The Rise of Expanded Gamut Technology

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Expanding the Press Gamut – xGamut (xG)

- Extended vs Expanded
  - *Extended* = Adding more CMYK
    - Like extending your fingers, still have just 5
    - CRPC7 is Extended compared to GRACoL2013 CRPC6
      - 4 colors = CMYK
  - *Expanded* = Adding new colors
    - Orange, Green, Violet inks

- Expanded Gamut History

- Advantages
  - Flexo
  - Digital
  - Offset

- Driving forces for adoption

- Case Study/Litho Packaging
Expanded gamut printing (xG) isn’t new.

- 1995 - Pantone’s Hexachrome offered six color process printing by the addition of orange and green using specialized software in Adobe PhotoShop.
- Opaltone uses CMY with RGB and the optional addition of black.

Expanding the gamut allows for the creation of colors that are much more vibrant when converting from RGB, CMYK or CIELab.
Brief History of Expanded Gamut Printing (xG)

- xG also provides the ability to reproduce a greater range of spot colors using a fixed palette.

- A major step to industry adoption was the introduction of the Pantone Plus Series Extended Gamut Guide,

- xG printing is also a means to achieve other results. Measurable, more profitable results:
  - shorter changeover times,
  - lower consumption of inks and plates
  - efficiencies gained from running multiple SKUs on the same form with little interruption.
xG Advantages for Flexographic Printing

- Anilox roll and ink inventories can be standardized
- Fewer washes of ink pans and doctor rolls
- No changing the anilox
- Simple plate changes

*Press efficiency goes up dramatically!*
xG Advances in Digital Printing and Proofing

- Wild Wild West of Printing
- Wider range of spot colors in-gamut
- No standardized device color space
  - *Every device is different*
    - CMYKOG – Screen
    - CMYKOGV – HP Production
    - CMYKO – Fuji Graphium
    - CMYKV – Domino
    - CMYKX - Xerox
  - *No ISO Standard for CMYK + OGV*
xG Advantages for Offset Printing

- Ink inventories can be standardized
- Fewer wash-ups of ink trains
- No blanket changes
- Simple plate changes
- Gang Run Efficiencies

*Press efficiency goes up dramatically!*
xG Efficiency Study: March 2018

20,000 pcs ea of 7 SKUs
   2 common colors + 7 brand colors and CMYK
22pt C1S Blister Board

Resources
8 Color press
   Runs at 5000 sheets per hour
X Gamut profiling and workflow software
   Scanning spectrophotometer
**Processing Steps**

- Print and Measure the CMYK + Spot Characterization set
- Print and Measure the Expanded Gamut Data Set
- Map Spot color to xG Data Set
- Calculate the error metrics between the Spot and xGamut test colors

**Evaluation Steps**

- Confirm test colors are within metrics
- Calculate time/material savings
  - Number of plates
  - Press Changes
  - Press Time
xG Efficiency Study: March 2018

- Test consisted of 4 press runs
  - 1st Run – Characterize Brand Colors
    - Each SKU consisted of
      - CMYK Elements
      - Common Elements
        - Yellow/Red Violator
      - Unique Elements
xG Efficiency Study: March 2018

- Test consisted of 4 press runs
  - 1st Run – Characterize Brand Colors
  - 2nd Run – Characterize CMYKOGV
xG Efficiency Study: March 2018

- Test consisted of 4 press runs
  - 1\textsuperscript{st} Run – Characterize Brand Colors
  - 2\textsuperscript{nd} Run – Characterize CMYKOGV
  - 3\textsuperscript{rd} Run – 6 Color Efficiencies
xG Efficiency Study: March 2018

- Test consisted of 4 press runs
  - 1\textsuperscript{st} Run – Characterize Brand Colors
  - 2\textsuperscript{nd} Run – Characterize CMYKOGV
  - 3\textsuperscript{rd} Run – 6 Color Efficiencies
  - 4\textsuperscript{th} Run – xG Conversion
1st Run: Characterization of Brand Colors

- 200 Line AM screening
- Spot colors printed to <2 dE00 using spot inks.
- CxF Data Wedges measured for each color and standards established
- CxF/x4 files exported to xGamut Software for Separations and Proofing
2\textsuperscript{nd} Run: Press Characterization in xGamut

