  - All fibers (mostly)

**Fiber Reactive Dyes**
- Invented in 1956
- Fiber reactive dyes react with the fiber forming a covalent bond
  
  \[
  \text{Cell-OH} + \text{Dye-R Stuff} \rightarrow \text{Dye-O-Cell} + \text{Other}
  \]

- Very Bright Shades
- Good Washfastness
**Fixation Of Reactive Dyes**

**Fiber Reactive dye**

Dye-R

\[ \text{Hydrolysis} \rightarrow \text{Fixation} \]

(\text{In the presence of steam})

Dye-OH \quad \text{Dye-O-Cell}

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**Acid Dyes**

- Anionic (negatively charged)
- Can be brightly colored
- Form an ionic bond in the presence of acid

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**Acid Dye Fixation**

\[
\begin{align*}
\text{NH}_3 & \quad \text{SO}_3^- \\
\text{NH}_3 & \quad \text{O}_3S \quad \text{In the presence of acid}
\end{align*}
\]

Fiber \quad Ink

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**Disperse Dyes**

- Also sometimes known as “Dye Sublimation” dyes
- Literally sublime upon heating forming a gaseous dye
- Gaseous dye is extremely attracted to and soluble in polyester (and nylon in some cases)
- Upon cooling, the now-solid dye is entrapped in the fiber
- Good wash fastness and light fastness that increase as energy level increases.

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**Selection Of Inks Based On End Use**

**High Energy Versus Sublimation Example**

- **Standard Textiles**
  - Established markets (dye sublimation inks)
  - Soft signage / Visual communication
  - Apparel / Fashion
  - Sportswear

- **Technical Textiles**
  - Emerging markets (direct to fabric inks)
  - Home Textiles (curtains, decorative)
  - Automotive interiors
  - Sun umbrellas
  - Outdoor furnishings
  - Outdoor awnings
  - Outdoor flags and banners

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**Fastness Test Example**

**FAKRA (Hot Light)**

Automotive interior

Test conditions: Temperature 60°C / Humidity 20% / more UV light / one cycle 72 h

<table>
<thead>
<tr>
<th>Test condition</th>
<th>Pigment Inks</th>
<th>Sublimation Inks</th>
</tr>
</thead>
<tbody>
<tr>
<td>FAKRA</td>
<td>Very High Energy Inks</td>
<td>Very High Energy Inks</td>
</tr>
</tbody>
</table>

**Scale**

FAKRA 5x

Target: 4
**Pigments**

- Colored particles with no attraction to fibers
- Typically “glued” onto the fiber with a binder
- Very good light fastness
- Simplest fixation
- Limited color space and crock (rubbing) fastness

**Post-treatments**

- Urethanes/Acrylics
- Dye Fixatives
- UV Absorbers
- Fluorochemicals

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**Processing Points**

**Fiber Reactives**

- Fabric is pretreated with alkali, urea, and antimigrant.
  - Depending on the pretreatment, once printed, the fabric is either steamed for 8-12 minutes OR it is thermofixed at 325-350F for 1.5-3 minutes.
  - After printing, the fabric is washed and dried.

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**Washing**

**Steamed Fiber Reactives**

**Unsteamed Fiber Reactives**
Similar to reactives, the fabric is pretreated with antimigrant and urea, substituting an acid for the alkali.

- The fabric is then steamed for 18-40 minutes.
- Following steaming, the fabric is then washed and dried.
- A dye fixative can be used in the last wash cycle to improve washfastness. (Usually done for swimwear)

If the fabric is to be direct-printed, it can be pretreated with an antimigrant.

- The fabric is then printed and dried
- After drying, the fabric is then either thermofixed at 400F for 0.5-1.5 minutes, OR it is steamed at 350F for 8 minutes.
- Depending on the application, the fabric may be washed and dried after fixation.

Limited to low-energy disperse dyes.

- The fabric may or may not be pretreated.
- The dyes are printed onto a specially treated transfer paper.
- The image on the paper is then transferred to the fabric by pressing the paper and fabric together at 380-410F for 30-60 seconds.

The simplest processing

- The fabric may or may not be pretreated with antimigrants or other chemicals.
- The fabric is then dried and heated to 300-350F for 30-90 seconds to cure the binder.

Traditional Tenter Frame or "Stenter"
**Pretreatment Equipment**

“Ministenter”

**Processing Equipment**

**Jacquard Vertical Steamer**
- One of the first steamers for digital
- Up to 1.5m wide fabric
- Capacity: 5-10 meters/hour
- Can be used in an office environment

**Jacquard SteamJet II**
- Up to 70 meters/hour
- High temperature ability
- Disperse dye capability

**Rimslow Steam-X**
- Continuous Steamer
- 20-50 Linear mtr/hr

**Xorella Mini Contexxor**
- High Pressure Steamer
- Similar to Steamjet but higher capacity

**Arioli Vapo 20**
- Continuous “Slack Loop” Steamer
Processing Equipment

Rimslow Wash-X
- Continuous Washer and Padder + Dryer
- Up to 100 linear mtr/hr

Processing Equipment
- Cibitex easyCoat/Dry

Processing Equipment
- Cibitex Easywash

Processing Equipment
- And there’s always...

Tricks Of The Trade
- Because of the risk of hydrolysis, don’t oversteam reactive-printed fabrics.
- Steam reactives, even if you don’t plan to wash them. Over time, the reactives will react at room temperature and change shade.
- Buy a humidifier and try to keep the printer room at 60% relative humidity and 72F.
- Use the appropriate machine cleaner with your inks (NO WINDEX). Using the wrong cleaner can (and usually does) cause ink coagulation and nozzle clogging.

Tricks Of The Trade
- Be sure that fabric printed with reactive or acid dyes is completely dry before steaming.
- To avoid staining during washing, wash cold first, then hot. There are also products available to prevent backstaining with acid and reactive dyes.