EXTENDED GAMUT PRINTING

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SCOPE & SUMMARY

- Measure the accuracy of colour mapping with extended gamut printing by using Orange, Green and Violet in addition to the four process colours (CMYK)
- We will be comparing five samples from different printing processes
- The purpose of this test is to explore the capabilities of 7-colour printing process (CMYK+OVG) compared to the standard 4-colour process (CMYK)
- There are several conditions and factors that need to be taken into consideration

EXPECTED OUTCOME & EDUCATIONAL GAINS

EXPECTED OUTCOME

- We expect the printed samples using CMYK process printing to show variation in colour due to different colour gamut of tested devices
- We expect printed samples using a 7 colour printing process to display accuracy across different devices
- We predict very little variation in the image quality based on the printing process

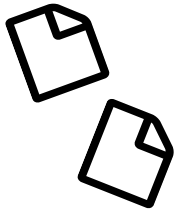
EDUCATIONAL GAINS

- Each device has variable that determines its gamut which cannot be replicated exactly by other device
- It shows that some device have advantage over other in terms of outputting more colors using extended gamut
- The extended gamut technology is to help achieve a broader range of colours

EQUIPMENT & MATERIALS







MATERIAL

- **Stock (Inkjet Proof)**: Epson Coated Photo Paper 44”
- **Ink Cartridges (Inkjet Proof)**: Orange, Green, Violet
- **Stock (Offset Proof):** Earnscliff Linen 182M, 148 gsm
- **Offset Ink**: hubergroup Esko Orange 2 ONX 5150-V, hubergroup Esko Prem. Violet 3 ONX 51501-V, hubergroup Esko Green 4 ONX 51502-V, Black, Process Cyan, Process Magenta, Process Yellow
- **Printed Samples**:
  - Xerox iGen 5 Sample
  - Flexographic Sample
  - Heidelberg Offset Sample

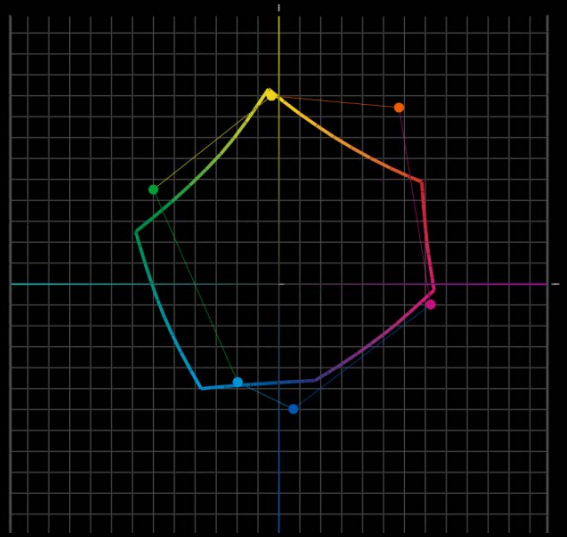
EQUIPMENT

- **Software**
  - X-Rite i1Profiler software on the iMacs
  - CHROMIX ColorThink Pro
  - Esko Equinox Photoshop Plugin
  - EFI Fiery RIP
- **Machines**
  - Prüfbau - Dr.Ing. H. Durner, #82380
  - Pipette
  - Spectrophotometer - X-Rite, eXact
  - X-Rite, i1Pro2 Spectrophotometer
  - Epson SureColor P9000

