ECG Printing

Challenges for analogue and digital printing processes

About us

- Foundation 1985
- Near Frankfurt (Germany)
- 40 Employees
- Our Passion is Color
  - Smart Color Solutions for Decor and Packaging!

- Since 2024 owned by SCREEN Graphic Solutions Co., Ltd Kyoto (Japan)

- We love Print!

About me

- Foundation 1970
- Near Frankfurt
- More than 35 years in the Printing Industry
- Joining the company 1998
- Since 2019 Technical Head / CEO

- I love Print!
- ...and like challenges...

CGS ORIS


EGP
N-color printing
Fixed Color Palette
Hexachrome
Expanded Gamut
Extended Color Gamut
Multi-color printing
Hi-Fi printing
Xpanded Gamut
7-Color printing
ECG
Heptatone printing

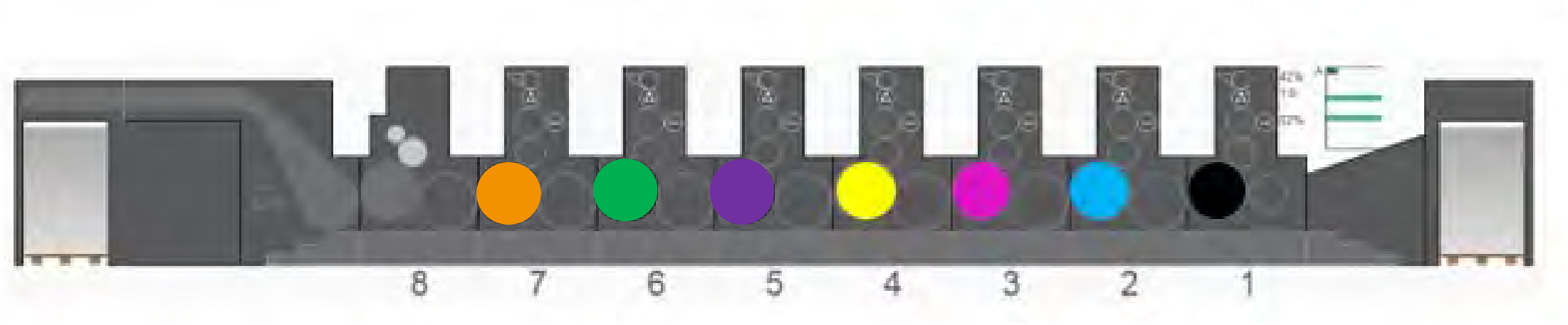
What is ECG Printing?

- Printing with a fixed ink-set
  - Device neutral solution which works with Flexography, Offset Lithography, Gravure & Digital printing (default)
  - Ink types: conventional, UV, water-based, solvent-based

- Flavors of ECG
  - 5 inks, 6 inks, 7 inks (most common CMYKOGV)
  - 4 inks: Enhanced CMYK (e.g., XCMYK by Idealliance)

The core idea

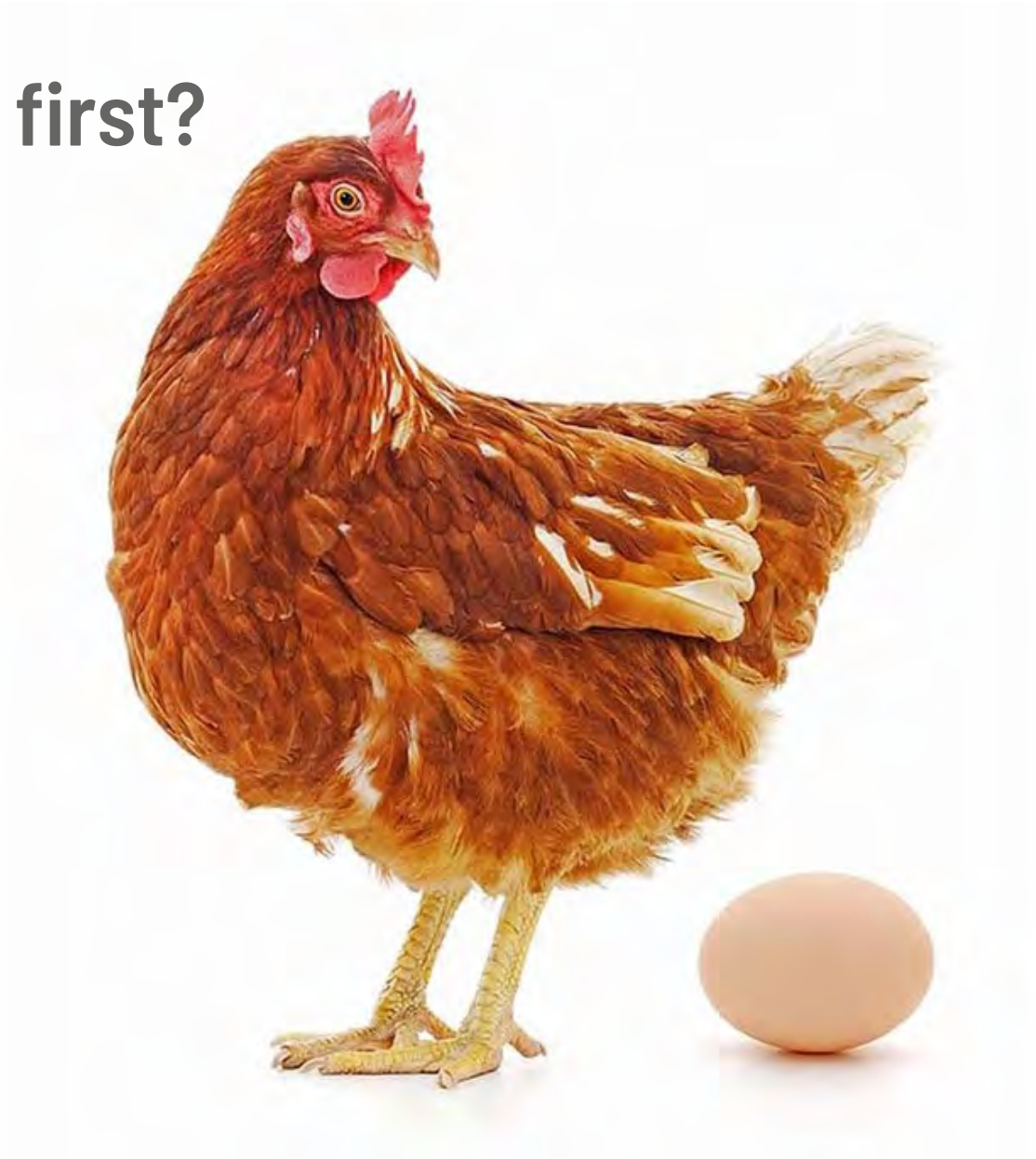
- Printing spot colors without using spot inks by adding one, two or more extra inks to the standard ink palette of process colors CMYK



CGS
ORIS

CGS ORIS

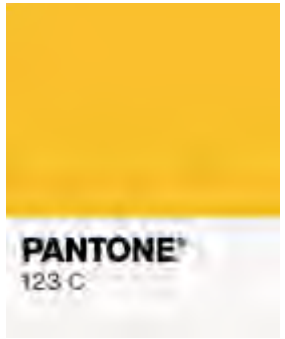
Who was first?



