

2016



Making A Future  
with Color Management

THE INTERNATIONAL CONFERENCE

**NPES-ICC COLOR MANAGEMENT | 2016**

MARCH 17, 2016 • JAKARTA, INDONESIA • POLIMEDIA AUDITORIUM



# Managing Special Colours

By: STEVEN SMILEY  
SMILEYCOLOR & ASSOCIATES



# Agenda

- Brand Owners Requirements
- ISO Standards
- CxF/X Workflow
- ISO 20654 - Spot Colour Tone Value (SCHMOO)
- ICC Max



# All components are the display



# Consistency Implies Quality Product

## Inconsistency raises Questions



Great Packaging delivers a promise about the brand!

“We care about our product”





# According to Published Articles

- The average supermarket shopper is exposed to 42,000 products in a shopping visit lasting 30 minutes
- 60% are impulse purchases
- 80% of purchasing decisions are made in the store
- The decision whether to pick up the package or not is made in less than 2.6 seconds

Packaging Research - Evaluating Consumer Reaction - Elliot C. Young  
How to Tell If Your Packaging Will Sell Your Product - JoAnn Hines



**What we do not want our consumers see our brands at retail:**



# ISO 15930

- PDF/X -4– Portable document exchange
  - 1.6 Blind Exchange (1.7 keeps Adobe Illustrator file)
- Providing all the necessary information in the PDF/X Embedds
  - Fonts
  - Images
  - Color ( Both CMYK and Spot colour)
    - Output Intent ICC profile (Customers Expectation)
    - CxF/X-4 Spot Colour Definitions – Mixing Hints





# ISO 15339 - Color Exchange Principles and aim datasets



# CMYK Workflow

- ANSI CGATS 21 CRPC 1-7.icc, ISO 15339 – [www.color.org/registry](http://www.color.org/registry)
- 7 Reference Print Conditions



CRPC1

Coldset



CRPC2

Flexo Cotton Top  
Flexo uncoated  
Improved News



CRPC3

UN



CRPC4

SCA



CRPC5

Wide Web Flexo  
Corrugated Coated  
Publication



CRPC6

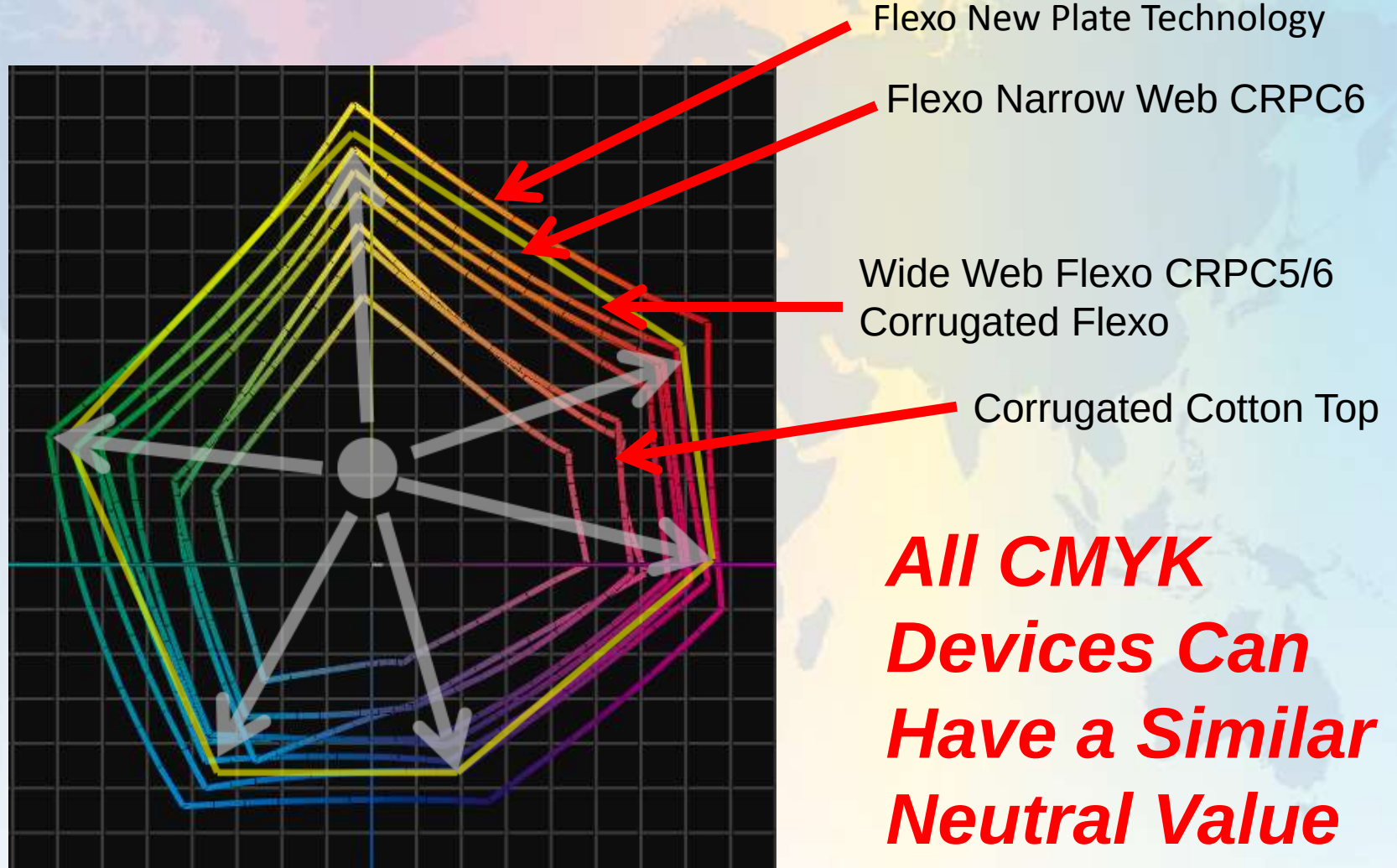
Narrow Web Flexo  
Sheetfed



CRPC7

Flexo New Plate  
Digital

# Brand Equity: Tying this all together





# ISO 17972-4

## Color exchange format – spot colour characterization

-  • ISO Standard – History of development
-  • Standard Requirements
-  • Workflows
-  • Proofing
-  • Ink Formulation

# ISO 17972 Series



- ISO 17972-1 Graphic technology — Colour data exchange format (CxF/X) — Part 1: Relationship to CxF3 (CxF/X-1)



- ISO 17972-2 Graphic technology — Colour data exchange format (CxF/X) — Part 2: Scanner target data (CxF/X-2)



- ISO 17972-3 Graphic technology — Colour data exchange format (CxF/X) — Part 3: Output target data (CxF/X-3)



- ISO 17972-4 Graphic technology — Colour data exchange format (CxF/X) — Part 4: Spot colour characterization data (CxF/X-4)

*Abstract: In a global world, communicating electronically the color data of spot colors is a hot (and not yet solved) issue. Global workflows and value chains, whether they are found in a B2B or B2C process, as well as an in-house digital workflow from designer to press, are demanding adequate and effective means to communicate (spot) colors. CxF is a new standard allowing seamless, worldwide digital communication of all commercially significant aspects of spot colors. Furthermore, CxF is defined in a completely open way so that all aspects of a color can be communicated, even when the application and the color communication features required are unknown. For example, every software vendor implementing / supporting CxF is able to extend the basic feature set to the needs of a new application without affecting the general usability. Wherever color communication is mission critical, CxF should be considered to be the solution to the problem!*

# Color Exchange History

- 1990-2001 Proprietary Formats ASCII Text
- 2001- Gretag Macbeth developed Cxf for communication across their systems- for spot color communications
- 2002 – Gretag Macbeth offered Cxf to ISO as a replacement for ASCII TXT files
- 2002 CGATS 17 started - 2005 CGATS 17 publish
- CxF-Version 1 incorporated into standards
- 2006 GWG starts discussing how to optimize Spot colours in PDF/X proofing Solutions – xmp?
- 2009 ICC recommends Cxf for spectral data
- 2010 ISO starts to discuss adding CxF to PDFX in mixing hints
- 2012 ISO 15930 allows CxF spectral data in PDFX
- 2014 ISO 17972-1 Published
- 2014 ISO DIS 17972-2 and 17972-4 Approved



# ISO 17972-4

## Graphic technology — Colour data exchange format (CxF/X) — Part 4: Spot colour characterisation data (CxF/X-4)

### Scope

This part of ISO 17972 defines an exchange format for spectral measurement data of inks to provide a means to characterize spot colour inks to allow reliable printing and proofing of products that have been designed using these inks. Only isotropic (paper-like) substrates are within the scope of this standard which is limited to application areas where the same ink and paper combination that has been characterized is used when printing.

