If Paper is the 5th Color, OBA’s are the 6th and Beyond!

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Fujifilm North America Corp
GSD
An Educational Presentation on OBA’s

A FUJIFILM Presentation

Don Schroeder, Director Solutions Development
Optical Brightening Agents…Why all the fuss

- Who has had issues with OBA’s in a job?
- When in the production cycle did it become an issue?
- How much time did it take to resolve?
- Was there a clear and definitive solution to the problem?
- Has it been resolved so it does not happen again?
What is the problem in the production stream?

- A Print specifier decides on a paper not knowing if it has OBA’s or not…and if they do know, have they communicated this to the printer? More often than not …no, but would this alone solve the problem? No…

- Most print specifiers want the best, brightest, whitest, paper they can buy at a price that is attractive to them…

- In the USA most paper manufacturers are responding with more brighteners due to the competitive nature of papers made internationally….mainly Asian Pacific Rim

- The problem of matching a color or standard now falls on the Printer!
Who’s got the ball?

- Now let’s say a Print Specifier and Agency want to make a “Marketing Campaign” Lets say for “Don’s Dream Boats Inc”
- This means, offset printing for ad’s in trade publications, direct mail pieces from digital printing, wide format printing for poster boards and point of purchase displays, and they want all the images and corporate logos to match…and they want it all printed to GRACoL color space…sound familiar?
Who’s got the ball?

- Now what happens when the paper for offset, the paper for digital and the poster board for wide format all have different levels or some have no levels of OBA?

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<th>SPORT SERIES</th>
<th>SLX SERIES</th>
<th>SUNDECK SERIES</th>
<th>SPORT CRUISERS</th>
<th>SPORT YACHTS/YACHTS</th>
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<td>300 Sundek</td>
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View prior model years
What do OBA’s look like

OBA’s are colorless or slightly colored organic compounds
Why OBA’s in Paper or Media?

- OBA’s are used to make paper appear more white!
- OBA’s use fluorescence to absorb invisible radiation from the UV light spectrum and re-emit the radiation as light in the visible blue range.
- The OBA’s add blue light to the reflected light
- The additional blue light offsets the yellowish tinge in the reflected light
- Thus the increase the visible brightness of the material
Principles of Optical Brightening

OBA’s absorbs ultraviolet light and re-emits most of it at between 400 and 500 nm as blue fluorescent light.

Figure 1: Example absorption and fluorescence emission curves

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<tr>
<td>Concentration</td>
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<td>Layer thickness</td>
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<td>Absorption maximum</td>
<td>375 nm</td>
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<tr>
<td>Fluorescence maximum</td>
<td>437 nm</td>
</tr>
<tr>
<td>Quantum yield</td>
<td>0.81</td>
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OBA’s

- Most coated papers have a b* value of -4 to -10 (The b* measurement is the blue-yellow axis of the L*A*B*)
- For uncoated papers or wide format vinyl's or boards it can be higher -14 b*
- OBA’s fade, the paper yellows over time, and have environmental issues.
- But one larger issue remains…Standards
Standards and OBA’s

- ISO and US Print standards specify paper that is a neutral white
- Years of press runs and media measurements have been made to make international data sets
- The problem is not that the paper is too white, it is that measurements might not match our perception!
- To a Spectrophotometer the brightened papers appear blue. Our eyes adapt to the paper, it appears White

Color Perception

3 factors that influence the perception color

1. Light source
2. Object being viewed
3. Observer (person)
So let's take a closer look at what we have learned to this point..

- OBA’s make the paper whiter, some more than others depending on the amount and the light spectrum.
- OBA’s shift the color appearance to the blue portion of the visible spectrum…? 
- If we can see the shift to the blue…, what do you think a Spectral Device that measures color see’s?
- And if this high tech tool see this shift while making a color profile what do you think the color engine will try to do when making a profile to a standard such as GRACoL?
Answer....

- Throws more Yellow at it!
Proof to Press Match

- Modern Print Standards such as GRACOL, SWOP 3 & 5 are based on Spectrophotometric readings.
- Works well with ISO 12647-2 medias, but they are becoming harder to find.
- When paper has OBA's (Blue) the measurements are no longer accurate.
- When we calibrate using these wrong measurements we get a proof to press match that is not visibly accurate. Most often an extreme yellow cast due to the CMM information trying to add yellow as it thinks.
Let's take a look..

