ICC Color Experts Day

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Textile Color Management

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Colored Textiles

- **Traditionally textiles are woven from colored threads**
- **Threads are formed from dyed fibers**
- **Patterns in textiles are formed by weaving multiple threads of different colors**

Color management of threads

- Threads are woven into solid-color fabrics or thread windings
- Colors of solid-color fabrics or thread windings are measured by specialized color devices
- Experimentally Speaking - Woven fabric measurements can also be estimated from spectral image capture of individual threads (HKRITA)
- Dye recipes are often formulated by trial and error

Textile Digital Printing Applications

- **Apparel**
- **Interior décor**
- **Furniture**
- **Soft signage**

Textile Printing Approaches

- **Direct Printing without Dye Sublimation**
  —Latex/UV/Hotmelt Printers
- **Direct Dye Printing**
  —Media treated to enable fixation
  —Media loaded into printer
  —Ink jetted onto media
  —Dye fixing process applied
- **Transfer Dye Sublimation**
  —Transfer media loaded into printer
  —Image printed reflected on transfer media
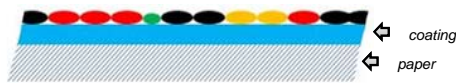 —Image transferred to media with heat press
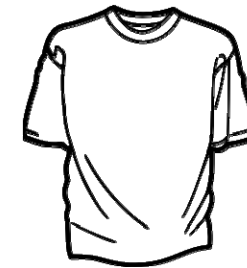
Issues:
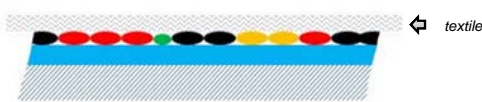- Ink adhesion (washing, rubbing)
- Color fastness (light)
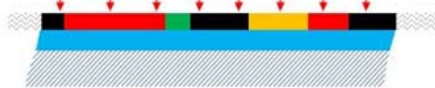
Transfer Dye Sublimation Process

1. Print design on coated paper

← coating
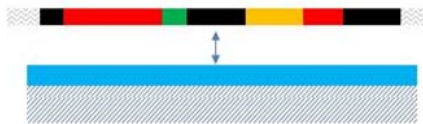← paper

2. Mount textile onto paper

← textile

3. Apply heat and pressure to sublimate dye into textile

Source Image in RIP

4. Separate printed textile

Print Reflected

Heat

Fabric

Image on Paper

Pressure
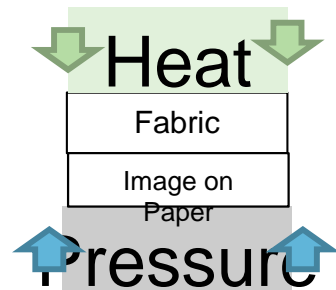
Sublimation Process

Final Result

1. **Prepare source image in RIP**

2. **Print reflected on transfer paper with sublimation inks**

3. **Sublimate from paper to fabric**
   - Heated dye becomes gas and infuses into fabric fibers
   - Color of dyes on paper not the same as final color
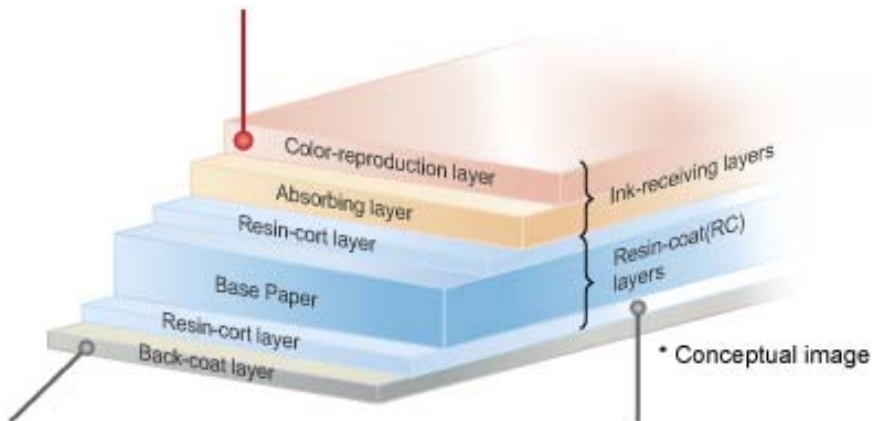   - Final output may change size due to heat