The right definition?

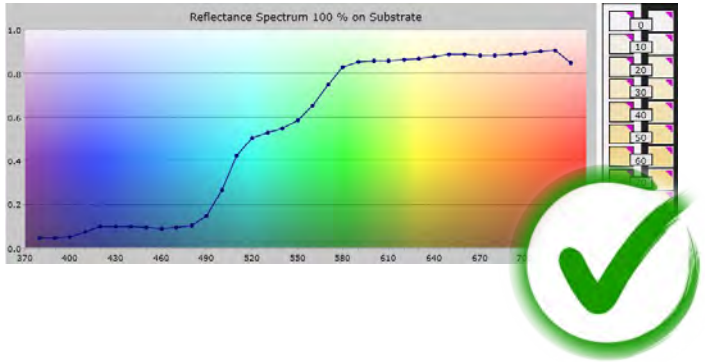
?

Standard

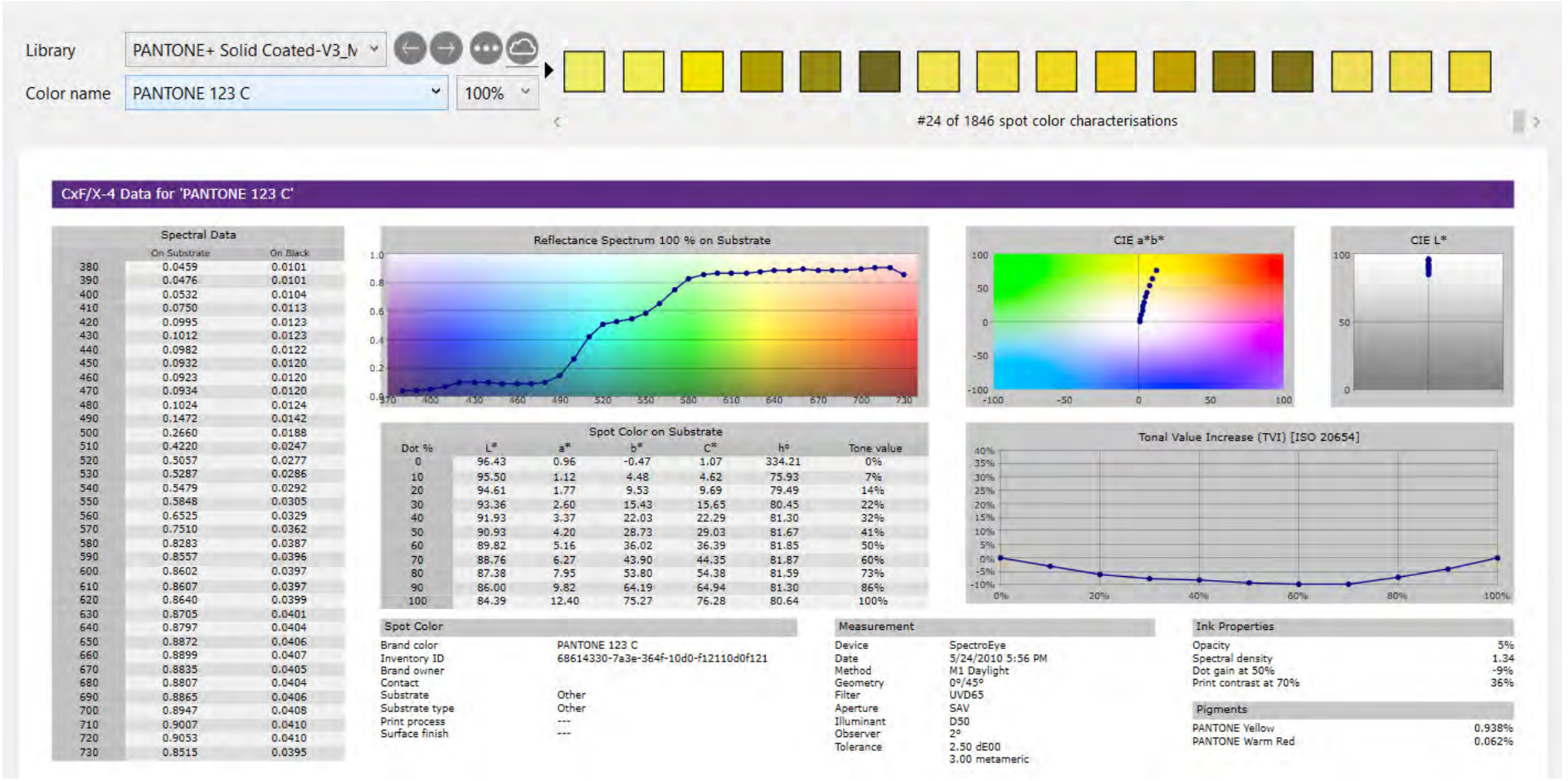


- RGB 255/199/44
- CMYK 0/22/83/0
- LAB 84/12/75

- CXF Spectral