DRAFT INTERNATIONAL STANDARD  
ISO/DIS 17972-4

ISO/TC 130  
Voting begins on:  
2014-08-11

Secretariat: SAC  
Voting terminates on:  
2014-11-11

Graphic technology — Colour data exchange format (CxF/X) —

Part 4:  
Spot colour characterisation data (CxF/X-4)

Technologie graphique — Échange des données de couleur en utilisant CxF —  
Partie 4: Données de caractérisation des points de couleur

ICS: 35.240.30; 37.100.99

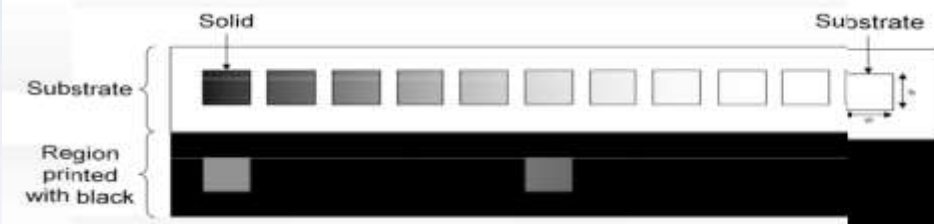


# ISO DIS 17972-4

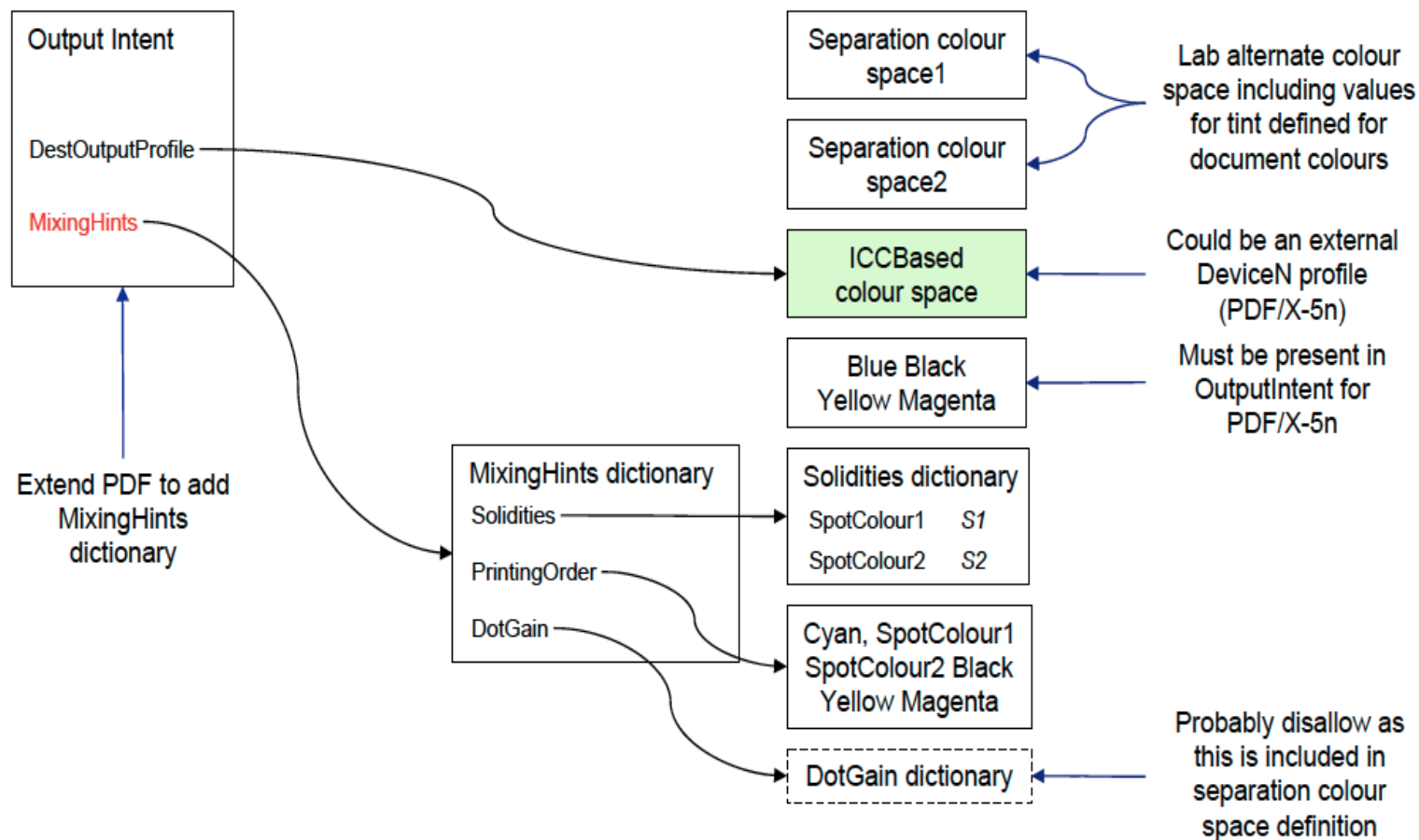
## Conformance levels

This specification defines three conformance levels identified as CxF/X-4, CxF/X-4a and CxF/X-4b. These conformance levels allow different methods of spot colour communication in common use to be described.

| Type of measurement                      | CxF/X-4                      | CxF/X-4a                     | CxF/X-4b       |
|------------------------------------------|------------------------------|------------------------------|----------------|
| Solid ink printed on substrate           | Required                     | Required                     | Required       |
| Tints of ink printed on substrate        | 3 minimum,<br>11 recommended | 3 minimum,<br>11 recommended | No requirement |
| Tints of ink printed on black background | 3 minimum                    | No requirement               | No requirement |



## Proposed PDF support for spot colour inks (revised proposal)



Define how Solidities values should be interpreted



# Current PDF/X Workflow without CxF/X-4



No overprint  
No Opacity  
No Ink rotation

Brand Owner / Designer -  
Color Development

# ISO 17972-4 - CxF X4 Spot Colours

From Design through Print Consistency  
Utilizing PDF X as the document to carry CXF X4 data

## Objectives



Designers can create  
a printable product  
that meets the brand  
requirements for  
colour



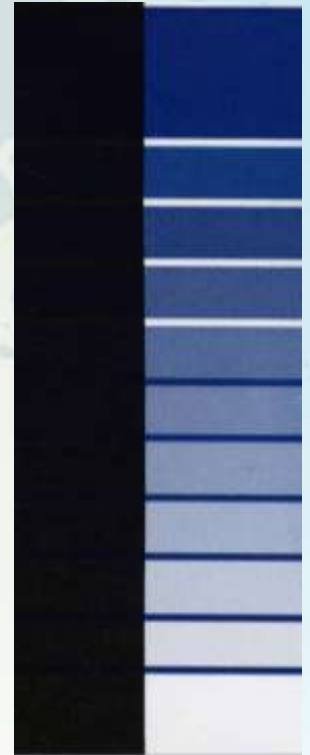
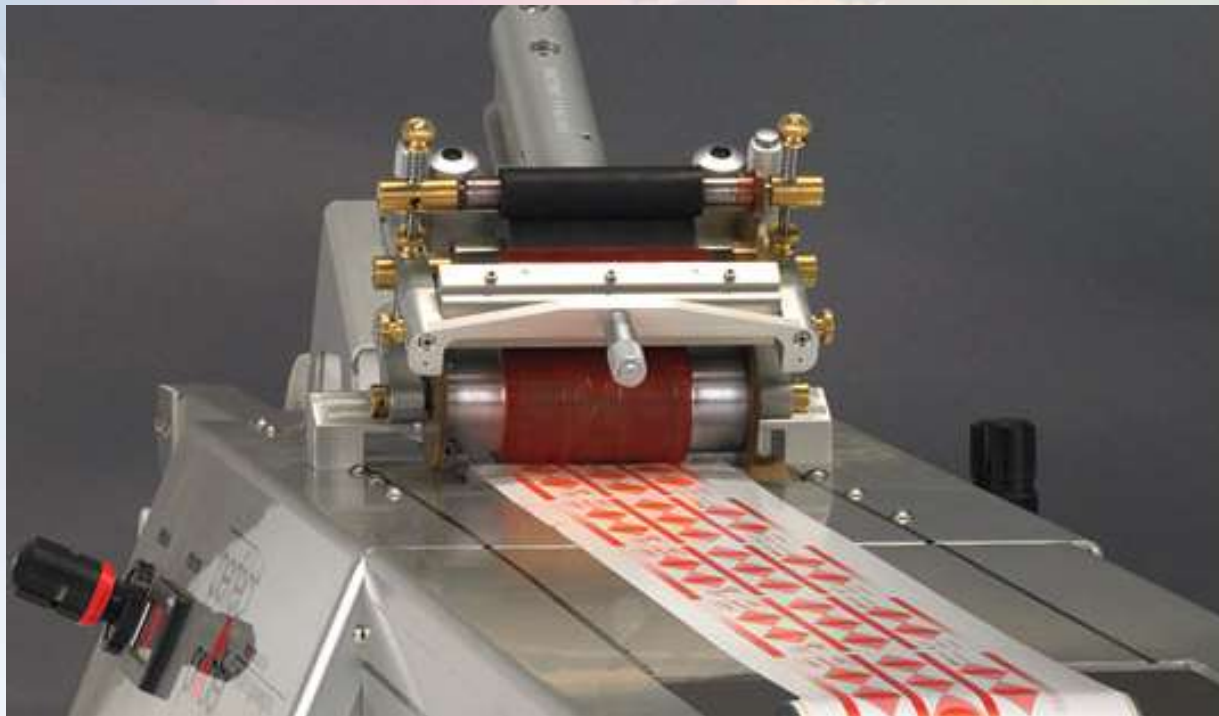
Design can be  
proofed accurately  
on monitor or on hard  
copy proof



Package (or other  
product) can be  
printed as the  
designer intended

# Brand Management

- Developing Colour to align with CPC requirement - Actual INKS!