Colorant Surface Interactions

Coated Paper

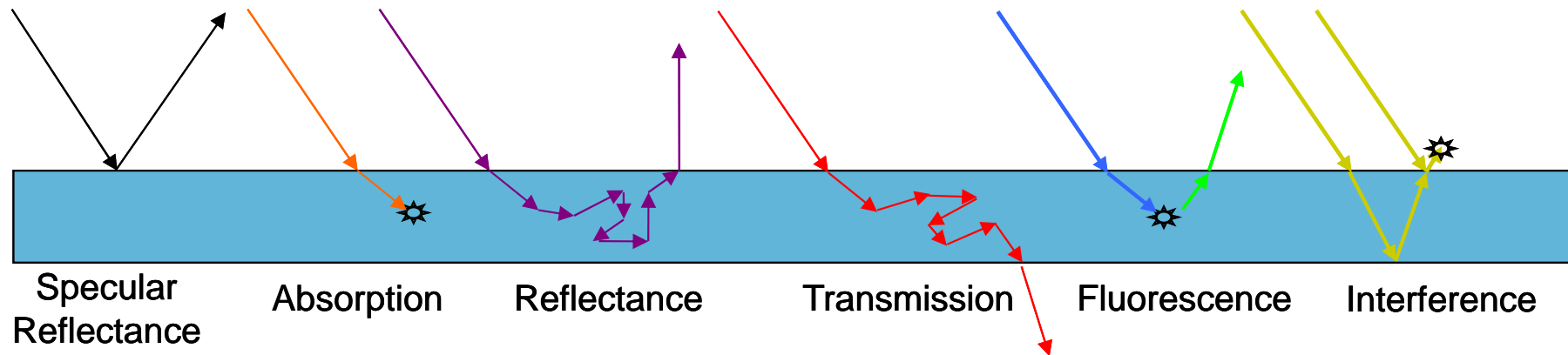- Single "Flat" Surface
- Colorant Absorbs into Media

Textile

- Lots of Rounded Surfaces
- Uneven application of colorant

Color-reproduction layer
Absorbing layer
Resin-cort layer
Base Paper
Resin-cort layer
Back-coat layer
Ink-receiving layers
Resin-coat(RC) layers
* Conceptual image

Light-Surface Interactions

How a photon interacts with a surface is dependent on its wavelength and the surface characteristics

Results in challenges for measurement of printed textiles to correspond to visual appearance