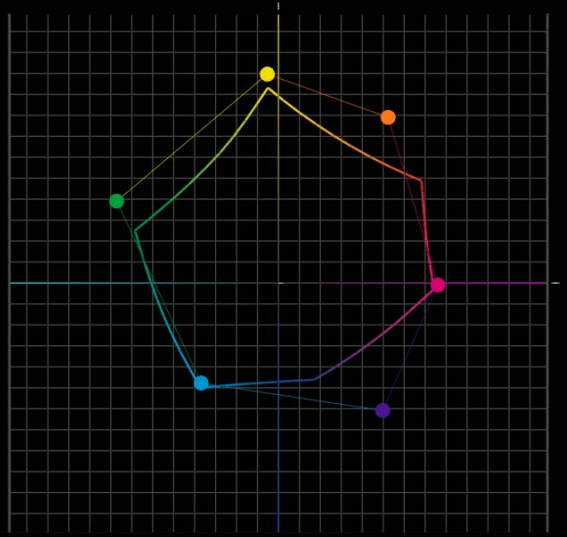
DATA

Sample	Cyan	Magenta	Yellow	Orange	Green	Violet
Epson SureColor P9000	L*: 57.2 a*: -19.61 b*: -46.72	L*: 45.2 a*: 72.38 b*: -9.74	L*: 85.9 a*:-3.52 b*:89.56	L*: 59.08 a*: 57.25 b*: 84.11	L*: 57.08 a*: -59.80 b*: 45.04	L*: 36.5 a*: 6.88 b*: -59.62
Heidelberg Offset Sample	L*: 58.89 a*: -33.48 b*: -55.38	L*: 50.9 a*: 76.97 b*: -5.46	L*: 85.16 a*: -4.49 b*: 66.5	L*: 68.97 a*: 68.85 b*: 76.53	L*: 61.3 a*: -78.78 b*: 0.05	L*: 17.10 a*: 48.27 b*: -62.82
Flexographic Sample	L*: 53.83 a*: -36.73 b*: -47.57	L*: 46.78 a*: 75.96 b*: -0.95	L*: 87.9 a*: -5.23 b*: 99.24	L*: 67.35 a*: 52.20 b*: 78.77	L*: 55.93 a*: -76.89 b*: 38.97	L*: 22.76 a*: 49.69 b*: -60.75
Xerox iGen 5 Sample	L*: 57.41 a*: -19.64 b*: -46.54	L*: 45.21 a*: 72.38 b*: -9.74	L*: 86.56 a*: -3.48 b*: 85.70	L*: 62.05 a*: 58.86 b*: 79.02	L*: 59.91 a*: -73.75 b*: 16.55	L*: 19.92 a*: 20.58 b*: -57.55
Prüfbau Sample	L*: 43.19 a*: -25.69 b*: -60.29	L*: 41.50 a*: 77.3 b*: 14.91	L*: 85.40 a*: -4.83 b*: 107.49	L*: 64.33, a*: 60.25 b*: 91.60	L*: 53.03 a*: -84.93 b*: 3.99	L*: 15.14 a*: 45.96 b*: -53.52