The best defintion for spot colors is spectral



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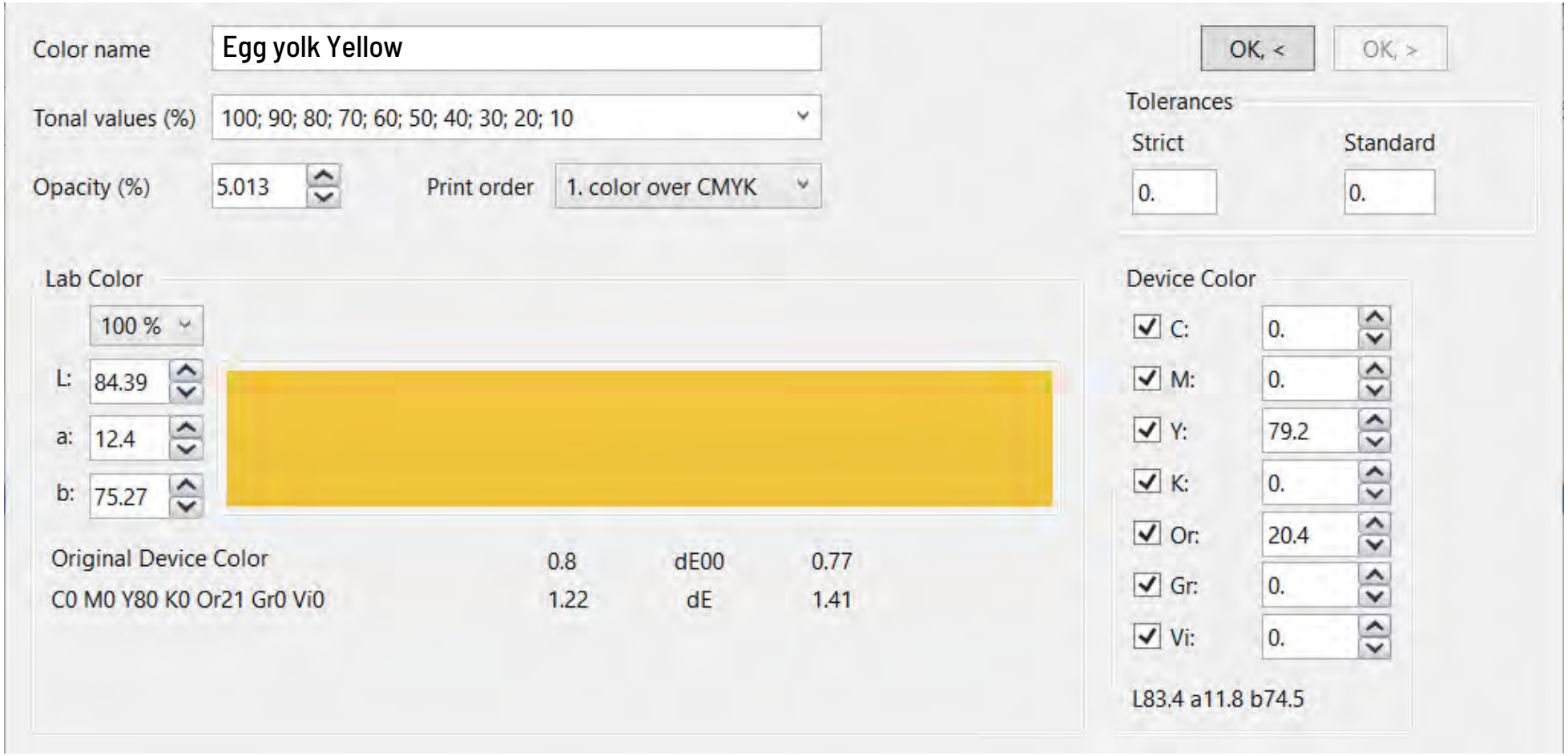
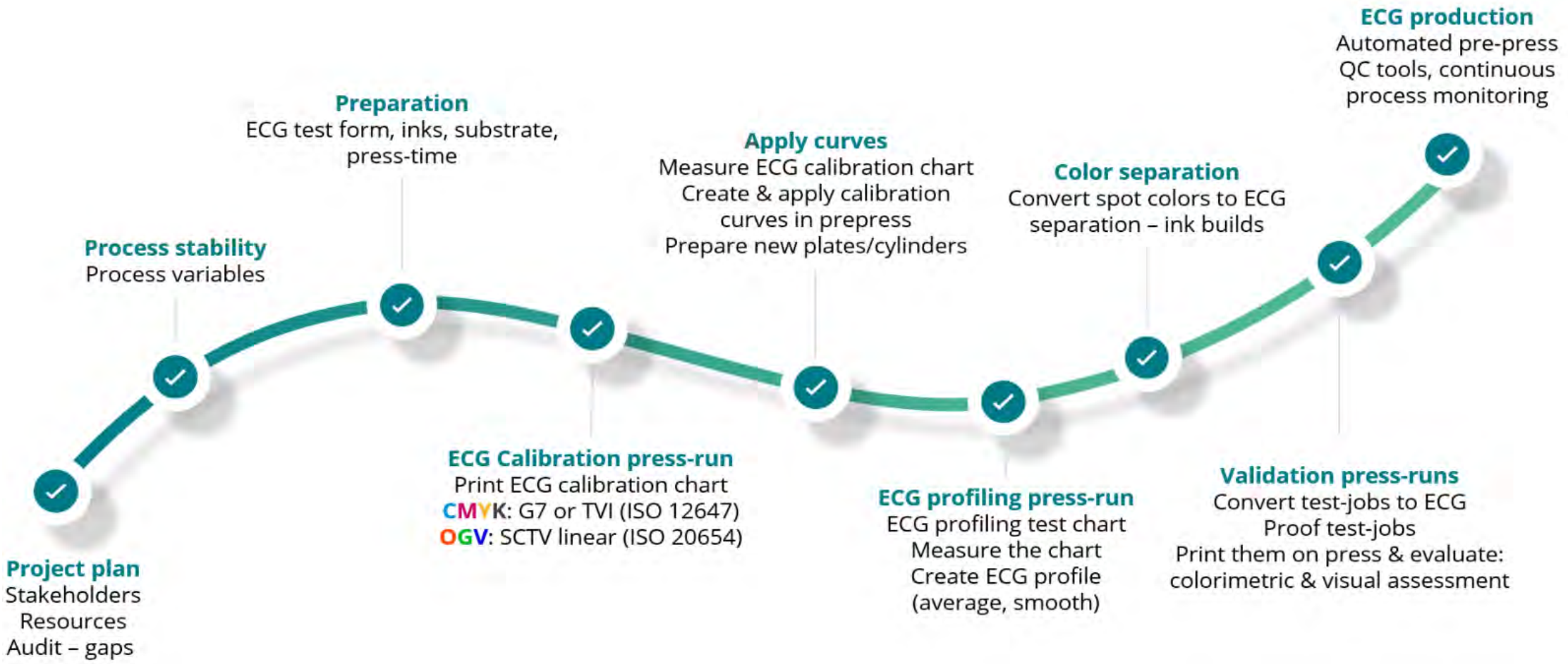