ONYX Swatch Book Tool

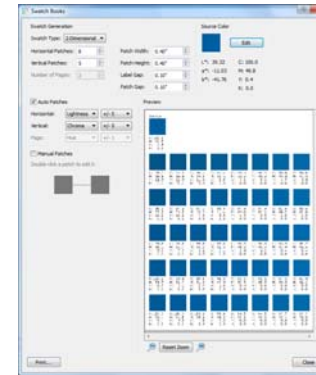ONYX Named Color Setup

ONYX Colorways Configuration

Managing Color

- **Manual**
  - Print color swatches and use color recipes in design applications
  - Use Named Spot Colors with device based color replacement
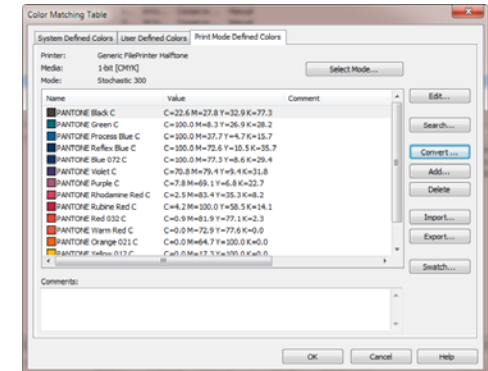 - Setup and use device color based Colorways palettes in RIP
- **Automated**
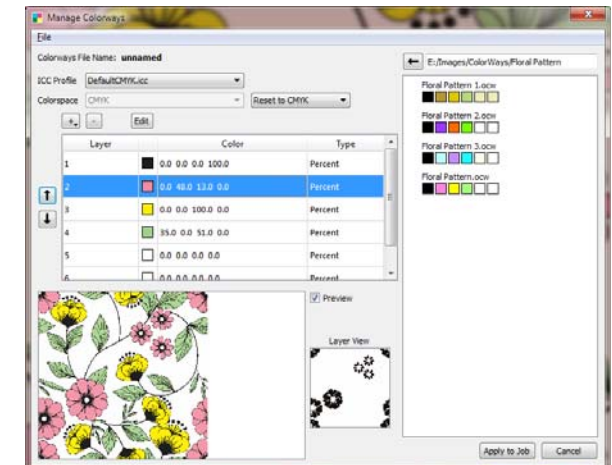 - Profile Media and Print Mode
 - Use ICC Color Management

Textile Gamut Differences

- **Good gamut coverage of bright/ saturated yellow, orange, red, magenta, and blues**
- **Limits to dyes**
  - Magenta is more of a red
  - Cyan is more of a blue
- **Results in loss of green and violet portions of gamut**
  - Additional inks may be required to achieve these kinds of colors
- **Cannot get very dark**
  - Black Ink Issues
    - Black often formed by mixing Cyan, Magenta, Yellow dyes
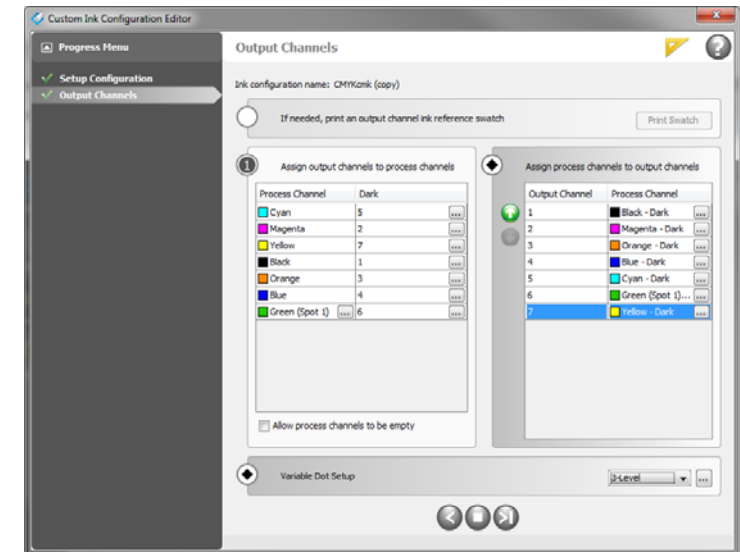 - Fibers of fabric scatter light resulting in lower densities

Offset gamut – wireframe

Dye sub transfer gamut - solid
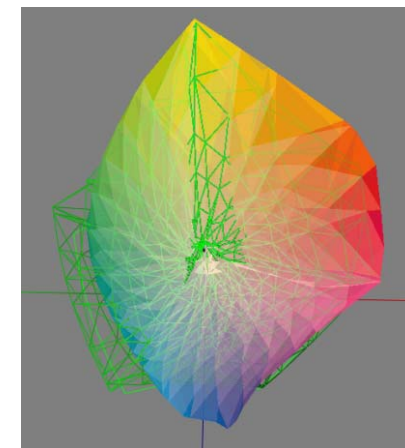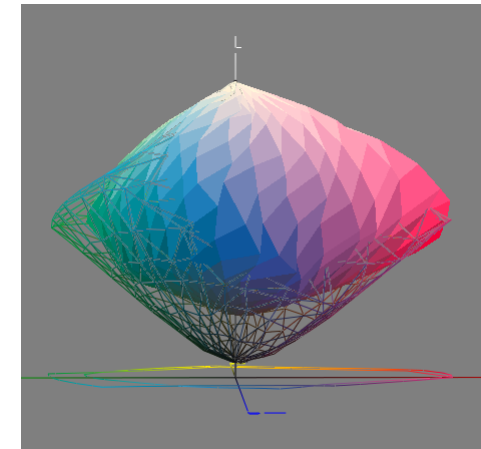
Ink Channel Selection