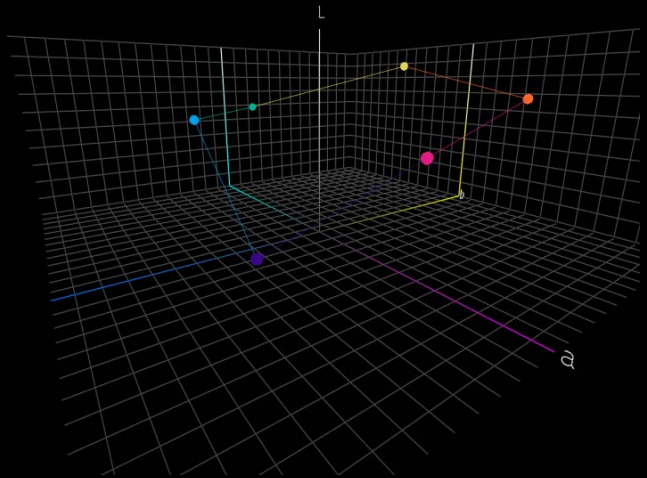
GAMUT COMPARISON



Epson SureColor P9000 Vs GRACoL 2006 Coated

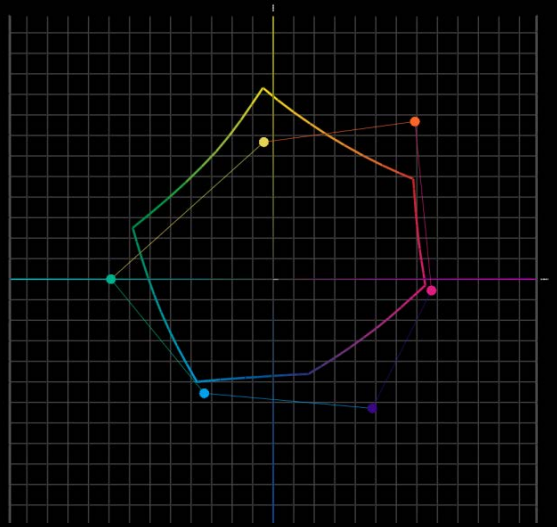


Flexography Sample Vs GRACoL 2006 Coated

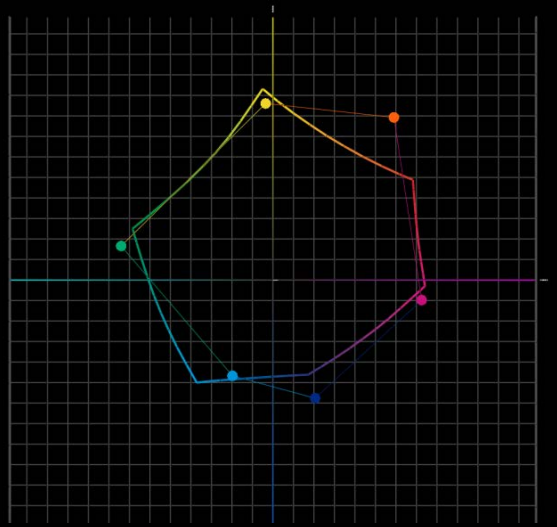


Flexography Color Gamut in 3D Space

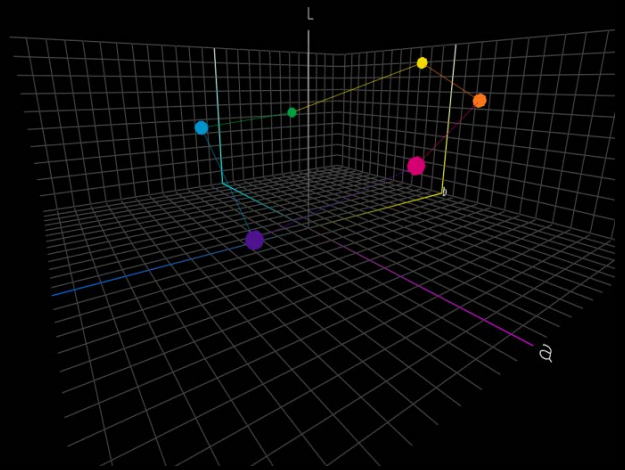
GAMUT COMPARISON CONT.



