Implementing Repeatable Color In Flexography

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Repeatable Color for Flexography

• Topics
  – Overview of Project Objective
  – Review of Project Phases
  – Results
  – CPC Feedback
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• Project Overview
  – Main Objective
    • To Develop A Scientific Methodology For Repeatable Color That Meets Or Beats The Top Tier Performance Of Today's Artisan-Based Process
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- Project Phases

1. *Benchmark and characterize the ‘top-tier’ performance of today’s flexographic package printing system*

2. *Define critical control parameters and process variables, and develop a scientific methodology for repeatable color*
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• Project Phases, cont.

3. *Demonstrate that the methodology beats the best artisan-based approach in delivering repeatable color*
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• Phase 1 Review
  – Large multi-billion dollar CPC was solicited to identify top-tier label printer
  – Printer opened up vault of retained samples
    – over 14 month’s worth of samples
  – Samples were measured and evaluated colorimetrically
  – Results served as the target
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• Phase 1 Results
  – 6 spot colors were evaluated
  – Only spot colors could be measured
    • Samples were post-die-cut
    • Had to measure within the label
  – Delta E 2000 was used
  – Results:
    • Averages ranged from 1.1 to 2.5 DE
    • Overall average was 1.8 DE
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• Phase 2 Review
  – Methodology Development
    • Extensive literature search
    • Visited key vendors:
      – Ink
      – Substrate
      – Anilox
      – Doctor Blades
      – Prepress/Platemaking
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- **Phase 2 Review**
  - Over 40 attributes/variables were identified
  - For each one:
    - Description
    - Targets/Tolerances
    - Measurement Apparatus
    - Method/Technique
    - Affected Response Variable(s)
      (solid color, tone reproduction, overprint traps, registration)
    - Likelihood of Control
    - Issues – any concerns that could lead to a lack of control
    - References
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• Phase 2 Review, cont.
  – For press set-up
    • All settings & material attributes were documented:
      – Ink batch information
      – Anilox roll selection
      – Stickyback lot number
      – Substrate ID and lot number
      – Plate Information
      – Doctor blade information
      – Press settings (tensions, nip pressures, etc.)
        » Others
# Repeatable Color for Flexography

## Standard Operating Conditions (SOC)

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<th>Condition/Variable</th>
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## Job and Misc. Details

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## Unwind

- Tension: 28
- Infeed Nip: Open
- Taper: Auto
- Lay: Off

## Rewind

- Lower Tension: 8.2
- Taper: Auto
- Doctor Blade: Daetwyler 0.008" 15 degree bevel

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Date of Pressrun: 9/16/02

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• Phase 2 Review, cont.
  – Press Operation/Control
    – Keeping in mind UV label application…
    – Primary controls on press were gear and operator side impression
    – Control patches were incorporated into the gear and operator sides of the form for measurement and control
    – Solid and shadow tint patches alone proved to be all that was necessary for control
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• Main Controls for Controlling Impression
  – Solids
    • Anchors endpoints for gamut boundaries
  – ¾-Tone Tints (i.e. 70%, 75%, 80%)  
    • Most sensitive to impression pressure
Impact of Impression Pressure on Tone Reproduction – 4 Levels

![Graph showing the impact of impression pressure on tone reproduction for different color levels.](graph.png)
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• Phase 3 Review/Results
  – Spot Color Repeatability
    • 12 pressruns with 4/color process plus 3 spot colors were conducted over 12 months
      – First pressrun served as target run
    • Each pressrun had different:
      – Set of plates
      – Batch of inks
      – Lot/batch of stickyback
      – Lot/batch of substrate
## Repeatable Color for Flexography

<table>
<thead>
<tr>
<th>COLOR</th>
<th>BEST IN CLASS</th>
<th>RIT RESULT</th>
<th>CONFIDENCE LEVEL</th>
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<tr>
<td>Lighter Green</td>
<td>Mean - 1.43</td>
<td>Mean - 0.58</td>
<td>99</td>
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<td>Std Dev - 0.71</td>
<td>Std Dev - 0.24</td>
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<td>Darker Green</td>
<td>Mean - 1.47</td>
<td>Mean - 0.93</td>
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<td>Std Dev - 0.88</td>
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<td>Very Dark Blue</td>
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<td>Std Dev - 0.48</td>
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RIT’s Scientific Methodology Beat The Industry’s Best Art
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• Phase 3 Review/Results
  – Top 3 Variables:
    1. Plate Specification and Conformance
    2. Numeric Control of Press
      – Gear and Operator Side
      – Tolerance Limits to Target
    3. Ink Formulation
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- Phase 3 Review/Results, cont.
  - Process Color
  - Issues
    - Spatial Uniformity
    - Temporal Consistency
    - Sampling Strategies for Profiling
    - Evaluation of Color Managed Runs
      - Utilization of IT8-basic
      - Patches derived from images
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• Phase 4 – Demonstrations
  – Took a step into Predictable Color
    • Color-managed workflow
      – proof and press
    • Running to the numbers
    • Very short makereadies (<10 minutes)
    • Aimed for commercially acceptable color (90% match)
“Well, that’s not a 90% match…

…that’s a 95% match, and it knocked our socks off!”
Q/A

Thank You for Your Attention.