- **To get larger gamuts you may need to use additional inks**
  - As supported by the print device
- **Software should be configured to correspond to inks in printer**
- **Support for color profiling of custom ink configurations is required**

ONYX Custom Ink Setup

Potential for using iccMAX with textile?

- **iccMAX provides a flexible and extensible platform for modeling and defining color workflows**
  - Support for fluorescence based PCS
  - Support for custom illuminants
  - Support for modeling observing conditions
  - Extended "programmable" transform encoding
- **Advancements in color measurement technology are needed to take advantage of many iccMAX possibilities**
- **Implementation of iccMAX functionality that takes advantage of these features is yet to be seen**
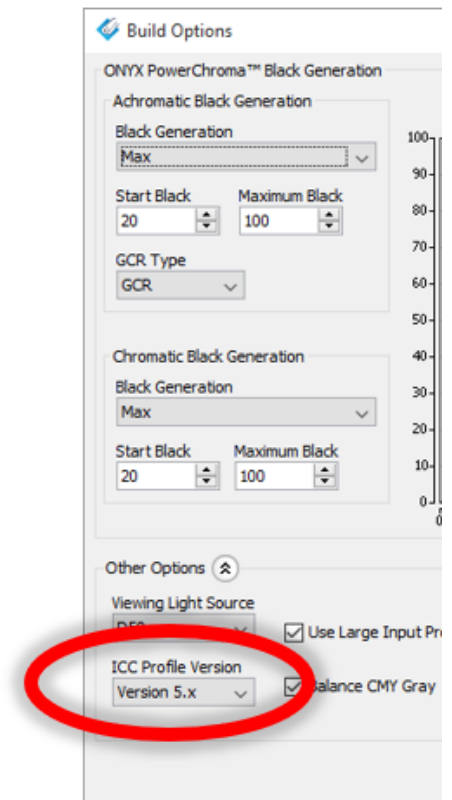
ONYX Profile Build Options

Textile Profiling Issues and Tips Part 1

- **Fabrics can have optical brighteners**
  - This results in false reading of blue light resulting in addition of yellow in final output

- **Dyes can Fluoresce**
  - Get really bright saturated colors
  - Results in very unreliable measurements

Fluorescence

- **Tip: Use M1 (part 1) measurements or manual color management**
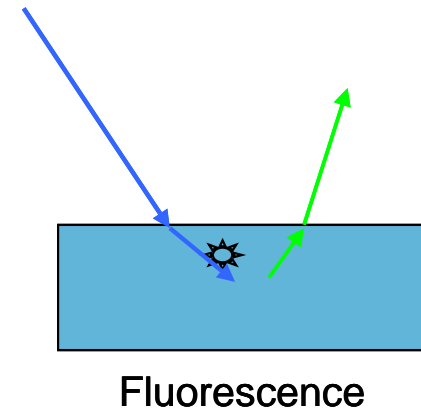
ONYX Color Device Setup