# ANSI.txt

[illegible]

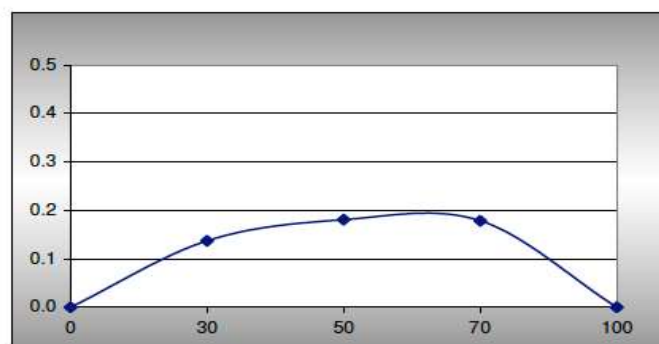
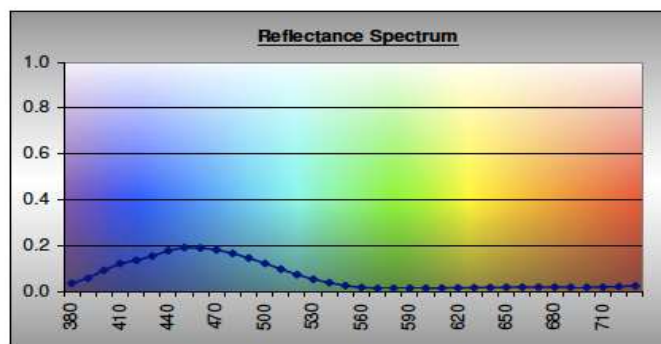


# Color Definitions of Brand Colors – Physical and Digital

## Spot Color Definition

### Birdseye 294 Redesign

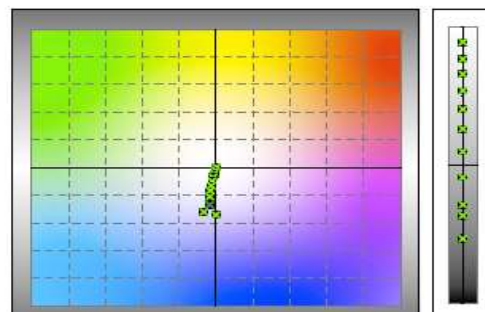
| Spectral Data |            |            |
|---------------|------------|------------|
|               | Over White | Over Black |
| 380           | 0.0345     | 0.0176     |
| 390           | 0.0569     | 0.0184     |
| 400           | 0.0916     | 0.0188     |
| 410           | 0.1209     | 0.0184     |
| 420           | 0.1352     | 0.0173     |
| 430           | 0.1539     | 0.0169     |
| 440           | 0.1772     | 0.0165     |
| 450           | 0.1910     | 0.0161     |
| 460           | 0.1897     | 0.0155     |
| 470           | 0.1807     | 0.0149     |
| 480           | 0.1655     | 0.0141     |
| 490           | 0.1453     | 0.0133     |
| 500           | 0.1217     | 0.0125     |
| 510           | 0.0967     | 0.0116     |
| 520           | 0.0726     | 0.0106     |
| 530           | 0.0525     | 0.0096     |
| 540           | 0.0371     | 0.0088     |
| 550           | 0.0246     | 0.0080     |
| 560           | 0.0163     | 0.0076     |
| 570           | 0.0132     | 0.0078     |
| 580           | 0.0133     | 0.0085     |
| 590           | 0.0135     | 0.0088     |
| 600           | 0.0136     | 0.0091     |
| 610           | 0.0143     | 0.0096     |
| 620           | 0.0152     | 0.0103     |
| 630           | 0.0159     | 0.0106     |
| 640           | 0.0166     | 0.0110     |
| 650           | 0.0175     | 0.0111     |
| 660           | 0.0184     | 0.0110     |
| 670           | 0.0187     | 0.0107     |
| 680           | 0.0181     | 0.0106     |
| 690           | 0.0177     | 0.0106     |
| 700           | 0.0176     | 0.0112     |
| 710           | 0.0186     | 0.0124     |
| 720           | 0.0207     | 0.0134     |
| 730           | 0.0237     | 0.0145     |



| Spot Over White |       |       |        |       |       |      |  |
|-----------------|-------|-------|--------|-------|-------|------|--|
| Dot %           | L     | a     | b      | C     | H     | TVI  |  |
| 0               | 94.62 | 0.27  | 0.35   | 0.44  | 52.6  | 0%   |  |
| 10              | 88.40 | -0.48 | -2.69  | 2.73  | 259.8 | 17%  |  |
| 20              | 82.97 | -1.17 | -5.58  | 5.71  | 258.2 | 31%  |  |
| 30              | 77.05 | -1.85 | -8.70  | 8.89  | 258.0 | 44%  |  |
| 40              | 70.30 | -2.63 | -12.39 | 12.66 | 258.0 | 57%  |  |
| 50              | 63.11 | -3.38 | -16.47 | 16.81 | 258.4 | 68%  |  |
| 60              | 54.93 | -3.91 | -20.92 | 21.28 | 259.4 | 79%  |  |
| 70              | 45.58 | -4.16 | -26.36 | 26.69 | 261.0 | 88%  |  |
| 80              | 35.71 | -4.23 | -33.77 | 34.03 | 262.9 | 95%  |  |
| 90              | 31.69 | -8.32 | -40.11 | 40.96 | 258.3 | 98%  |  |
| 100             | 23.32 | -0.06 | -42.80 | 42.80 | 269.9 | 100% |  |

| Specs            |      |
|------------------|------|
| Opacity(Y ratio) | 24%  |
| Spectral Density | 1.88 |
| DotGain @ 50%    | 18%  |
| Print Cont @ 70% | 50%  |

| Pigments    |  |
|-------------|--|
| Reflex Blue |  |
| Pro Blue    |  |
| Blk         |  |
| -           |  |

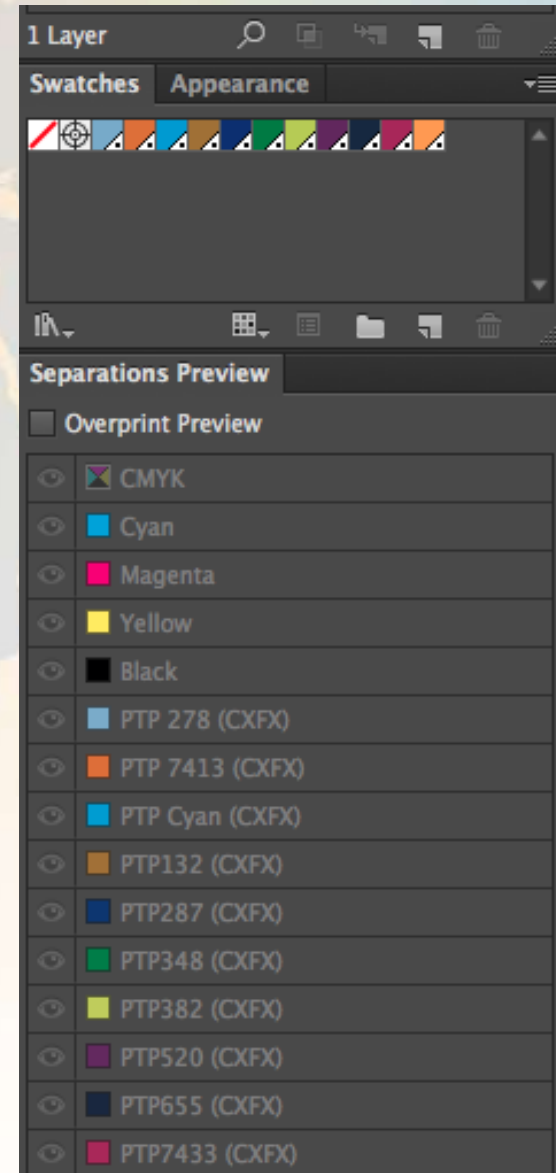
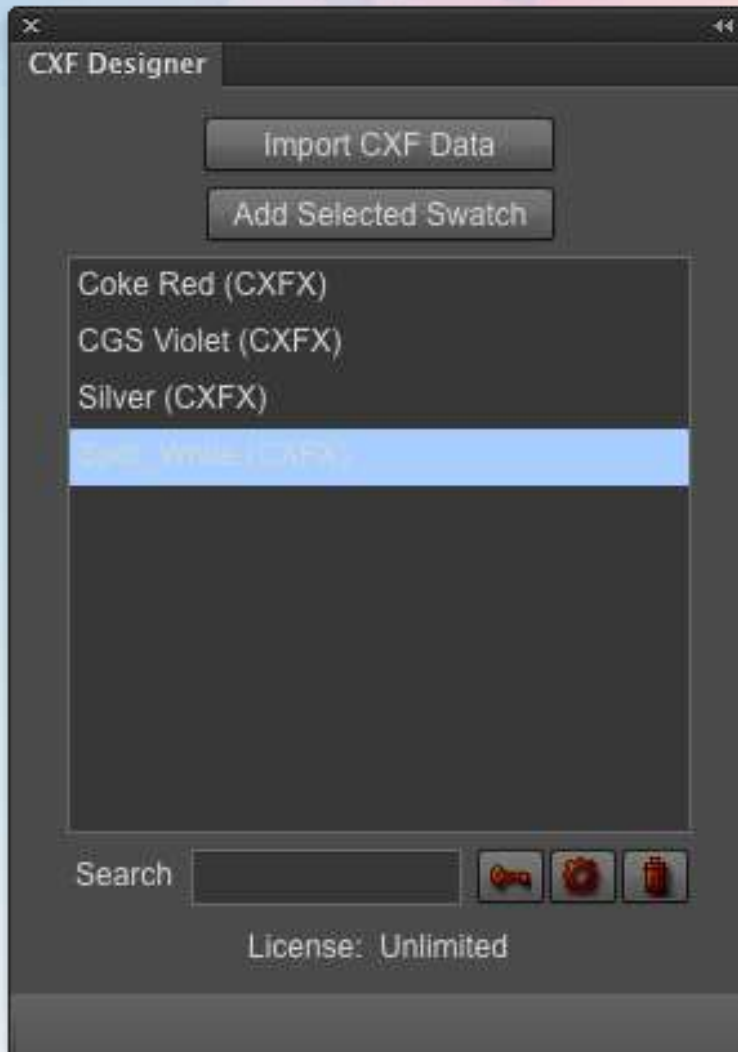


| Birdseye 294 Redesign |                                       |
|-----------------------|---------------------------------------|
| Brand Color           | Birdseye 294 Redesign                 |
| Substrate             | SBS                                   |
| Backer                | ISO 13655 White                       |
| Meas Device           | Xrite SpectroEye (Certified: 12/2011) |
| Meas Conditions       | 5000K, 2°, No Filter                  |
| Geometry              | 0/45 (M0 - ISO13655)                  |
| Expiry Date           | 3/8/2013                              |
| Approved By           | Color Engineering                     |
| Date                  | 3/8/2013                              |

