



ICC Color Symposium

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Textile Color Management 紡織色彩管理

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Colored Textiles 顏色紡織

- 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
- 傳統的紡織品是用彩色線編織而成
- 線由染色纖維形成
- 紡織品中的圖案通過編織不同顏色的多種線而成



Color management of threads

線的色彩管理

- Threads are woven into solid-color fabrics or thread windings
- Colors of solid-color fabrics or thread windings are measured by specialized color devices
- Woven fabric measurements can also be estimated from spectral image capture of individual threads (HKRITA)
- Dye recipes are often formulated by trial and error
- 線可以用來編織成淨色布或繞線
- 通過專用顏色裝置測量淨色布或繞線的顏色
- 織物面測量也可以通過單線的光譜圖像來估算 (HKRITA)
- 染料配方通常通過反復試驗制定





Textile Digital Printing Applications

紡織數碼印刷之應用

- Apparel 服飾
- Interior décor 室內裝飾
- Furniture 傢具
- Soft signage 軟指示牌



Textile Printing Approaches

紡織印刷方法

- 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
- 無需熱昇華的直接印刷
 - Latex/UV/Hotmelt 印刷機
- 直接染印
 - 已處理的物料以令之鞏固
 - 物料載入印刷機
 - 噴墨印在物料上
 - 用於染印固定過程
- 熱昇華轉移
 - 將物料轉移並送至印刷機
 - 打印的圖像反映在被轉移的物料上
 - 利用熱壓將圖像轉印到物料上

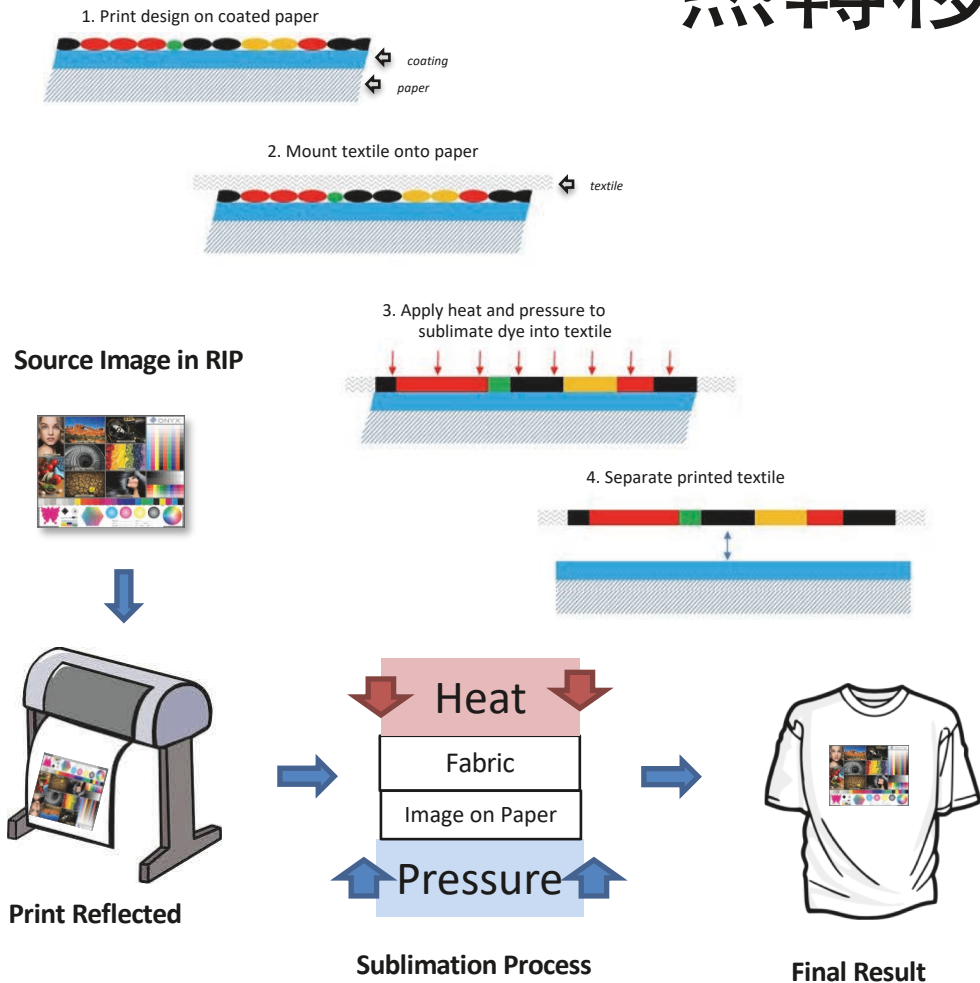


Issues問題:

- Ink adhesion 油墨附著力 (washing 清洗, rubbing 摩擦)
- Color fastness 色牢度 (light 亮度)

Transfer Dye Sublimation Process

熱轉移流程



1. Prepare source image in RIP
在RIP內預備來源圖
2. Print reflected on transfer paper with sublimation inks
使用昇華墨轉印在轉印紙上
3. Sublimate from paper to fabric
從紙張轉移至布料上
 - Heated dye becomes gas and infuses into fabric fibers 加熱的染料變成氣體並注入布料纖維中
 - Color of dyes on paper not the same as final color 紙上染料的顏色與最終顏色不同
 - Final output may change size due to heat 最終輸出可能會因熱量而改變尺寸

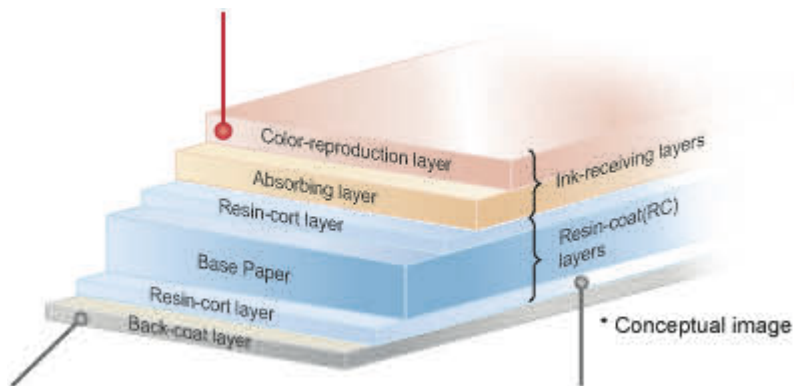


Colorant Surface Interactions

著色劑表面相互作用

Coated Paper 粉紙

- Single “Flat” Surface
單一平面
- Colorant Absorbs into Media
著色劑被媒介吸收



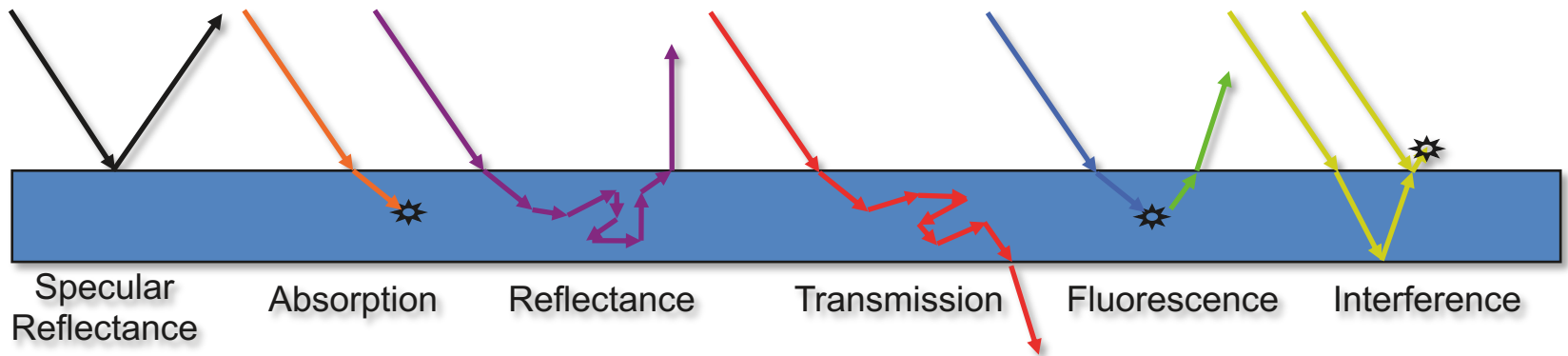
Textile 紡織

- Lots of Rounded Surfaces
很多圓的表面
- Uneven application of colorant
著色劑不平均





Light-Surface Interactions 光表面相互作用



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

光子如何與表面相互作用取決於其波長和表面特徵

導致印刷紡織品的測量與視覺外觀帶來挑戰



Managing Color 顏色處理

• Manual

- Print color swatches and use color recipes in design applications
- Use Named Spot Colors with device based color replacement
- Setup and use device based Colorways palettes in RIP