Heidelberg Offset Sample Vs GRACoL 2006 Coated

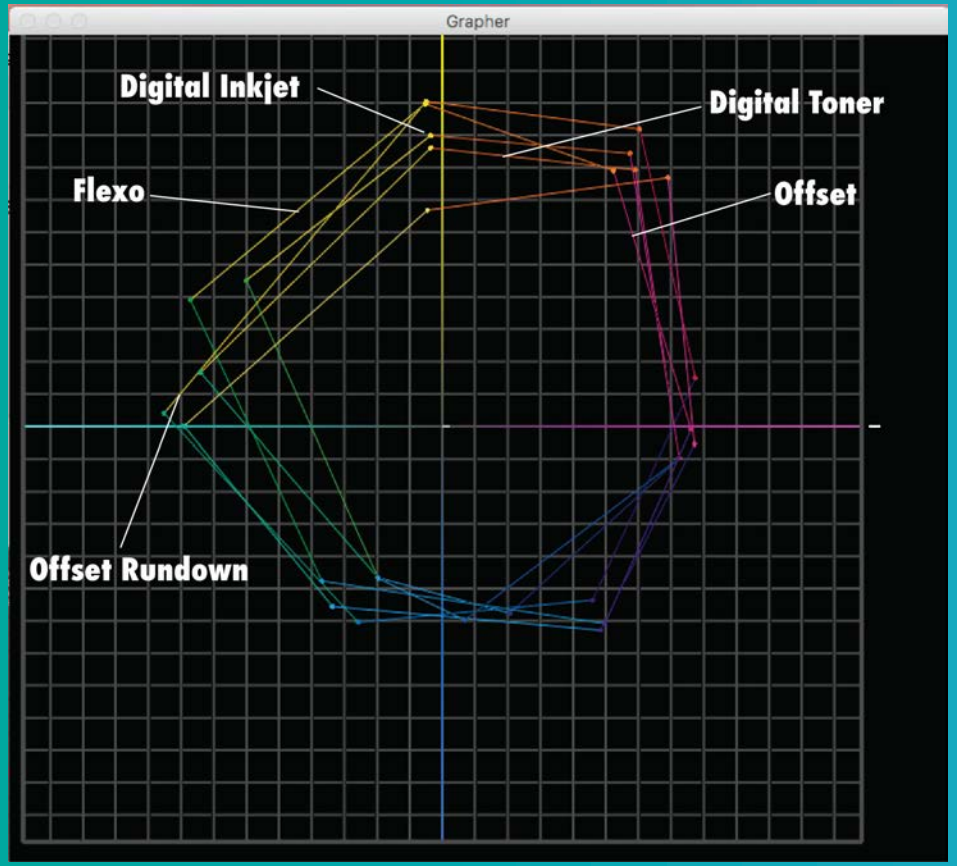


Xerox iGen 5 Sample Vs GRACoL 2006 Coated



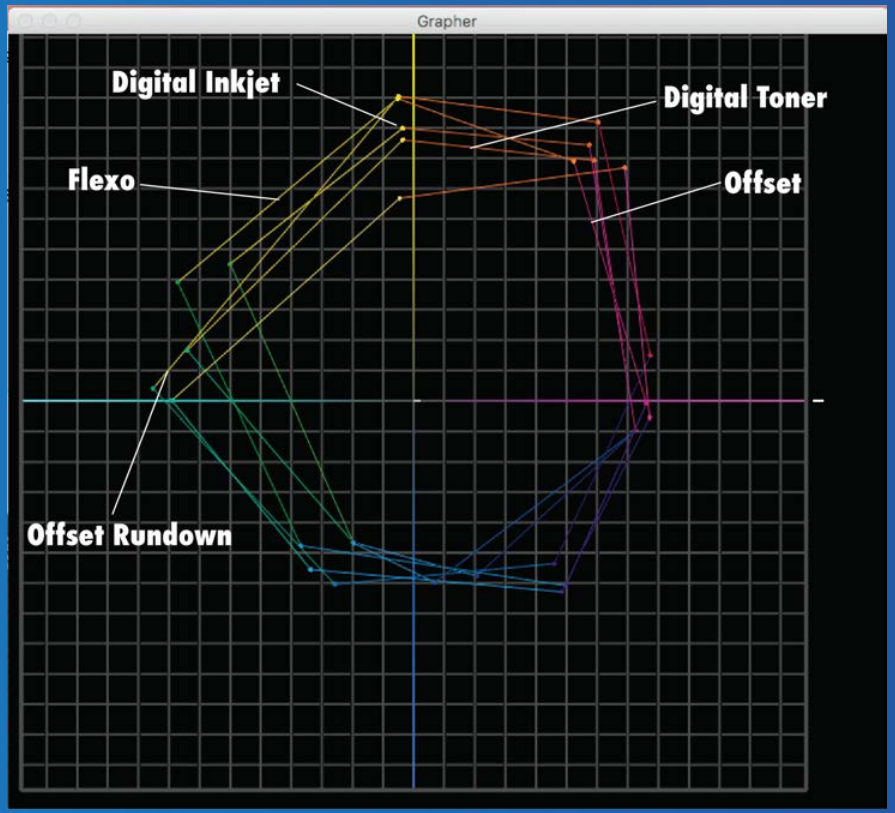
Prüfbau Sample in 3D Space

RESULTS

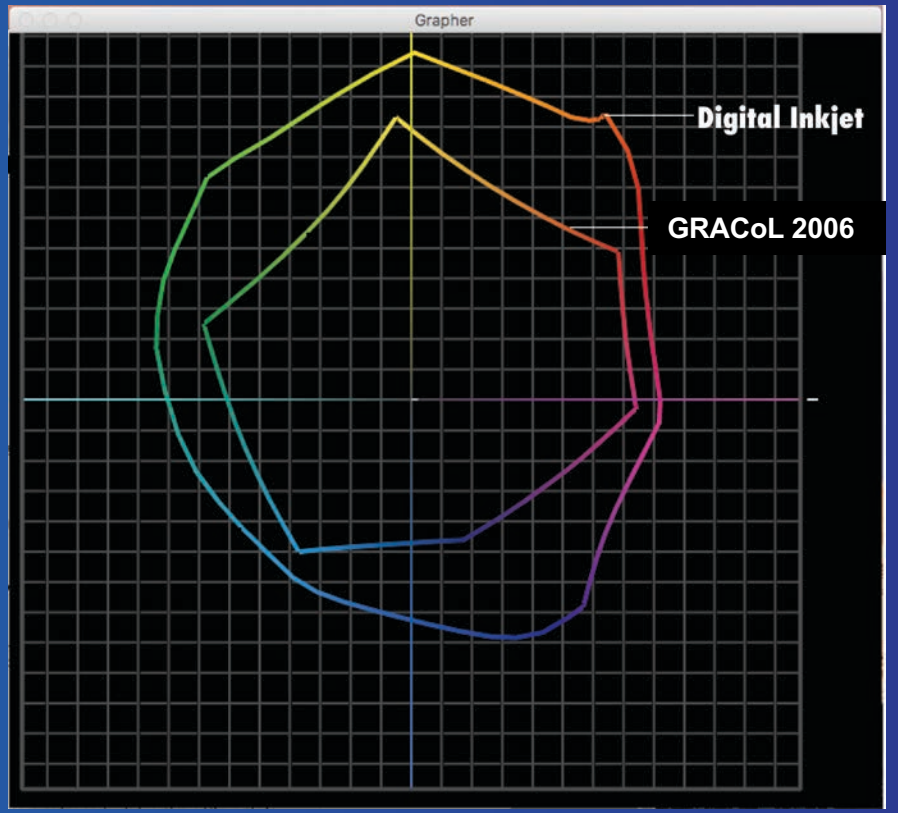


Sample	Orange Hue angle	Green Hue angle	Violet Hue angle
Epson SureColor P9000	35	173	318
Heidelberg Offset Sample	43	144	270
Flexographic Sample	44	140	298
Xerox iGen 5 Sample	36	160	284
Prüfbau Sample	46	154	308
PANTONE Standard	58	180	311

RESULTS CONT.



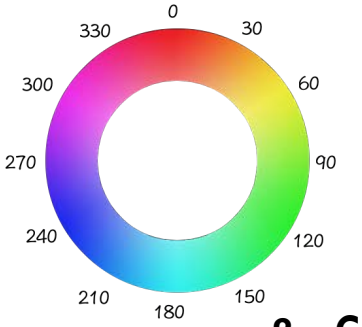
Extended Gamut Comparison across different printing processes



CMYK Gamut Comparison across different printing processes

DISCUSSION

- We hypothesized that if we can achieve similar gamut volume across all printing processes, then we can output similar print using any printing process. However, in our test we were not able to control the substrate and the type of PANTONE ink used for the extended gamut sample across all printing processes.
- Process Variation: Impact Vs Non Impact Printing



FACTORS AFFECTING GAMUT EXPANSION

1. **Hue angle**

   For any printing process to fall within the G7-ISO L*a*b* ink colour standards, the extended gamut ink (Orange Green and Violet) need to fall within the proper hue angle of the specifications (Baldwin, 2016).

   Should have a hue angle of 58 degree, 180 degree and 311 degree respectively, to accurately project the expansion of the colour gamut of the output device

2. **Chroma and Value**

   Chroma relates to the amount of visual difference from the grey of same colour

RECOMMENDATIONS

PRINTABILITY

- In XG, seven inks are being printed rather than four - the sequence of ink printed becomes more complex and varies between printing processes
- To optimize XG abilities printers need to be able to determine transparency of ink, in relation to overprints, to determine how colours are reproduced, and the most effective printing sequence
- XG - 7 is known as mono-pigmented ink. For clients who request the printing of accurate colours

END USE

- Big in the packaging industry because of its added benefits of being cost efficient and producing accurate colours in a timely matter
- Retain a consistent colour throughout the face of their company in order to gain recognition of their brand
- More inexpensive and quality solution for the replication of accurate colours

RUNABILITY

- Ink tack is a major component of the runability on the press - the stickiness of how ink adheres from one surface to another
- Substrates are important - where the most optimal paper will have efficient paper strength to print accurate colours accordingly

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