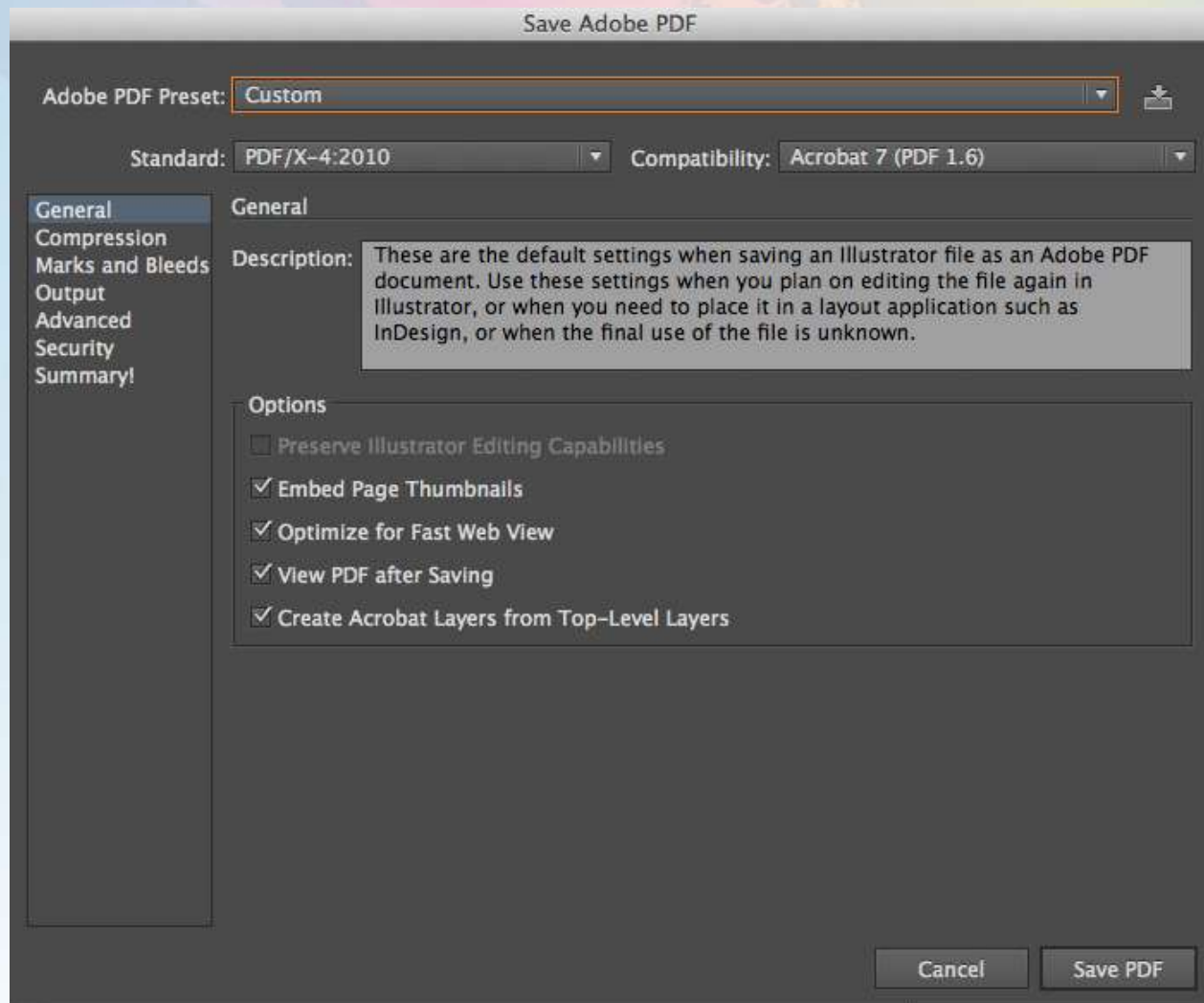
# Import CxF/x4 Data to Illustrator



# CxF X4 in Adobe Illustrator



# Save as Adobe PDFX-4





# PDF X4 Output



## Adobe® Acrobat® XI

Version 11.0.03

Inventory report for Document:"demo2.pdf"



### Color Space 2 (out of 3) on page 1



#### Color Space properties:

Separation color space: "Orange (CMYK)" Lab (ICC) (60.29/62.38/69.67)

Color name: Orange (CMYK)

Alternate color space:

ICC based color space: "Lab D50"

Components range (0.0/1.0/0.0/1.0/0.0/1.0)

Number of color components: 3

Alternate color space:

Lab color space

Diffuse white point

0.964

1.0

0.825

Diffuse black point

0.0

0.0

0.0

Components range

-128.0

127.0

-128.0

127.0

ICC profile data

Profile version number: "2.1.0"

Color Management Module (CMM) type: "ADBE"

Profile/Device class signature: "spac"

Color space of data: "Lab"

Profile Connection Space (PCS): "Lab"

Magic number: "acsp"

Primary Platform: "Apple Computer, Inc. (APPL)"

Device manufacturer: "none"

Device model: ""

Profile creator: "Adobe Systems Incorporated (ADBE)"

Creation date: "6/3/99 12:00 AM"

Default rendering intent: Perceptual

Profile illuminant

Illuminant X: 0.964

Illuminant Y: 1.0

Illuminant Z: 0.825

Copyright information: "Copyright 1999 Adobe Systems Incorporated"

Profile description: "Lab D50"

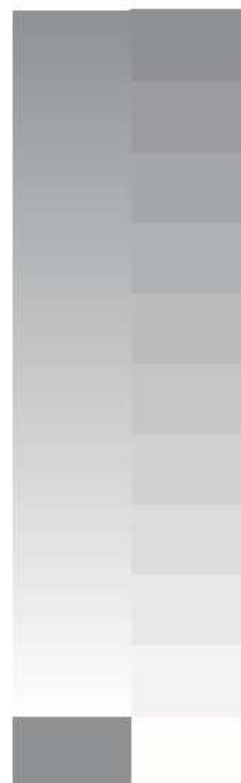
Profile ID (MDS hash):

"BC759FE4D6C84997D34103C11419E4DA"

Inventory report for Document:"demo2.pdf"



### Color Space 3 (out of 3) on page 1



#### Color Space properties:

Separation color space: "Silver (CMYK)" Lab (ICC) (60.83/-0.83/-1.63)

Color name: Silver (CMYK)

Alternate color space:

ICC based color space: "Lab D50"

Components range (0.0/1.0/0.0/1.0/0.0/1.0)

Number of color components: 3

Alternate color space:

Lab color space

Diffuse white point

0.964

1.0

0.825

Diffuse black point

0.0

0.0

0.0

Components range

-128.0

127.0

-128.0

127.0

ICC profile data

Profile version number: "2.1.0"

Color Management Module (CMM) type: "ADBE"

Profile/Device class signature: "spac"

Color space of data: "Lab"

Profile Connection Space (PCS): "Lab"

Magic number: "acsp"

Primary Platform: "Apple Computer, Inc. (APPL)"

Device manufacturer: "none"

Device model: ""

Profile creator: "Adobe Systems Incorporated (ADBE)"

Creation date: "6/3/99 12:00 AM"

Default rendering intent: Perceptual

Profile illuminant

Illuminant X: 0.964

Illuminant Y: 1.0

Illuminant Z: 0.825

Copyright information: "Copyright 1999 Adobe Systems Incorporated"

Profile description: "Lab D50"

Profile ID (MDS hash):

"BC759FE4D6C84997D34103C11419E4DA"

# CxF X-4 Proofing

- Look for solutions that utilize CxF / Hard and Soft Proof

Settings for Job 'GWGExamplePDF-X4 CxFx.pdf'

Printer Epson Stylus Pro 4900

Queue ISOcoated\_v2 PSuper240g

Job GWGExamplePDF-X4 CxFx.pdf

Copies 1

|            |                        |                |             |                  |                       |
|------------|------------------------|----------------|-------------|------------------|-----------------------|
| Marks/Info | Success/Error Handling | Load Balancing | Workflow    | Scatter Proofing | Certification         |
| Driver     | Paper                  | Print Layout   | Calibration | Color Correction | Spot Color Correction |

Spot Color Correction

☐ None

☒ Table C:\Program Files\CGS\Common Files\CTuner Setups\SpotColor\Pant...

☒ Use calibration with spot color correction

CxF/X in PDF Files

☒ Always apply CxF/X

# CxF/X-4 Work Flows

- CxFX Tools for Extracting Data
- Re-ordering Colors in PDFX

Manage Cxf/X-4 data in PDF file

\\psf\Home\Desktop\ORIS CxF Toolbox\PDF\GWGExamplePDF-X4+CxFx.pdf Browse...

PDF Information: File contains output intent.

Output Intent Info: Coated FOGRA39 (ISO 12647-2:2004)

ICC Profile Name: Coated FOGRA39 (ISO 12647-2:2004) Extract ...

CxF/X-4 definitions in file:

- Orange
- Silver
- Spot\_White

Add ...  
Remove  
Extract ...  
Rename ...  
View ...

