WHICH INK DO I USE?

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What This Presentation Covers

- 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

\[ \text{Cell-OH} + \text{Dye-R} \rightarrow \text{Dye-O-Cell} + \text{Other Stuff} \]

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

**Fiber Reactive dye**

Dye-R

\[ \text{Dye-R} \xrightarrow{\text{Hydrolysis}} \text{Dye-OH}, \quad \text{Dye-O-Cell} \]

(In the presence of steam)

**Acid Dyes**

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

\[ \text{Fiber} \overset{\text{In the presence of acid}}{\longrightarrow} \text{Ink} \]

\[ \text{NH}_3 \quad \text{SO}_3 \quad \text{O}_3 \text{S} \]

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.
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

Fastness Test Example

FAKRA (Hot Light)
Automotive interior
Test conditions: Temperature 65°C / Humidity 20% / more UV light / one cycle 72 h

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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
Processing Points

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 325-350°F for 1.5-3 minutes.

- After printing, the fabric is washed and dried.
Processing Points – Washing Steamed Fiber Reactives

Processing Points – Washing Unsteamed Fiber Reactives
Processing Points – Steamed Versus 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)

Processing Points - Acids
Processing Points – Direct Disperse

- 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.

Processing Points – Transfer Disperse

- 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.
Processing Points - Pigments

- 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.

Pretreatment Equipment

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
Processing Equipment

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

Processing Equipment

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

Xorella Mini Contexxor

- High Pressure Steamer
- Similar to Steamjet but higher capacity

Processing Equipment

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

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.