Measurement Challenges For Non Paper Substrates

Ray Cheydleur
Market Manager
Printing, Packaging and Imaging
X-Rite Pantone
Let’s start with the Basics

- Classic paper measurement is done with a 0:45 or 45:0 measurement device
- Spectrophotometer (a.k.a. Spectro) – A device that illuminates a sample, and measures the amount of light reflected (or transmitted) at various wavelengths
Aperture Size

- Traditionally in print the smallest aperture appropriate for the linescreen or DPI is used
  - Substrate is very smooth and homogeneous
- In grand format this is not always the case
  - Printer may be capable of finer DPI
    - May not be used depending on application/speed
- Non paper substrates are often rougher
  - Better to use a larger aperture
- Other options
Non 0:45 devices

- Sphere D:8
- Transmission
- Imaging Spectros
- Multiangle spectros
Traditional Industrial Geometry

- **Sphere D:8**

Diagram showing a sphere with labels for sample viewing port, specular port, lamp, and baffle. The diagram indicates an angle of 8°.
So Glossy, Flat or Matte – Is that all?

glossy object

matte object
Transmission

- Aperture Size
- Definition of the light
  - D50
  - “D50”
  - Other
- Material being measured
  - Vinyl/Film
  - Fabric
- End use
  - Day/Night backlight
Traditional Spectro

- Capture the light reflected by the sample that is inside the aperture – a single set of reflectance data
Imaging Spectro

- **HSI – Hyper Spectral Imaging**
  - Uses a “true-color” camera, capable of providing reflectance data per pixel vs. typical RGB color cameras
Imaging Spectro

- Capture the light reflected by the sample that is inside the aperture – a set of reflectance data per pixel.
Use Case #1

- **Standard Spot Measurement (Simple)**
  - Whatever fills the aperture is measured
  - Combined reflectance data for all pixels
  - Mimics a traditional Spectro maintaining inter-instrument agreement

Sample  
Traditional  
HSI Simple
Use Case #2

- **Removing artifacts/defects (Smart Spot)**
  - Measure the full area
  - Smart Spot algorithm eliminates the pixels that are outliers – defects, pin-holes, shadows, highlights, etc.
  - Compare Simple & Smart Spot for print quality
Use Case #2

- Stucco – an extreme example
Use Case #3

- **Color Standards & Formulation**
  - Customer provided color standards can provide challenges
  - Smart Spot provides the real desired color
Use Case #4

- **Multi-Color Measurement**
  - Does not require a full patch for each color
  - A textile example
Imaging Devices in Other Workflows

- TAC Ecosystem
  - Total Appearance Capture TAC7
  - Pantora Material Hub
  - AxF Files
  - Virtual Light Booth
- Material capture for 3D design
Imaging Devices in Other Workflows

CAPTURE
MEASUREMENT TECHNOLOGY

- Structured light projector
- 4 industry-grade cameras
- Spectrophotometer
- Variable linear light scanner
- 32 white LED point-light sources
- Backlight module
- Rotation stage
- 8 spectral light sources
Imaging Devices in Other Workflows

**PANTORA 1.5 | TRANSLUCENCY WORKFLOW**

1. **SAMPLE**
   - Multi-thickness step chip material sample (polished surface)
   - New Split Back and White Backing

2. **CAPTURE**
   - TAC7 Scanner (4 minutes scanning time)

3. **DIGITAL TWIN**
   - Virtual material in AvF

4. **VISUALIZE**
   - Ray tracing with AvF V-Ray Plug-ins. Realtime rendering will be supported in V.3 with firmware 1.2 and Pantora 1.6

Translucent plastic chip measured with a TAC7.
Imaging Devices in Other Workflows

- **MA-T Multi-Angle Instruments**
  - Traditional & Imaging
  - 6 or 12 measured angles
  - Imaging for effect QC
Multi-Angle Measurements Why We Use Them

- Change Optical Properties with Illumination and Viewing Angles
  - Metallic
    - Extend / enhance the gloss or specular appearance
  - Mica / Interference additives
    - Change appearance at all viewing angles. Some may introduce strong shifts in both lightness and hue
  - Pearlescent
    - Make surfaces appear to shimmer
      - haze effects
Thank You