Ink laydown order

☒ Include in file

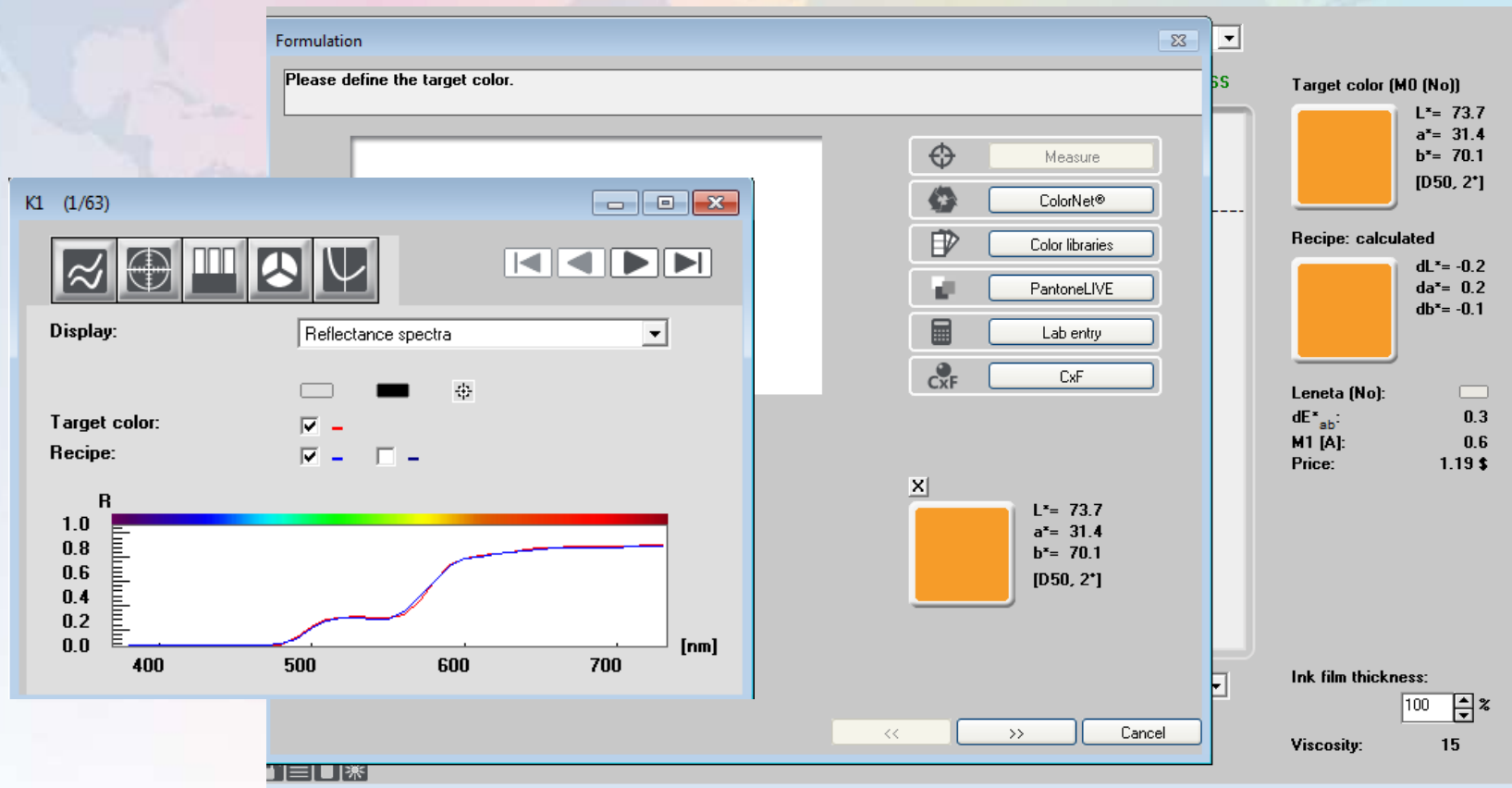
- Cyan
- Magenta
- Yellow
- Black
- Orange
- Silver

Move Up  
Move Down

Write CxF data to PDF file

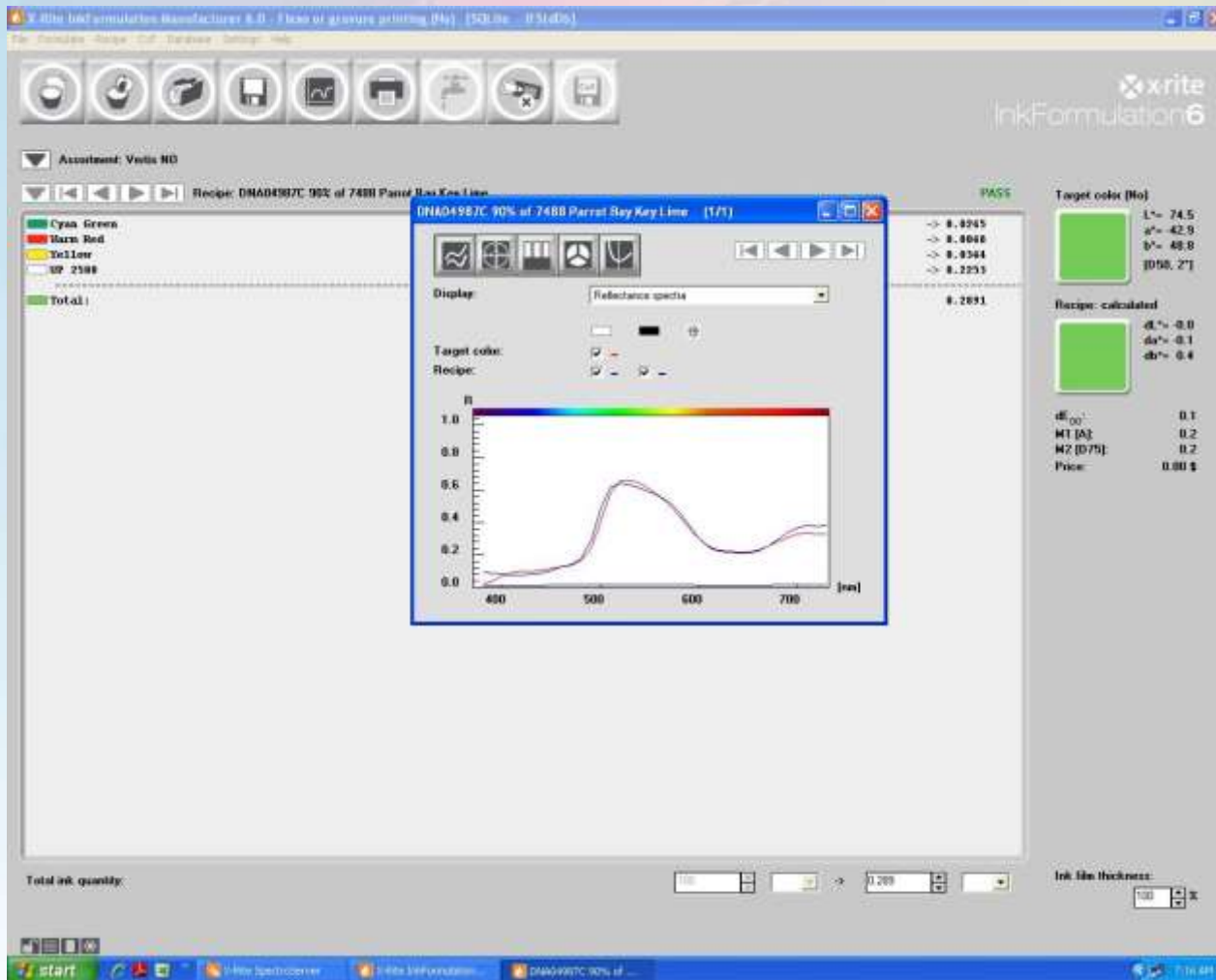
# CxF/X for Ink Formulation

- Use CxF/X for ink formulation – Lowest Metameric Index - (Same Ingredients)