• Automated

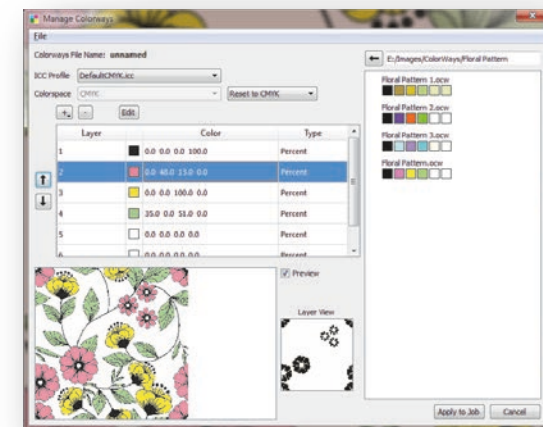
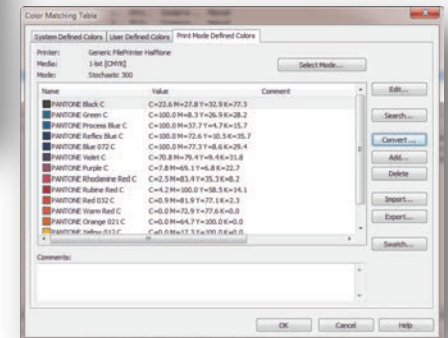
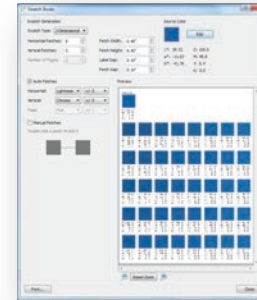
- Profile Media and Print Mode
- Use ICC Color Management

• 手動

- 印刷在設計軟件中印刷顏色樣本並使用顏色配方
- 將命名的專色與基於設備的顏色替換配合使用
- 在RIP中設置和使用基於設備的Colorways調色板

• 自動

- 媒介特性檔及印刷模式
- 使用ICC色彩管理



Textile Gamut Differences

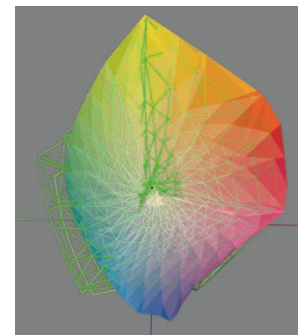
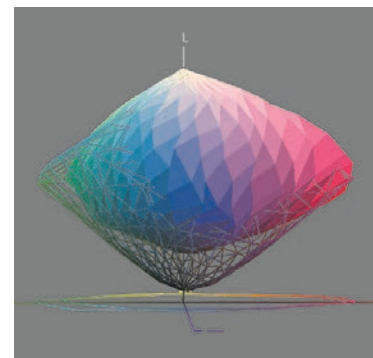
紡織色域之差異

- 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

- 良好的色域覆蓋明亮/飽和的黃色、橙色、紅色、洋紅色和藍色
- 染料之限制
 - 洋紅多於紅
 - 靛藍多於藍
- 導致色域中的綠色和紫色部份損失
 - 可能需要額外的油墨來實現這些種類的顏色
- 不能變得很暗
 - 黑墨問題
 - 黑色通常由靛藍色、洋紅色、黃色染料混合而成
 - 布料的纖維散射光，導致較低的密度

Offset gamut – wireframe
柯式色域 – 線框圖

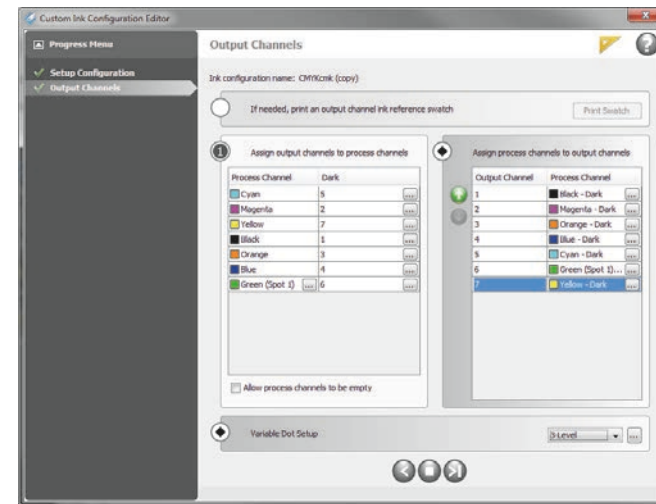
Dye sub transfer gamut – solid
熱昇華色域 – 實色



Ink Channel Selection

色版之選用

- 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
- 要獲得更大的色域，您可能需要使用額外的油墨
 - 印刷設備支援
 - 應將軟件配置與印刷機中的油墨相配合
 - 需要支援自定油墨配置的色彩特性檔