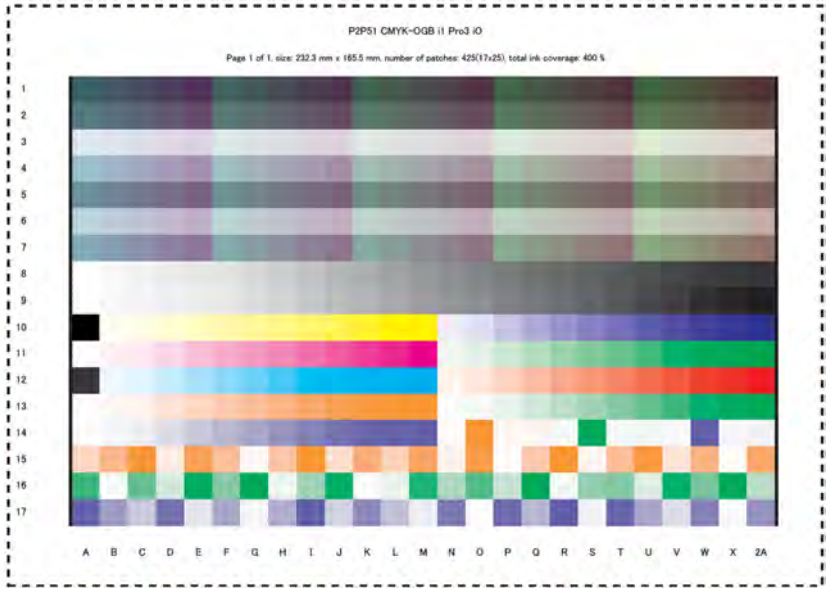
Preparation is the base for success



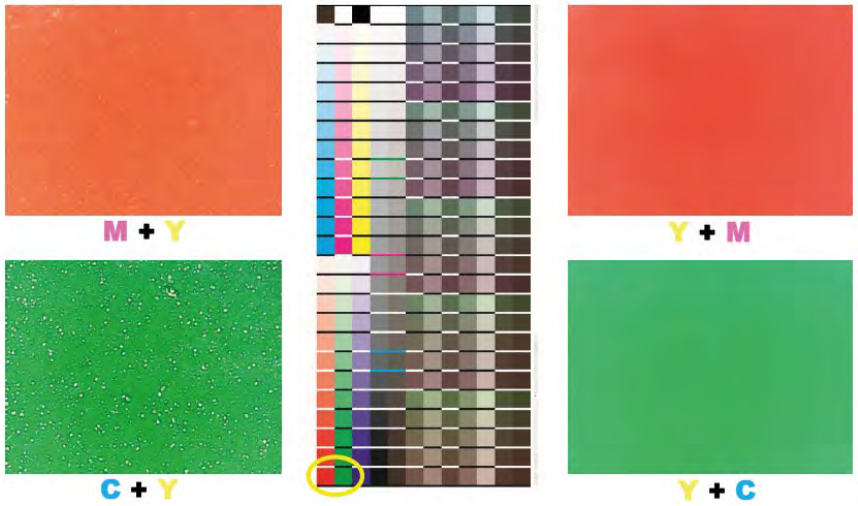
Essentials for the preparation

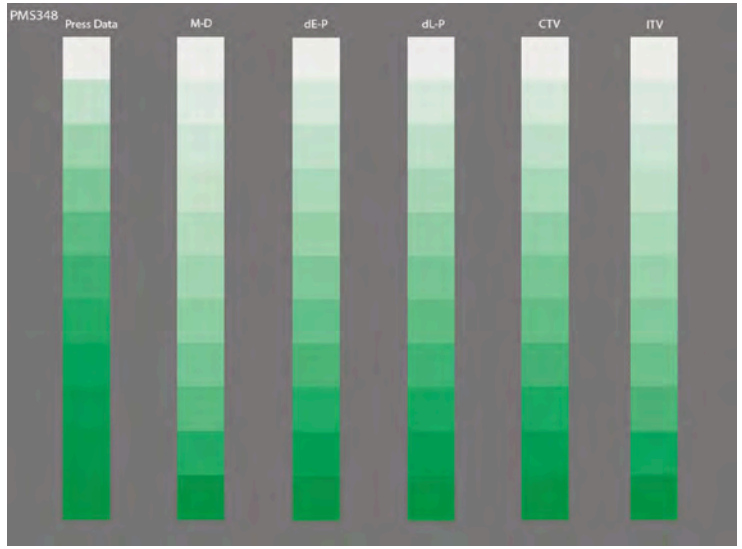
CMYK
Default CMYK inks

Mono-pigment
Typical hue angles:
O ≈ 54° - 56° (PO-34)
G ≈ 179° - 181° (PG-7)
V ≈ 307° - 310° (PV-23)



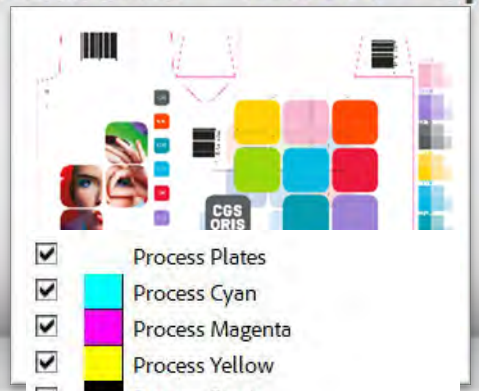
Issue: Trapping
Color Sequence: K C M Y V G O → Y C M K O G V





Color configurations – typical

Traditional = CMYK + Spots



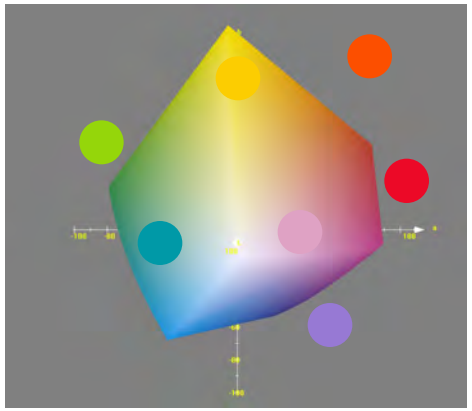
- Process Plates
- Process Cyan
- Process Magenta
- Process Yellow
- Process Black
- Spot Plates
- CO 021
- CO 185
- CO 375
- Stanzform
- CO 116
- CO 2036
- CO 306
- CO 425
- CO 320
- CO 2655

ECG = CMYKOGV

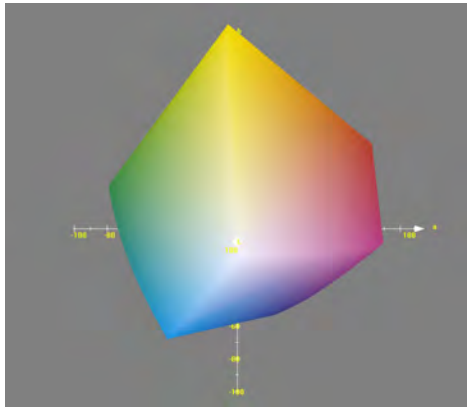
- Process Plates
- Process Cyan
- Process Magenta
- Process Yellow
- Process Black
- Spot Plates
- Green
- Violet
- Stanzform
- Orange

Image source: vecteezy.com

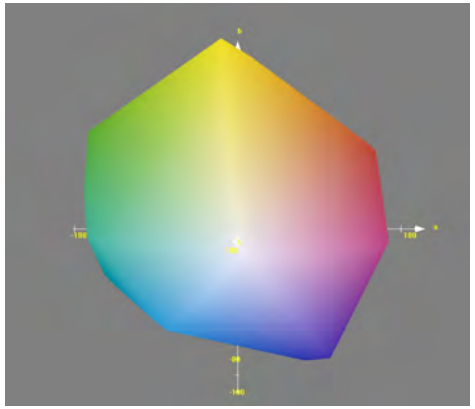
Going from CMYK+Spot ink to a fix color palette