- Papers in a normal light booth with no or minimal UV
- Papers in a ISO 3664 / 2009 light booth with UV included
- Papers in highly agitated UV light booth
Lighting Specifications

• ISO 3664:2009 The main difference between the old vs. new standards is that the new one closer incorporates the amount of UV energy present in D50 viewing conditions. *(This is daylight with high UV)* UV affects the way light is reflected from paper, especially if this paper has optical brighteners.

• This new standard now shows the effects of OBA’s
See how Lighting can effect change....

Epson 9800 on Epson Media M0, Epson 9900 on Epson Media M0, Epson 9900 on Oris **Media M1**, Sappi Opus Press Sheet, Sappi McCoy Press Sheet and NewPage Sterling Press Sheet
See how Lighting can effect change....

UV Booth at Fujifilm Hanover Park IL
See how Lighting can effect change....

UV Booth at Fujifilm Hanover Park IL
Other Industries with OBA’s

- Optical Brighteners for Plastic
- Optical Brighteners for Paper
- Optical Brighteners for Fibers
- Optical Brighteners for Tape
- Optical Brighteners for Labels
- Optical Brighteners for Adhesives
- Optical Brighteners for Polymer
- Optical Brighteners for Rubber
- Optical Brighteners for Paint
- Optical Brighteners for Coatings
- Optical Brighteners for Inks
- Optical Brighteners for Film

Laundry Detergent

What’s left on your clothes after washing

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So where do we go from here?

- By educating everyone on the issue at hand brings “light” to how we all need to work together to understand the situation.
- OBA’s have become a topic in Proof to Press match, Press to Digital match, Digital to Wide Format match and even Press to Flexo label match.
- Knowing your substrate will most certainly assist in the better ability to match to a standard.
The Paper is the issue but also the illumination as well...

- Spectral remissions using brighteners change with illumination!
- Without brighteners the remission curves of the same substrate are equal
- Blue paper does not mean it has brighteners in it!
- You can only detect brighteners by changing the illumination (i.e. with or without UV cut filter)
- The measurement devices do NOT give wrong measurements!
- They only use a different illumination than later for (human) observation.
- It is not an error of the measurement device, but the fact that the illumination changes the brighteners are used, and our eye interprets bright blue as white

"I see that Dufus McDufus will have a presentation on that topic later today"
The Paper is the issue but also the illumination….

- M0 / M1 (the two illumination options for graphic arts measurement using spectros) measurements identify and improve on the problem of consistent / comparable measurement data, but do not solve the issues of different measurements and viewing illumination, both don’t use true D50.

- MO / M1 measurements do not use real D50/Dxx illumination, because it does not currently exist, they use models, double measurements with different illumination / assumptions of brighteners to approximate the target illumination.

- Software solution may detect brighteners (in Spectral data only) and “compensate” it very well. Compensation means either it may reduce (simulate UV-Cut only) or increase (simulate more UV) the impact of brighteners. Still the relation between UV of the measurement and the viewing illumination must be known, and this is the critical point.

Dr. TwinkleButt is going to investigate the problems with getting this to work"
What’s being done to help

• Measurement companies such as X-Rite and Konica Minolta and Techkon, Barbieri, are making devices and software to assist in knowing when these OBA’s are present and help in the proper Illumination of these OBA’s

• Industry Organizations such as PIA and IDEAlliance are actively challenging and pursuing new standards to help in this issue

• Manufacturers of Graphics Arts solutions are assisting in the education of this issue and developing Solutions and software to help this issue

• Consultants and manufacturers are actively educating buyers, users and students on this topic
Educate and understand the technical terminology

• M0: does not define UV energy, and does not completely define the illuminant condition. By definition older instruments currently in use in the graphic arts are M0. While the UV level of these instruments is typically known, they are not held to any tolerances in manufacture, and all levels of UV are considered within specs for M0.

• M1: contains a defined amount of UV energy for use with brightened stocks.

• M2: contains a specification for UV cut or UV filtered illuminant condition.