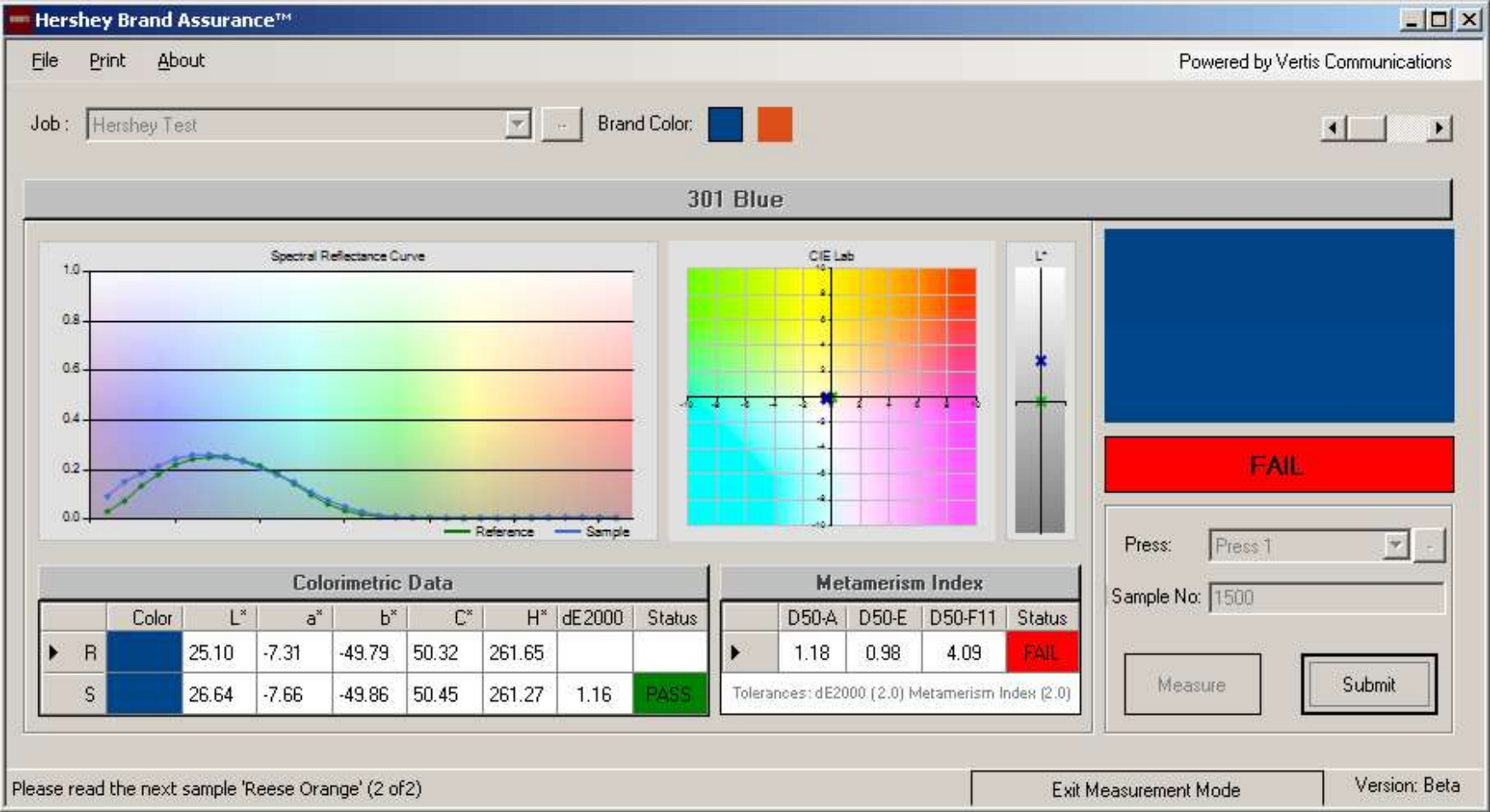


# Ink Formulation – CxF/X Define Aims Matching PMS or other element

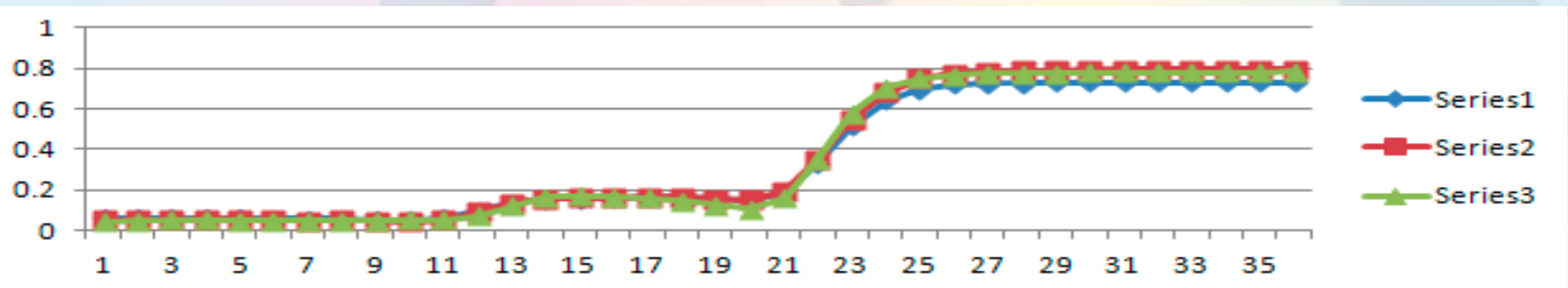


# •ISO 17972-4 – CxF/X4 Spot Colours Process Control

From Design through Print Consistency in ingredients of inks  
NOT only low DE00 / but satisfying metamerism match also



# Print Process Selection



# Spot Colour Halftone Metric

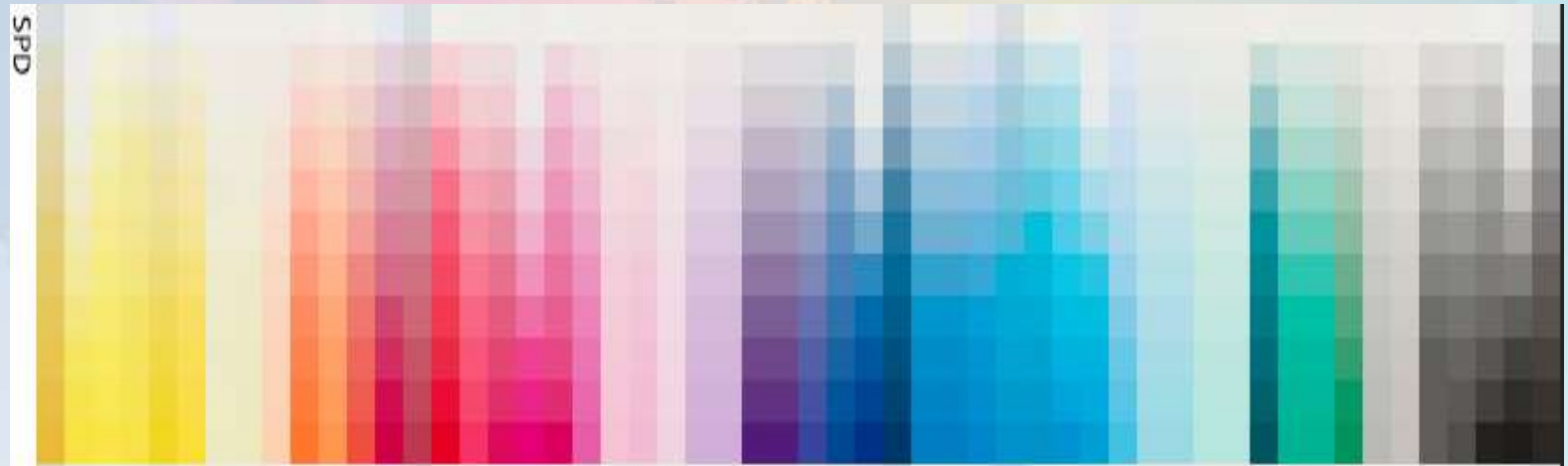
ISO – 20654 SCTV



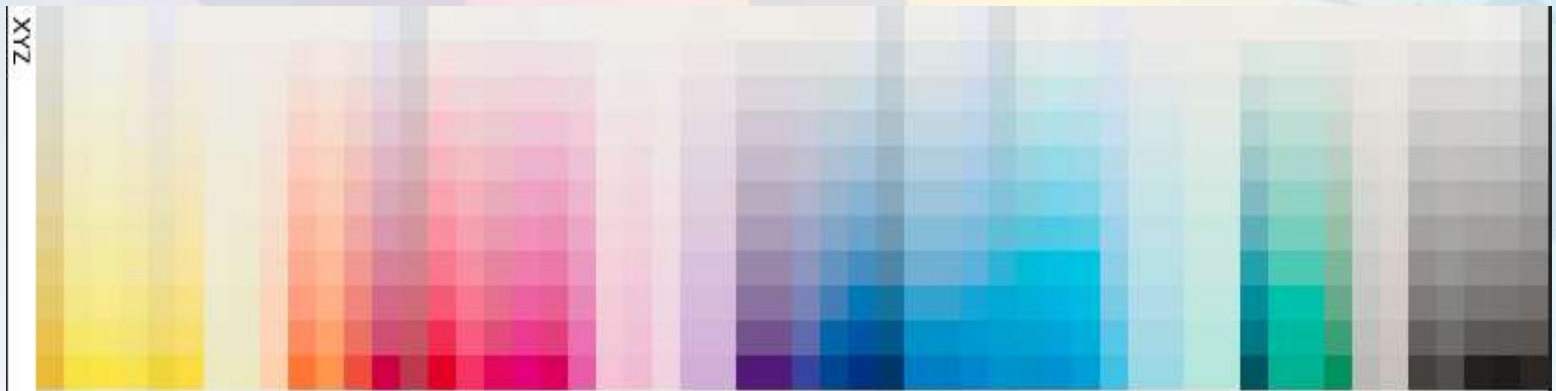


# ISO Spectral Density

ISO 5.3 Spectral Density



Illustrator or Photoshop visual appearance



ReflexBlue

Press Data

M-D

dE-P

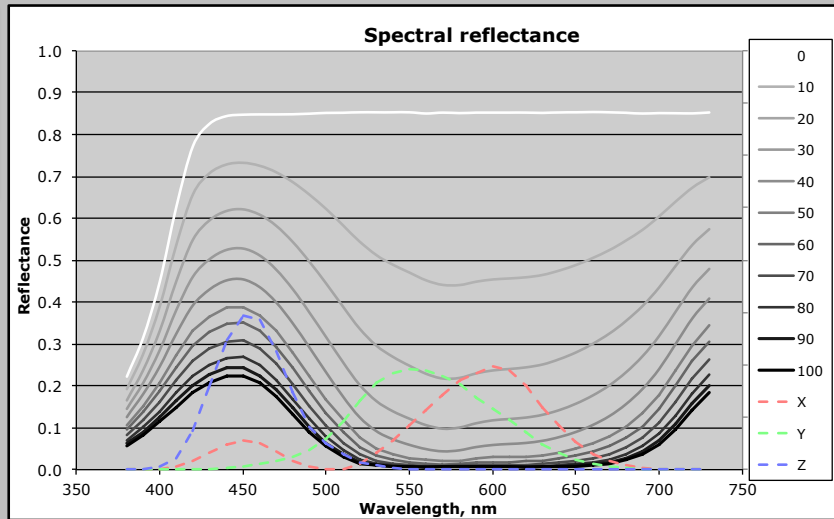
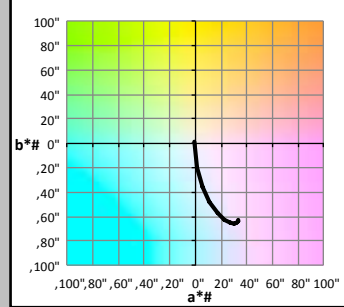
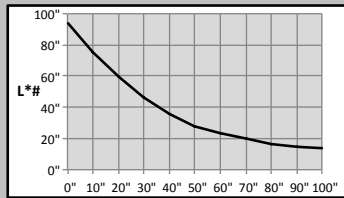
dL-P