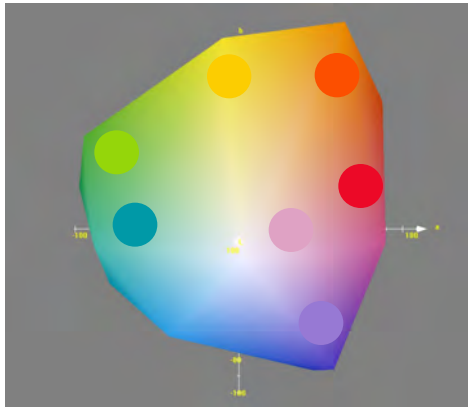
CMYK



CMYK



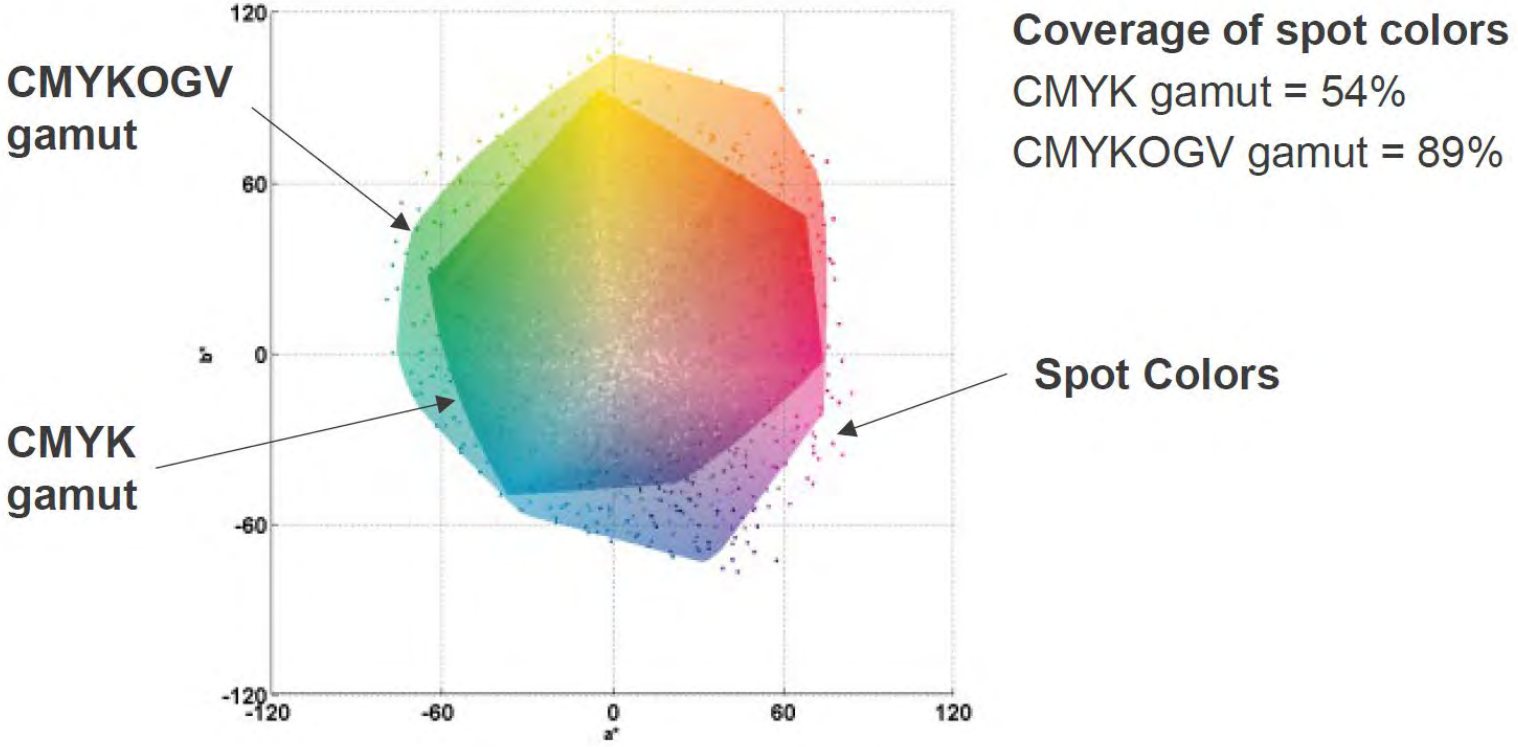
CMYK + GV



CMYK + OGV

Real-life example

- Any spot color needs to be checked
- Not all spot colors are equally relevant



Source: Kiran Deshpande (FOGRA Colour Management Symposium 2018 – Streamlining ECG Installations Worldwide)