• M3: contains a specification for UV cut or UV filtered illuminant condition as well as for polarization.
Educate and understand the technical terminology

- So what does this mean to you!
  - You need to know which measurement standard is being used
  - All the new 2013 datasets are using M1 measurement
  - All of the old 2006 datasets are using M0 measurement

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Educate and understand the technical terminology

- 2013/1014 Dataset and Standards using M1
  - GRACoL 2013 CRPC6, SWOP 2013 CRPC5
  - CGATS 21
  - ISO FDIS 15339:
  - ISO 12647:2013
Konica Minolta FD Series

Uniquely corresponds to Measurement Condition M1 of ISO 13655

The world's first M1 type.
Konica Minolta's original VFS (Virtual Fluorescence Standard) technology enables L*a*b* measurements corresponding to ISO 13655 Measurement Condition M1 (CIE Illuminant D50).
In addition, color measurements corresponding to ISO 13655 Measurement Conditions M0 (CIE Illuminant A) and M2 (illumination with UV-cut filter) can also be taken.

When using conventional instruments to measure materials printed on substrates containing fluorescent whitening agents (FWA), large differences between the results of measurements and visual evaluation may occur. With the new FD-7/FD-5, measurement results correspond more closely to visual evaluation results, including the effects of any FWA in the paper.

Measurement intensity distribution
Spectral reflectance under various illuminants

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SpectroPad Series 2

The portable professional spectrophotometer to measure most variety of different reflective media used in professional digital printing (including large and wide format).

Thanks to its independence from a computer it can be used also directly on the printer. His integrated touch display facilitates the interaction with the device and gives immediate feedback about the measurement results.

BARBIERI “qb-technology” inside

SpectroPad (display during measurement)

Instructions

Acquire Position and move head when ready!

Please measure Line<d>

Measuring speed indicator

Speed max

Mode

Beginner Mode

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Techkon Solutions

Commercial Printing
Techkon is the largest supplier of scanning spectrophotometers for most press manufacturers. Techkon’s handheld and scanning densitometers and spectrophotometers have been widely accepted tools in the commercial printing market for nearly three decades. Our SpectroDens spectrophotometer/densitometer and SpectroPlate digital microscope enable the critically accurate color measurements required in the high quality, demanding commercial print environment. The high throughput scanning capability of the SpectroDrive and the SpectroJet provides unmatched color accuracy and repeatability for every press sheet. The E55000 Inline Spectrophotometer offers similar quality color measurement for the latest high-speed digital print engines.

SpectroDens | Spectro-Densitometer
A fast, highly accurate handheld spectrophotometer and easy-to-use densitometer
X-Rite Solutions

Brochures
- L7-439, Optical Brightener Compensation - What is It? 618 kb (pdf)
- L7-519 i1Pro 2 Family Brochure 14.5 mb (pdf)
- L7-532 Print and Packaging Training and Services 1.1 mb (pdf)
- L7-533 Ink Formulation Software 1.2 mb (pdf)
- The M Factor: What Does It Mean? 1.2 mb (pdf)

User Guides & Operation Manuals
- NEW - i10Q Quick Start Guide 1.7 mb (pdf)

Get More Information
Sales/Support:
800-248-9748

Contact Us

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67th Annual Technical Conference
tagaatc.printing.org
Applications and Solutions that support M1 to date (as of 3/2015)

- FUJIFILM ColorPath Sync
- Xrite I1 Profiler
- SpotOn! Verify
- Alwan Print Standardizer
- Babel PatchTool
- Babel CT&A
- BasIICColor
- Most RIPs....EFI, CGS, GMG
See how Lighting can effect change….

Same Office Furniture same carpet and wall paint..different light bulbs!
Light Booths what can you do

1. Maintain and replace your bulbs with new ISO 3664:2009 compliant bulbs. If you need help determining if your bulbs are compliant contact your manufacturer. There is also information on ISO 3664-2009 bulbs at http://www.gracol.org. Note that it is important that everyone in your production workflow (customer and printers) use the same bulbs.

2. If you encounter problems you may choose to use a UV filtering lens in your viewing booth. Both JUST Normlicht and GTI include or make UV filtering lenses for their viewing booths. A UV filtering lens will block the UV light from passing through, and will make the new lights act like the previous bulbs, which had minimal UV content.
Light Booths what can you do continued..