CTV

ITV

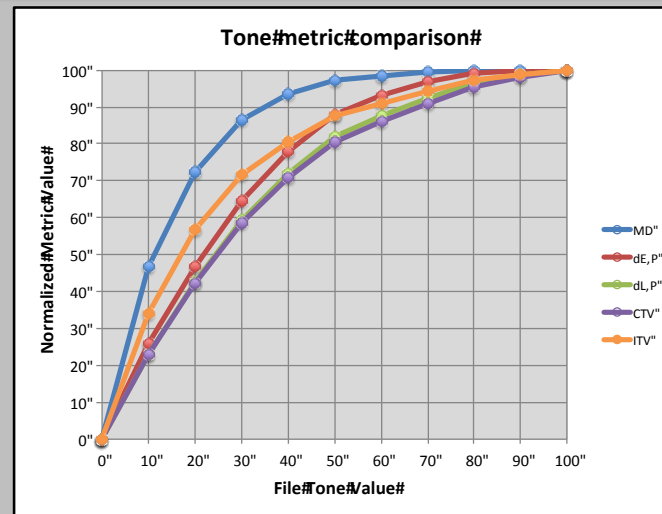


# Problem Defined



## Reflex(Blue(

| File TV | MD    | dE-P  | dL-P  | CTV   | ITV    |
|---------|-------|-------|-------|-------|--------|
| 0       | 0.0   | 0     | 0.0   | 0     | 0      |
| 10      | 46.7  | 25.8  | 22.9  | 22.8  | 34.21  |
| 20      | 72.2  | 46.7  | 42.5  | 42.1  | 56.74  |
| 30      | 86.3  | 64.6  | 59.2  | 58.4  | 71.44  |
| 40      | 93.4  | 77.9  | 71.9  | 70.7  | 80.69  |
| 50      | 97.1  | 87.8  | 82.0  | 80.6  | 87.49  |
| 60      | 98.5  | 93.1  | 87.6  | 86.1  | 90.98  |
| 70      | 99.3  | 96.9  | 92.4  | 91.1  | 94.29  |
| 80      | 99.8  | 99.2  | 96.3  | 95.4  | 97.12  |
| 90      | 99.9  | 100.0 | 98.6  | 98.1  | 98.85  |
| 100     | 100.0 | 100.0 | 100.0 | 100.0 | 100.00 |



PMS186

Press Data



M-D



dE-P



dL-P



CTV

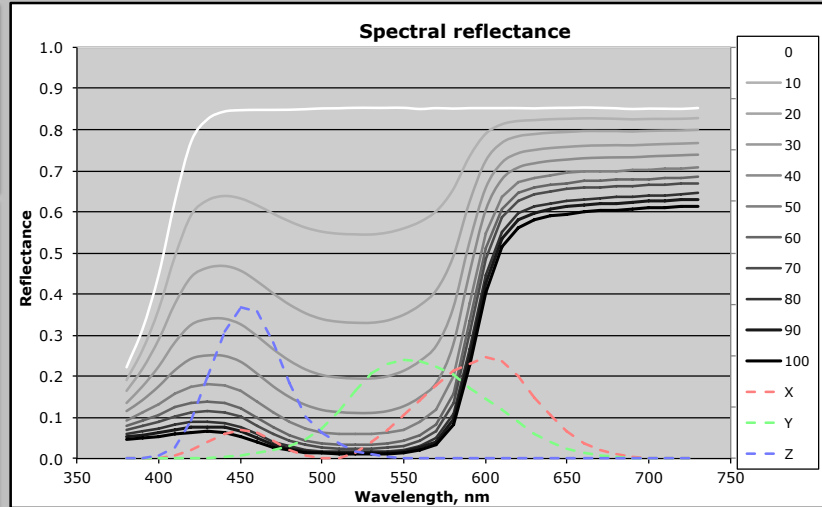
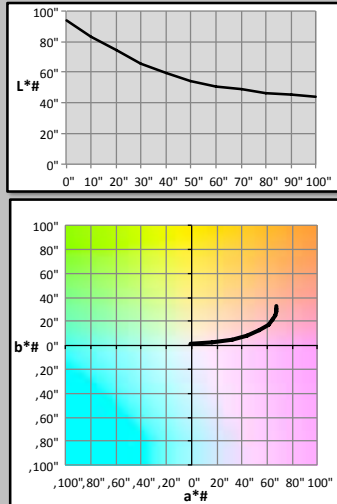