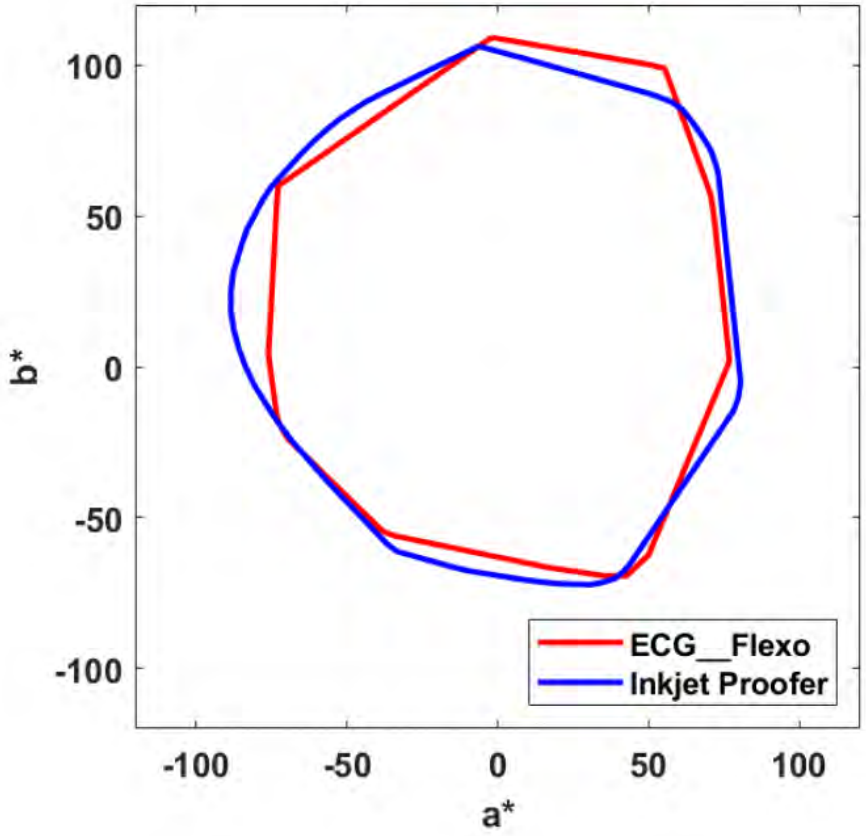
ECG Software

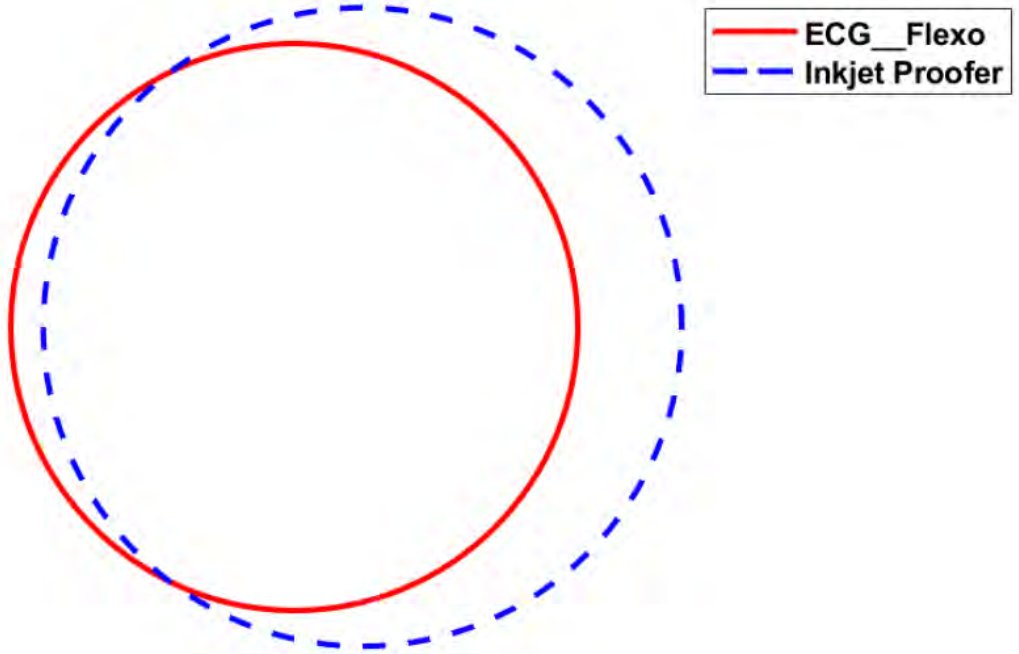
- Color separation e.g. CMYKOGV
  - Spot colors conversion: max 3/4 process inks, reduce complementary inks (C+O, M+G…)
  - Images conversion: custom algorithms, gamut mapping/compression, smooth gradations, contouring, banding issues; keep CMYK intact
  - Software must effectively convert both spot colors and images with equal proficiency

- ECG profiling
  - Multicolor (N-color) ICC profiles
  - Device Link Profiles
  - Proprietary color profiles
  - Profile accuracy, handling of tonal gradation, gamut calculation (ISO/TS 18621-11)

ECG Software

- ECG Flexo vs Inkjet proofer gamuts





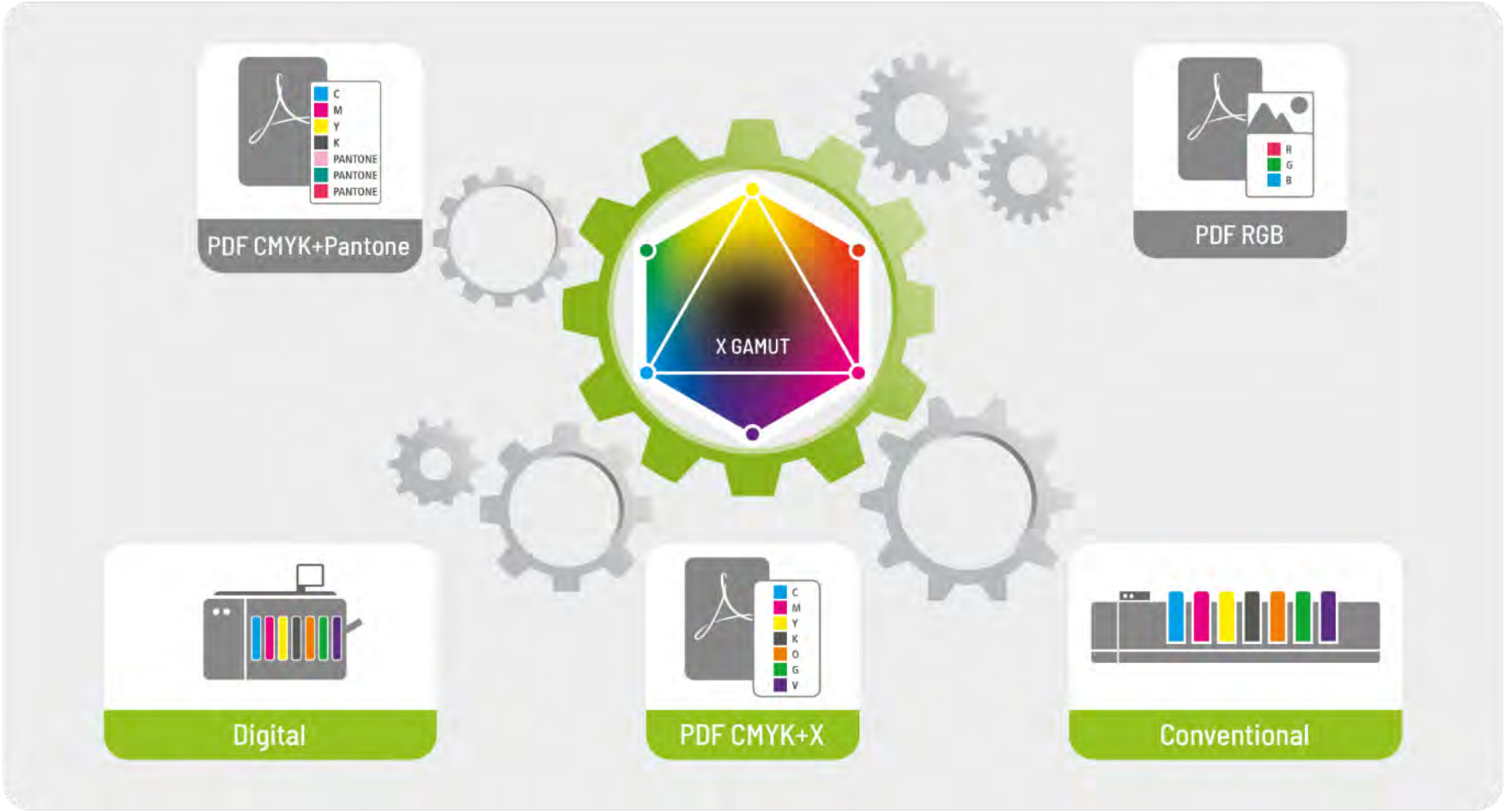
Source: Deshpande, 2023 (How to leverage gamut metrics for ECG printing? TAGA Conference))

ECG Software

- ECG proofing
  - Proofer gamut: is it big enough?
  - Soft proofing/preview: plug-ins for Adobe Photoshop

- Products in the market
  - CGS ORIS X Gamut
  - Esko Equinox
  - GMG OpenColor
  - Hybrid ColorLogic
  - Alwan ColorHub
  - Heidelberg Prinect Color Toolbox
  - Kodak Spotless
  - ...