Textile Profiling Issues and Tips Part 2

- **Color changes due to sublimation**
  — Measure all color from final sublimated output
  — Process control of sublimation process is critical
  — Dyes result in different gamut shape
    – Black ink is actually a combination of CMY
  — Print with as much ink as possible to get richest blacks
- **Things get reversed with transfer printing**
  — Set up your workflow for printing your final images reflected
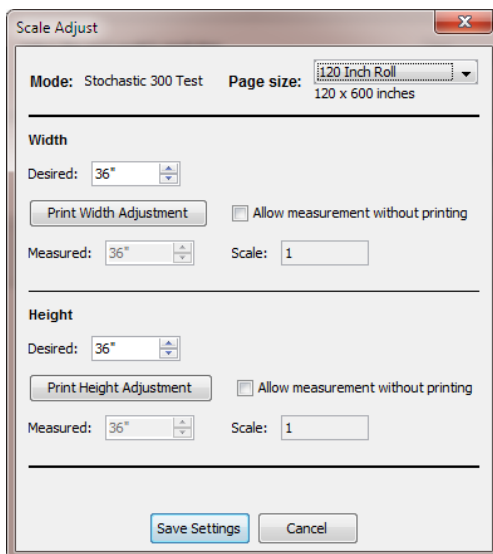 — Make sure color management swatches are also printed reflected

Rotate: 0°

☐ Reflect at Print time

Use Smart 16-bit processing
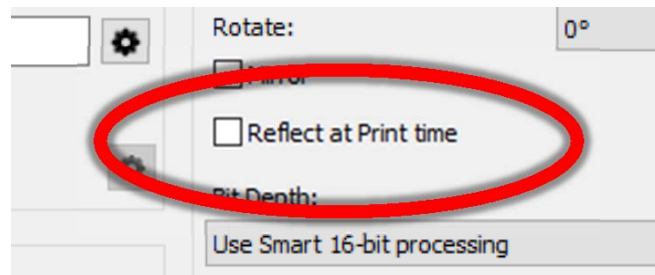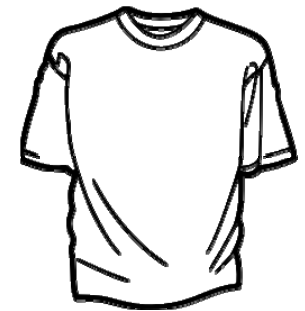
ONYX Quickset Setup

Textile Profiling Issues and Tips Part 3

ONYX Print Mode Adjustment

- **Weave directionality causes variability in the measurements**
  - Tip: Print two swatches with second swatch rotated 90° from first swatch
    - Measure first and second swatch with averaging for single reading for each patch
  - Use M3 measurement mode (with polarizing filter) to reduce impact of measurement light source
- **Fabric shrinks or stretches**
  - Tip: Use resolution adjustment to compensate for shrinking / stretching
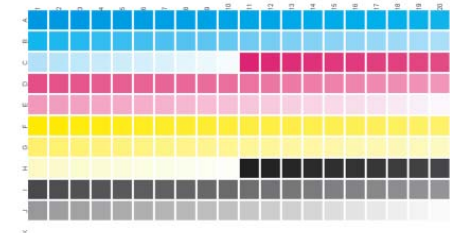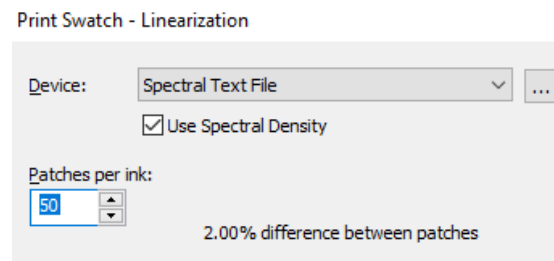
Textile Profiling Issues and Tips Part 4

- **Consider the number of patches when performing tone calibration**
  - —More patches may reduce severity of spikes with measurements
    - –The transition from zero to full color is very sharp
    - –Sublimation is a very NON-linear process
  - —Less patches avoids characterizing measurement noise

ONYX Linearization Print Swatch Dialog

Conclusions

- **Textile printing offers many opportunities**
- **Textile surface, media, and inks provide challenges to getting measurements of color that correspond to actual perception of color**
- **Managing color on textile has its challenges**
  —Manual approaches can work really well
  —Automated approaches are nearly the same as printing on conventional media when differences are accounted for
- **Important concepts:**
  —Getting good measurements, implementing process control, and using production workflow and color management software that you can trust

Thank You!