- 200 Line AM screening
- Print to G7 ColorSpace for CMYK
- Print to Lab for xG Colors
  - OGV
  - $dE < 2.0$
2nd Run: Gamut Comparison CMYK vs PMS

CMYK ProMatch

Color Space = GRACoL
Points = Pantone+ Coated

58% In Gamut
2\textsuperscript{nd} Run: Gamut Comparison CMYK-OGV vs PMS

CMYK-OGV xG ProMatch

Color Space = CMYK-OGV
Points = Pantone+ Coated

90\% In Gamut
3rd Run: 6-Color Efficiencies

- 200 Line AM screening
- Process Control to same densities as Run 2
  - CMYKOG Test Chart
  - CMYKGV Test Chart
  - CMYKOV Test Chart
  - CxF/x4 Data Wedges

- Customer can now calculate if a ganged job can be run efficiently with 6 color gamut rather than 7.
4th Run: Job converted to xG

- 200 Line AM screening
- Same PDF used as in Run 1
- All Spot Colors converted to CMYKOGV in xG Software
- Process Control to same densities as Run 2
- CxF Data wedges measured
4th Run: CxF/x4 Data Comparison

- 13 Spot Colors compared
- Average dE < 1.25
- Max dE00 < 4.25
- Meets all customer requirements
Post Run Analysis - Fixed Costs

Plates (each) $20.00
Press Time per Hour $200.00

*Might be light for a beast like this*

Washups = 30 mins $100.00

Assuming the customer has an Indy pit crew
Automatic wash units with auto plate change.

Spot Inks per lb $25.00
Mixing Inks per lb $20.00
Post Run Analysis – Spot Colors

Plates 13 @ $20  260.00
   CMYK + 2 Common and 7 Brand Colors
Press Time 2 Hrs @ 200/Hr
   x2 runs  800.00
Washups on 8C Press ½ Hr 100.00
Spot Inks
   5 lbs x 9 inks @ $25.00  1125.00
   45 lbs – PMS Colors
Total  $2285.00
# Post Run Analysis - xG

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
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<tbody>
<tr>
<td>Plates 7 @ $20</td>
<td>140.00</td>
</tr>
<tr>
<td>Press Time 2Hrs</td>
<td>400.00</td>
</tr>
<tr>
<td>Washups on 8C Press</td>
<td>0.00</td>
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<tr>
<td>XGamut Inks</td>
<td>900.00</td>
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</tbody>
</table>

- **15 lbs x 3 inks x $20.00**
- **45 lbs**

**Total** $1440.00
Post Run Analysis - Savings from xG Printing

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>Spot</td>
<td>2285.00</td>
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</tr>
<tr>
<td>xG</td>
<td>-1440.00</td>
<td>845.00</td>
</tr>
</tbody>
</table>

35% Saving in Hard Cost!!!
½ Makeready
½ Press Time
  – only 1 press run
Fewer plate changes and washups
Less ink waste
Less Environmental Impact

✓ Check Please
xG Project Analysis

- Customer Satisfaction
  - Met all customer requirements

- Greater Press Efficiencies – fewer changeovers
  - Maintaining an extended gamut on a press allows for more jobs to be run during a shift, as blanket washes and ink train washups are eliminated

- Greater Inventory Efficiencies – fewer inks
  - Less reliance on ink mill recipes

- Verification via CxF/x4 – cloud based, global
  - Confirm X Gamut colors are accurate to the spot colors from anywhere in the world.
xG Implementation Resources

- Pantone Extended Gamut Coated Guide

- N-Channel Color Profiling Software
  - ORIS X Gamut
  - GMG Color Server X
  - Esko Equinox
  - xRite i1 Profiler

- CxF/x4 Utilities
  - ORIS CxF Toolbox and CxF Cloud
Blogs and Articles

- Narrow WebTech

- FlexoGlobal Blog, Richard Black
  - [https://www.flexoglobal.com/blog/2016/01/16/flexos-future-expanded-color-gamut/](https://www.flexoglobal.com/blog/2016/01/16/flexos-future-expanded-color-gamut/)

- X-Rite.com
  - [https://www.xrite.com/blog/5-tools-to-print-extended-gamut](https://www.xrite.com/blog/5-tools-to-print-extended-gamut)