Workflow


C
M
Y
K
PANTONE
PANTONE
PANTONE
PDF CMYK+Pantone
X GAMUT
R
G
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PDF RGB
Digital
C
M
Y
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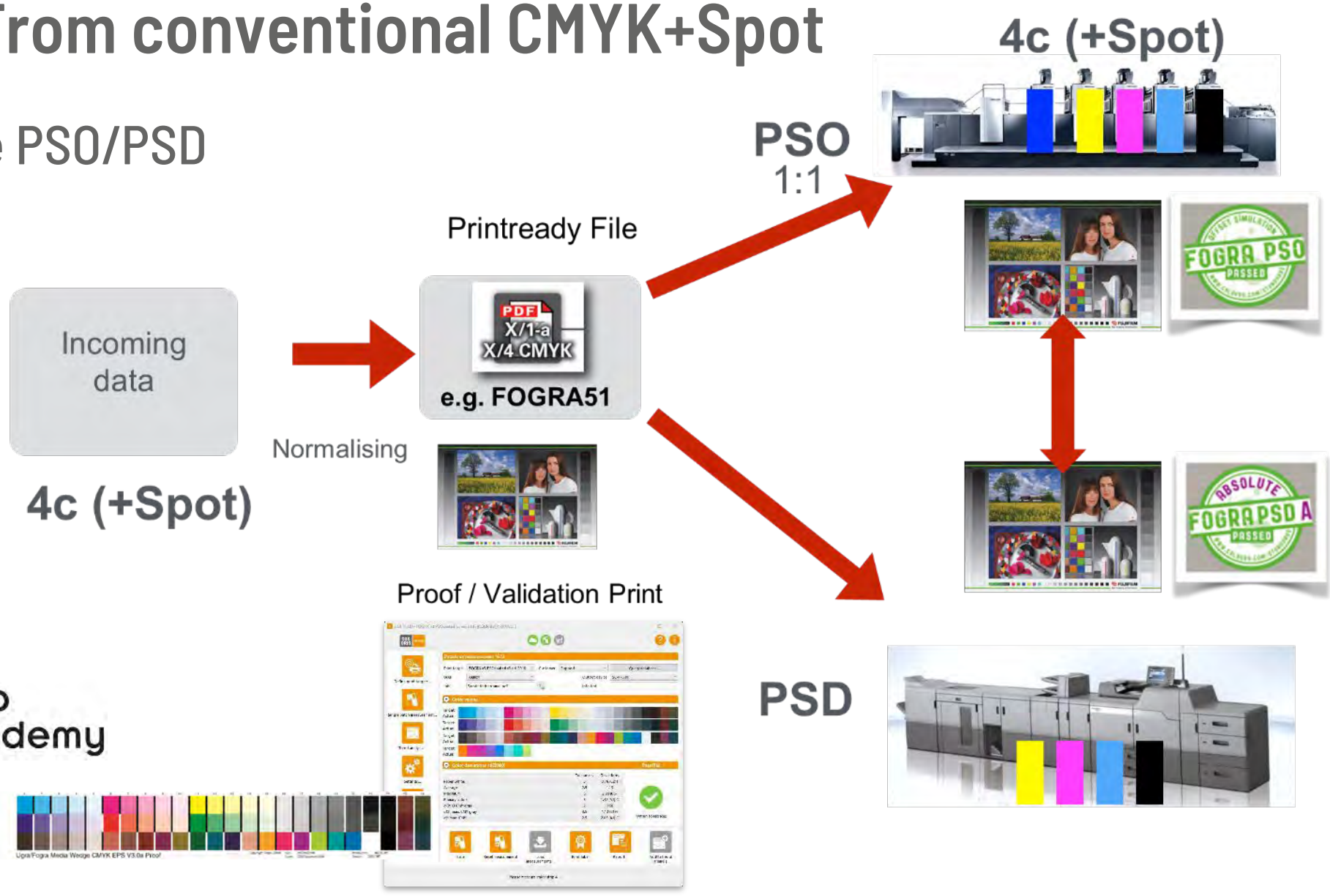
O
G
V
PDF CMYK+X
Conventional