ITV



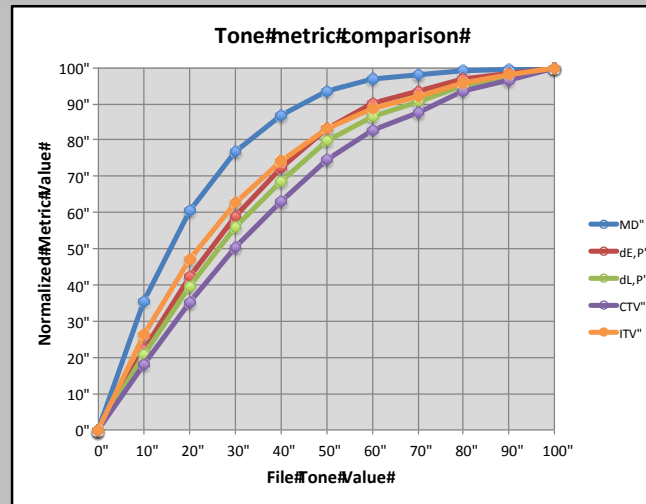


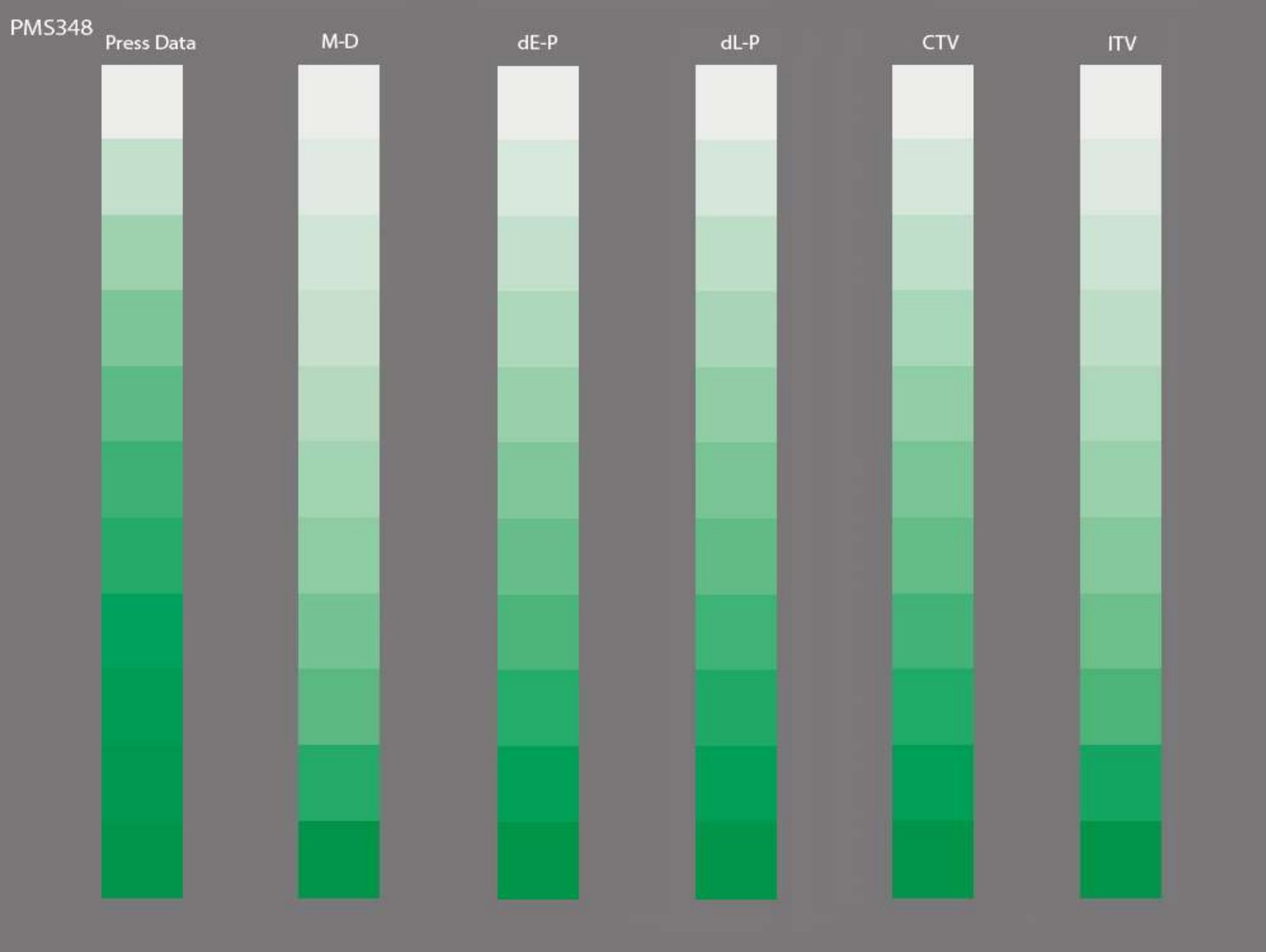
# Problem Defined



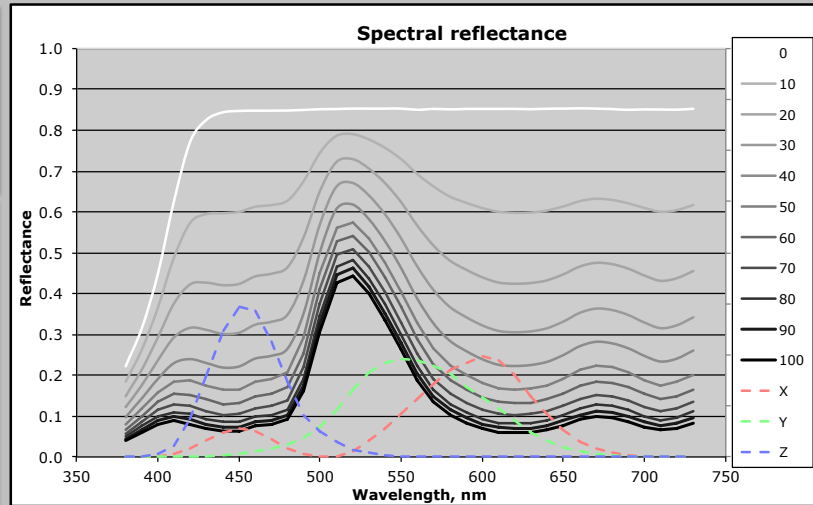
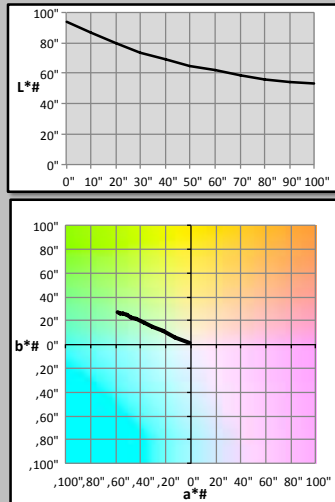
PMS186(

| File TV | MD    | dE-P  | dL-P  | CTV   | ITV   |
|---------|-------|-------|-------|-------|-------|
| 0       | 0.0   | 0     | 0.0   | 0     | 0.0   |
| 10      | 35.4  | 22.2  | 20.8  | 18.0  | 26.1  |
| 20      | 60.6  | 42.4  | 39.8  | 35.2  | 46.9  |
| 30      | 76.7  | 58.9  | 55.9  | 50.4  | 62.9  |
| 40      | 86.9  | 72.2  | 68.7  | 63.0  | 74.1  |
| 50      | 93.5  | 83.2  | 79.7  | 74.7  | 83.3  |
| 60      | 96.7  | 90.0  | 86.6  | 82.7  | 88.7  |
| 70      | 98.1  | 93.5  | 90.5  | 87.5  | 91.9  |
| 80      | 99.2  | 96.7  | 95.2  | 93.4  | 95.9  |
| 90      | 99.6  | 98.4  | 97.4  | 96.5  | 97.9  |
| 100     | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |



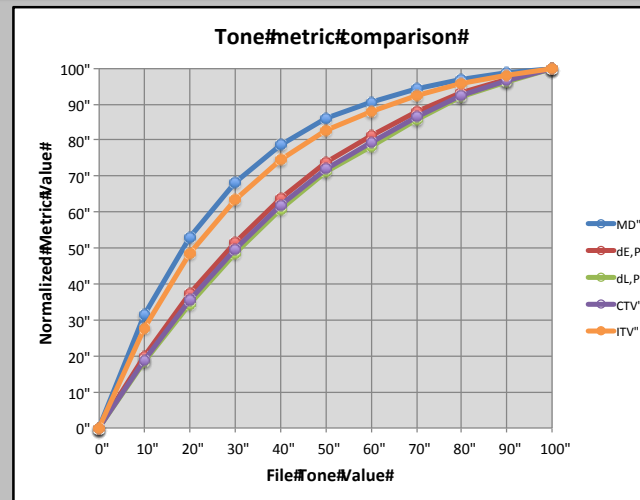


# Problem Defined



PMS348(

| File TV | MD    | dE-P  | dL-P  | CTV   | ITV   |
|---------|-------|-------|-------|-------|-------|
| 0       | 0.0   | 0     | 0.0   | 0     | 0.0   |
| 10      | 31.4  | 20.0  | 18.3  | 18.8  | 27.8  |
| 20      | 53.2  | 37.3  | 34.5  | 35.4  | 48.5  |
| 30      | 68.2  | 51.7  | 48.6  | 49.6  | 63.5  |
| 40      | 78.7  | 63.8  | 60.8  | 61.9  | 74.7  |
| 50      | 86.0  | 73.9  | 71.1  | 72.1  | 82.8  |
| 60      | 90.5  | 81.2  | 78.3  | 79.4  | 88.0  |
| 70      | 94.3  | 87.9  | 85.6  | 86.5  | 92.5  |
| 80      | 97.0  | 93.1  | 91.9  | 92.3  | 95.9  |
| 90      | 98.6  | 96.7  | 96.1  | 96.4  | 98.2  |
| 100     | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |



# ISO CD 20654

$$SCTV = 100 \times \sqrt{\frac{(V_{xt}-V_{xp})^2 + (V_{yt}-V_{yp})^2 + (V_{zt}-V_{zp})^2}{(V_{xs}-V_{xp})^2 + (V_{ys}-V_{yp})^2 + (V_{zs}-V_{zp})^2}} \quad \text{Equation 4.1}$$

where

$V_{xs}, V_{ys}, V_{zs}$  are  $V_x, V_y, V_z$  values calculated for the spot ink solid,

$V_{xp}, V_{yp}, V_{zp}$  are  $V_x, V_y, V_z$  values calculated for the substrate and

$V_{xt}, V_{yt}, V_{zt}$  are  $V_x, V_y, V_z$  values calculated for the spot ink tint.

The value components are defined to have functional form similar to that of CIE L\*:

$$V_x = f\left(\frac{X}{X_n}\right) \times 116 - 16$$

$$V_y = f\left(\frac{Y}{Y_n}\right) \times 116 - 16$$

$$V_z = f\left(\frac{Z}{Z_n}\right) \times 116 - 16$$

Equations 4.2

and where

$$f(u) = (u)^{\frac{1}{3}} \quad \text{if } u > \left(\frac{6}{29}\right)^3$$

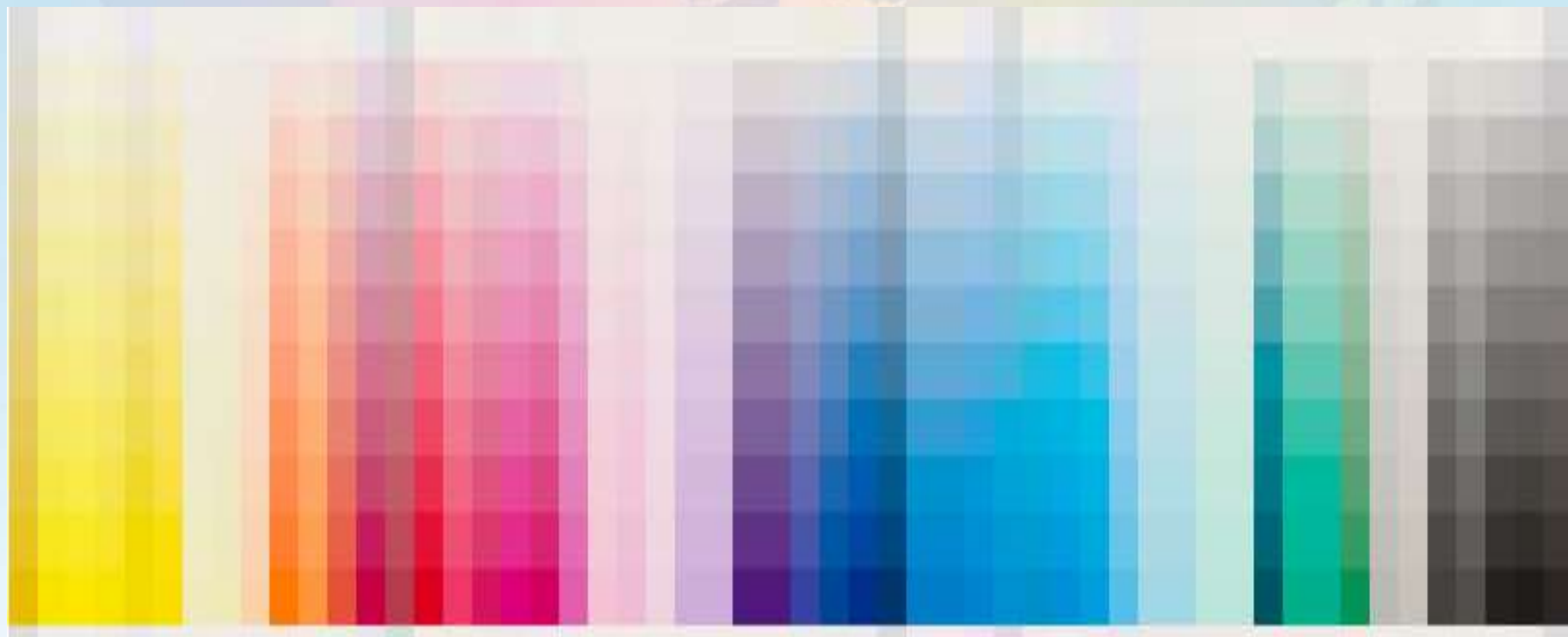
Equations 4.3

$$f(u) = \left(\frac{841}{108}\right) \cdot (u) + \left(\frac{4}{29}\right) \quad \text{if } u \leq \left(\frac{6}{29}\right)^3$$

is the same compression function defined in ISO 13655 in the derivation of CIELAB.



# ISO CD 20654 – Spot Colour Tone Value (SCTV)



# icc Max



Provides Support for the Packaging Industry  
Allows measurement data using the CxF format  
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Thanks for you time today!

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