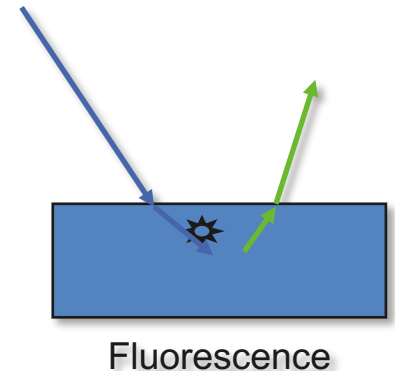




Textile Profiling Issues and Tips Part 1

紡織特性檔問題以及提示第一部份

- 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
- Tip: Use M1 (part 1) measurements or manual color management
- 布料能夠有螢光增白劑
 - 這導致錯誤讀取藍光，導致最終輸出中添加黃色
- 染料能夠發螢光
 - 獲得非常明亮的飽和色彩
 - 導致非常不可靠的測量結果
- 提示：使用M1（第1部份）測量或手動的色彩管理

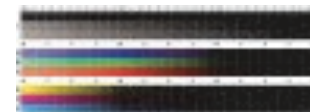




Textile Profiling Issues and Tips Part 2

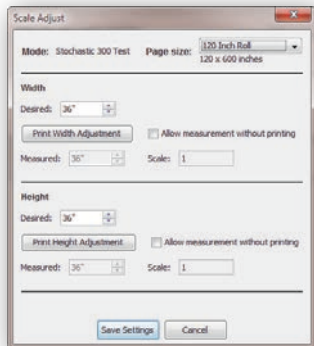
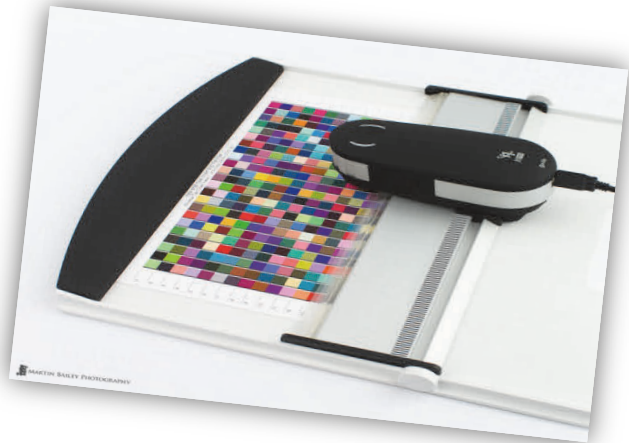
紡織特性檔問題以及提示第二部份

- 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 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
- 熱昇華會引致顏色產生變化
 - 測量以熱昇華輸出的所有顏色
 - 熱昇華流程控制尤其重要
 - 染料導致不同的色域形狀
 - 黑墨實際上是CMY的組合
 - 使用盡可能多的油墨印刷至最豐富的黑色
- 如果使用轉移印刷，情況會相反
 - 為印刷最終反射的圖像而設置工作流程以印刷
 - 確保色彩管理樣本也被反射印刷



Textile Profiling Issues and Tips Part 3

紡織特性檔問題以及提示第三部份

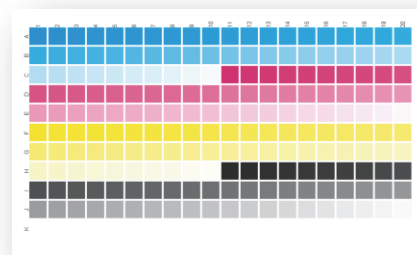


- Weave directionality causes variability in the measurements
 - Tip: Print two swatches with second swatch rotated 90° from first swatch
 - Measure first and second swatch with averaging for single reading for each patch
- Fabric shrinks or stretches
 - Tip: Use resolution adjustment to compensate for shrinking / stretching
- 編織方向性導致測量的可變性
 - 提示：打印兩個樣本，第二個樣本是將第一個樣本旋轉90°
 - 測量第一個和第二個樣本，將每個色塊的數值平均
- 織物收縮或拉伸
 - 提示：使用解像度調整來補償收縮/拉伸

Textile Profiling Issues and Tips Part 3

紡織特性檔問題以及提示第三部份

- 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
- 當執行色調校準時，考慮色塊數量
 - 測量更多色塊能提高色調校準的準確性
 - 從零過渡至全彩並非漸進的
 - 昇華是一種非線性過程
 - 較少的色塊避免了特徵化的測量雜訊



Conclusions 總結

- Textile printing offers many opportunities
- Textile surface and inks challenges getting measurement 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
- 紡織印刷提供了許多機會
- 紡織品表面和油墨難以獲得與實際顏色感知相對應的顏色測量
- 管理紡織品的顏色有其挑戰
 - 手動方法是很好的方法
 - 當考慮到差異時，自動化方法幾乎與在傳統媒介上印刷相同
- 重要概念：
 - 要獲得良好的測量，實施流程控制，以及使用您可信賴的生產工作流程和色彩管理軟件



Thank You!
謝謝!