From conventional CMYK+Spot

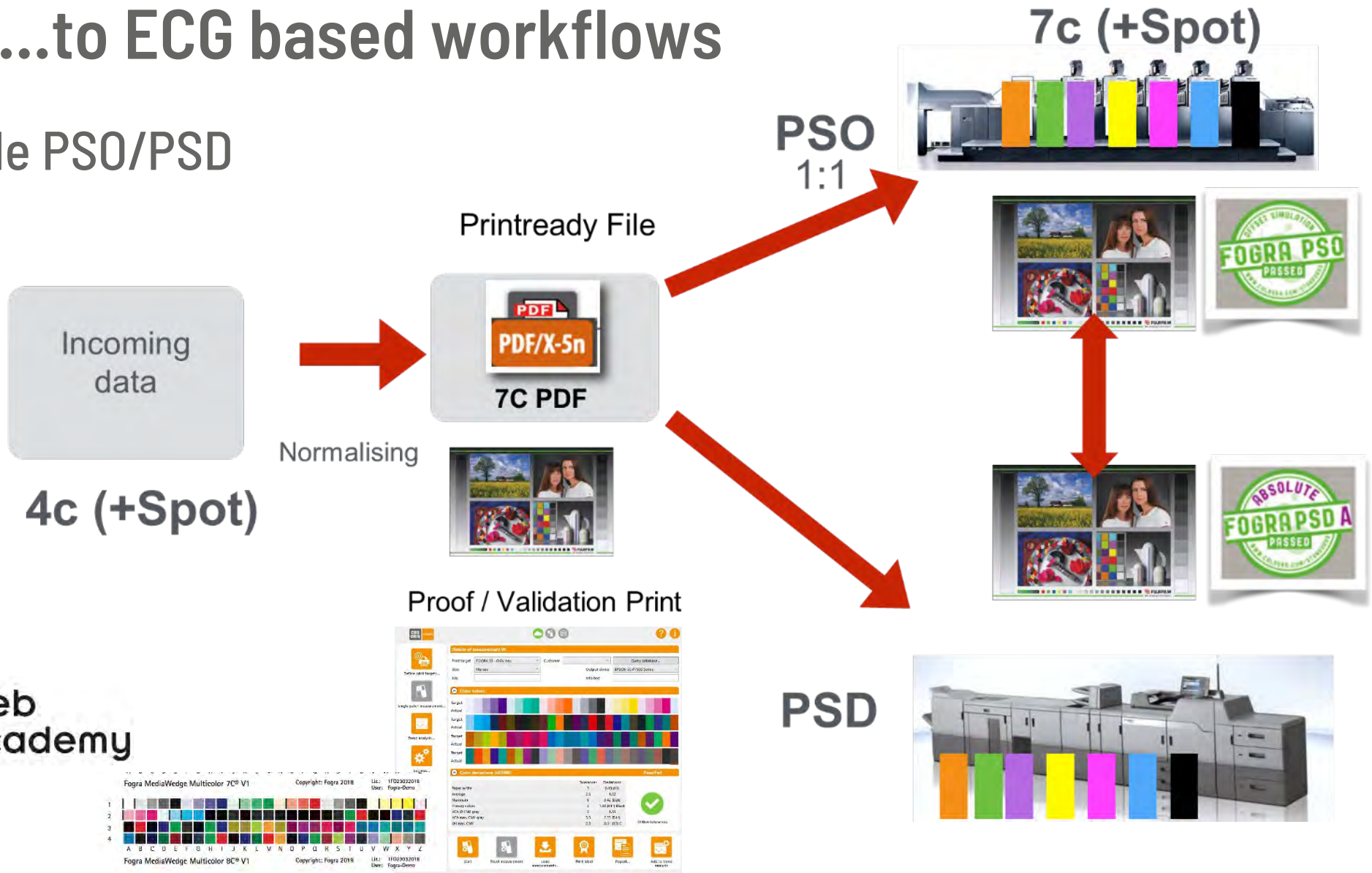
- Example PSO/PSD



Fogra | Web Academy

...to ECG based workflows

- Example PSO/PSD



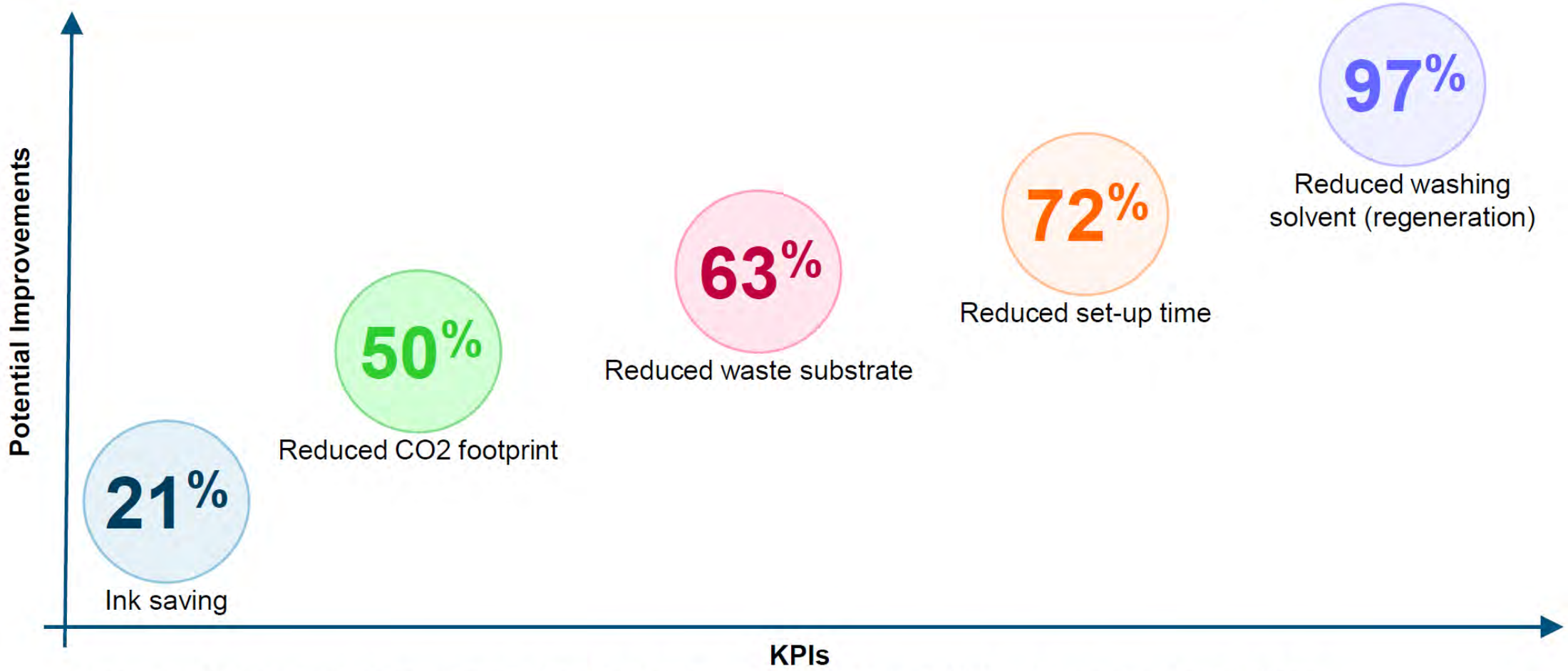
ECG-Workflow Aims

- Commercial Applications
  - High quality applications
  - Focus on saturation / brilliance
  - Preference on RGB content
  - “CMYK back to RGB”
  - Enhance vividness of images
- Packaging
  - Majority of ECG implementations
  - Honouring CMYK and minimize DE for spots (solids)
  - Check other technical specifications (negative fonts)
  - Important: Proof to Print Match
  - Barcodes

Key benefits and limitations

- Benefits
  - Reduced wash-ups, less set-uptime
  - Reduced material waste – substrate, inks, solvents
  - Less inventory of spot color inks & consumables
  - Press capacity gains – lower press downtimes
  - Lower press-return inks
  - Reduced CO2 footprint
  - Possibility of combination printing
- Limitations
  - Print structures and ink systems must be streamlined
  - Tighter process control & standardization required – process stability is very important, particularly registration
  - Separate metallic & fluorescent inks needed
  - Modify certain elements – micro-text simulation, negative text, barcodes etc.
  - Need strong partners / stakeholders with good knowledge and experience of ECG

Key benefits example:
ECG 7-color vs. CMYK + 3 spot colors



For a wide-web flexographic process with assumption of 50 million meters annual production (3,333 print-jobs), material width of 100 cm

Source: Lankinen, 2021 (PhD thesis: Evaluation of Expanded Gamut Printing in Flexography)

Conclusion

- ECG printing can provide significant benefits to your business
- But the implementation can be complex
- You need strong partners to avoid failure

Literature

WILEY

ENABLING DISCOVERY | POWERING EDUCATION | SHAPING WORKFORCES

Expanded Color Gamut (ECG) Printing CMYK and beyond

Kiran Deshpande

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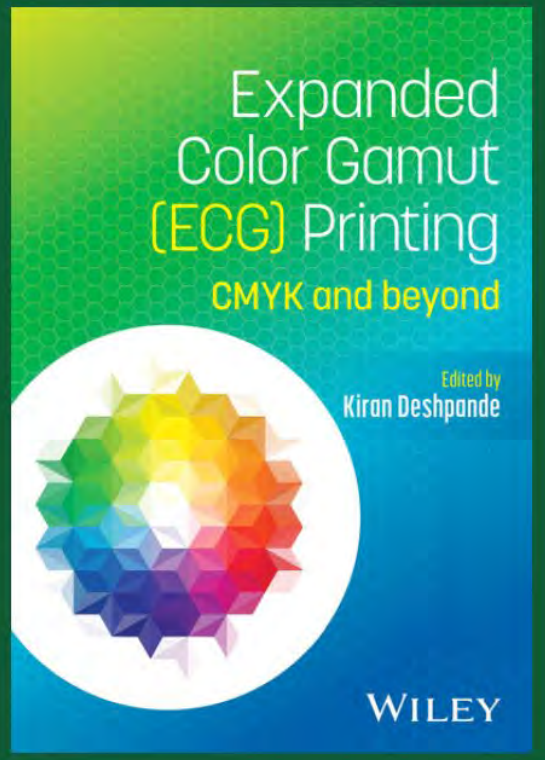

color you process