When we think about color management and what needs to be controlled to get the best result from the technology, we normally consider things like proper press maintenance, process control aims and tolerances, RIP settings, color management software and the instruments used to take the measurements. Often forgotten — except perhaps as a small portion of the preparatory steps mentioned above — is the paper to be printed on.

**PAPER CHOICE**

The choice of paper is critical for many designers and is often a fundamental part of the design. From both a design and production perspective, it is important to remember that paper is the fifth color. While many people believe that traditional color management is about managing the CMYK inks and their separations, paper has as much of an influence on the color of the final printed piece as it does on the mechanical and chemical action of the inks or toners.

The initial choices made on paper selection might not take into consideration the impact later in the production chain, and sometimes those decisions can have unintended consequences. Choices are often made based on price, brightness, color, finish, recycled content or other attributes. But when a paper is not directly specified in the design, it often falls to the printer to specify a paper that fits in with the overall production goals to meet the customer’s general specifications, price considerations and production efficiencies.

A lot has changed in the world of paper. One of the biggest changes in recent years has been the increased use of optical brightening agents (OBAs) in many papers to give the appearance of a very bright white paper. Printers have been known to accuse paper companies of using cheaper goods and “cheating” by using optical brighteners. In reality, the rise in the use of brighteners can be attributed to a host of reasons, including production efficiency for maintaining a consistent look to a paper with changing content and a desire from customers for a brighter sheet at lower cost.

Another, more subtle problem can be the intended colorcast of the sheet. While in some ways we might consider OBAs an unintended colorcast, designers will sometimes purposefully choose a paper that has a colorcast. Then the question from a color management perspective is: Do we need to do something about color balance because of the paper color without even worrying about OBAs?

**COMMUNICATION**

Clearly communicating goals and requirements up front is fundamental. Designers, paper manufacturers, standards bodies and printers all have different languages and standards of measure. Therefore, it is important that expectations regarding what is being requested and supplied are properly defined from the outset. When a customer requires the printer to meet a certain printing specifica-
In the graph above, you can see the amount of brighteners in papers commonly used today. The “hump” in the spectral curve between 400 and 440nm shows the effect of the brightening agents. A paper like Summerset has essentially no brightening agent but is fairly flat and neutral white, whereas Newsprint and McCoy Gloss are the more extreme examples in this chart.

**Mc McCoy 1 from Fortune Gloss**

<table>
<thead>
<tr>
<th>Paper</th>
<th>L'</th>
<th>a'</th>
<th>b'</th>
<th>DE</th>
</tr>
</thead>
<tbody>
<tr>
<td>McCoy 1</td>
<td>94.04</td>
<td>-1.32</td>
<td>3.38</td>
<td></td>
</tr>
<tr>
<td>Fortune Gloss</td>
<td>93.12</td>
<td>0.83</td>
<td>-4.33</td>
<td></td>
</tr>
<tr>
<td>Change</td>
<td>-1.52</td>
<td>2.15</td>
<td>-7.71</td>
<td>8.1446</td>
</tr>
</tbody>
</table>

The graph above represents the correction of one data set to another on papers with different optical brightener content.

**VIEWING CONDITIONS AND PAPER**

Maintaining proper viewing conditions for print evaluations is a key part of color management. The standards for viewing booths have changed over the past couple of years with the most recent release of ISO 3664 Graphic technology and photography – Viewing conditions. It may be difficult to see in this magazine, but the photograph below shows two identical viewing booths. One is fitted with lamps that fit the latest standard, while the other is fitted with lamps from the previous standard. This, in combination with additional updated measurement standards, promises to tighten the agreement between measured results and what your eye actually can see.

**PAPER AND COLOR MANAGEMENT**

What additional tools can color management bring to the table to help tame the paper problem? Traditionally, the way to “solve” OBA problems was to ignore them, primarily by using a filter that cut the UV light to stop it from hitting the paper and
thus prevented the brightening effect of the OBAs. This is still a very effective approach to process control, but it is no longer the norm in color management. The other way we ignored it was by doing just that, not acknowledging the problem.

Today, we are much more likely to solve the OBA problem by quantifying the amount of OBA by including the UV in the measurement and then adjusting the ICC profile to compensate for its presence. Some recent color solutions provide Optical Brightener Correction (OBC) technology, which allows you to fine-tune the profile results by evaluating specific test charts against a series of Munsell color standards in the target viewing condition. This combination of physical standards and measured results allows for a uniquely precise correction for optical brighteners.

An additional parameter that can be handled in color management is the final viewing environment. Traditionally, a graphic arts workflow targets a daylight illuminant (usually noted as D50/2 – describing the illumination and viewing angle). One additional way to fine-tune the result is to define the viewing condition of the final destination or illumination at the intended point of use if it is not D50. This can be done by either using CIE defined illuminants or by actually measuring the lighting in the final environment.

Earlier we asked, Do we need to do something about intended colorcasts in paper? The answer is not fixed in stone. Modern color management solutions do allow you to bias your results to either a strictly neutral result with no consideration of paper color, or to neutrality based on the paper color. This can be very important, as the human eye will quickly key in on the “white” of the paper and judge other colors on the paper based on that shade.

**BEST PRACTICES**

Be aware of the many different ways that paper affects the final color of printed work. For proofing, carefully manage the amount of OBA content from proof sheet to printed sheet and stay tuned for updated print specifications from ISO. When measuring paper, understand the impact of filters on the measuring device. Take advantage of all the options now available in a modern color management solution to make paper, the fifth color, an asset to the final product.