- This will allow you to have the same proof to press match that was possible prior to use of the newer bulbs. If you do use a UV filtering lens it is important that everyone in your production workflows (customers and printers) also use a UV filtering lens so they have the same viewing condition.
- You can use the UV filtering lenses and still be compliant with 3664:2009. The ISO 3664:2009 standard allows for use of a custom standard (such as 3664:2009 using UV lenses, as long as it is used in the entire production workflow. UV filtering lenses also degrade over time, so if using them realize they need to be replaced periodically.
Light Booths what can you do continued...

• Watch for updates. At some future point industry color scientists and those responsible for writing the ISO 3664:2009 standard will provide working best practices for color matching with the new viewing conditions.

ISO 3664 Compliance Testing

With the new, affordable spectrometer from GL Optic you can now afford to test your print viewing areas for ISO 3664 compliance. The GL SPECTIS 1.0 offers you the ability to measure the quality of your viewing booth not only for color temperature or brightness levels but also lets you measure the color rendering index (CRI) and metamerism indices for both the visible light spectrum and the UV spectrum. Don't waste anymore time guessing on whether or not your spectrophotometer is giving you accurate results. Upgrade to something that does today. Click here for more information on this affordable device.
Substrate Corrected Colorimetric Aims

Using Optically Brightened Papers

Traditional printing aims are no longer valid

Proofs no longer match prints
Substrate Corrected Colorimetric Aims

Substrate Relativity Calculator Kit 20120606

The Substrate Relativity Calculator allows advanced users the ability to recalculate industry standard or custom characterization data sets based on the CIELAB values of a given substrate. The procedure utilizes the tristimulus correction methodology defined in ISO 13655 Annex A for correcting measurements based on two backing materials. Once the data is modified relative to the new CIELAB values, the user is provided an idea on how the substrates color will affect the final printed result. The recalculated data can be used to generate profiles for more accurate proofing/converting, and the reported CMYK, RGB and Gray patches can be used for new process control aims when on press with the new substrate.

NEW 2013: There is an alternate calculator available from ANSI/CGATS that is available for free download at the NPES website on the right hand sidebar under Computational Tools:

Substrate Corrected Colorimetric Aims (RIT Video)

- http://youtu.be/-Y2kwwJTail
Relative Paper Scaling!

- ColorPath Sync has this method developed into the cloud color engine!
- Caution this is not a magic fix! If you move the aims of your output you move away from the actual GRACoL aim metrics!
- Caution needs to be used when performing this method!

New Relative Paper Scaling

Along with the new M1 measurement support, ColorPath Sync also allows for Relative Paper Scaling on today’s optically brightened substrates. Need an accurate G7 curve created for a press stock that’s even bluer than the GRACoL 2013 specification? ColorPath Sync Align can make the calculation.

Now you can be sure to use the most accurate measurement conditions for any given substrate and color target.
Substrate Correction Method a word of caution....

- But even this new paper scaling tool won’t magically match the press sheet with the proof.
- There is just no way that the specified super blue substrate is going to render color the way the neutral paper color of ISO would.
- To make it work, a new proof file should be created using this new dataset as well. It is not something desirable for every job but something that could be very important if one is printing on nonstandard substrates, custom colored paper or other situations where a precise match is expected.
- In practical terms, this could result in a printer having a traditional GRACoL C1 proof as well as one or two other proofs for nonstandard substrates such as blue/brightened or SBS. Keep in mind this challenge paper brings to our industry. Not everything will match a supplied proof, and more often than not, the problem could be the paper. Paper is the fifth color, and just ignoring it doesn’t help.
So let's go back to our Don's Boat Campaign

- By knowing the substrates you are using will greatly enhance your ability to be successful in a color match.
- By understanding the solutions and tools available to you will also enhance your success.
- By understanding the viewing conditions you work in and will be analyzing your campaign in will enhance your success.
- And by working with a knowledgeable Manufacturer and or Consultant you will make your Campaign as success.
Thank You!

White Paper on ColorPath Sync online at:

http://www.fujifilminkjet.com/colorpath-sync-white-paper/