

Profiles in Printing

By Herb Paynter

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Intro Ramble #1

Somewhere in the annals of fools there is a definition under the name Herb Paynter. If I weren't already well past the mark, I'd swear that my intentions here were telltale symptoms of mid-life crisis. Recently I've noticed a persistent, idealistic, Don Quixote-type of outlook on life. If not life in general, at least my own life in the publishing industry. I keep looking for answers where there are only questions. Don't charge the windmill, Herb.

Sometimes I feel that I have been involved in the graphic arts since the advent of movable type. I find that I like this industry because it has stood the test of time— for the most part without much noticeable change. While so many of the twentieth-century's crafts and industries have either faded quietly into obscurity or undergone radical reformations, there is a certain comfortable stability about the printing trade.

By nature I'm blue-collar. Occasionally now I sport a tie, but it is rarely with a white shirt. Even though I haven't run a printing press in years, every time I enter a pressroom all of my senses tell me that I am "home" again. The aromatic mixture of ink and fountain solutions is a sweet-smelling savor to my aging nostrils, and the rhythmic floor-shaking thunder of the big presses comforts me. There is something stable about big things. . . they don't change anything quickly.

But of late I've noticed a strange and powerful disturbance in the force. The printing industry is being pushed, pulled, and cajoled into adopting an upstart technology as its guiding light. This once craft-driven profession is being forced to deal with an electronic technology that is not only of recent birth, but whose origin is not even from "within the camp." The ever-lengthening arm of the ICC workflow philosophers and pundits is now at the gates of the printing industry. The new elite is now demanding the ear if not the acquiescence of the old guard.

If you are listening you can still hear the voice of the internal resistance. "If it ain't broke. . ." and "we've been producing eye-popping color since before you were born," are the nervous responses from inside the gates. "Who do you think you are talking to— rookies?"

Intro Ramble #2

I'm tired of being a silent observer of the changes in the printing industry. I worked for well over a quarter-century within the photographic, color separation, and printing trades, and I still count it a blessing that I have had significant hands-on experience in each of these disciplines. While I am acutely aware that the ICC color management system is significantly different from the color management system that I learned as an apprentice, the fact remains that color management is *not a new concept at all*. The trade that adopted and groomed me was hip-deep in color management on a much more "hands-on" level than the current definition affords.

It was this very *color management* process that lured me into the printing industry early in life. I learned how to produce (and protect the fidelity of) color images from conception through press delivery by meticulously employing certain physical controls and disciplines. By the time I was twenty-one, I had printed my first four-color project (on a A/M 1250, for those who know of such things) and I was seriously smitten by the process. I was in deep smit and I knew it.

The craft that was passed to me involved nearly all the human senses as control system sensors. And my senses were honed to a fine edge. I was taught to listen, to feel, and to smell quality control long before was introduced to electronic instruments that could measured it.

As a pressman, for example, there is a certain crisp snapping sound that reveals when the ink tack level is right on the press. There is an unmistakable aroma that fills the air when the fountain solution/ink balance is just right. There is a telltale rhythm known to pressmen by a hand on the press frame that tells him everything he needs to know about form roller settings and cylinder pressures. To this day, most good pressmen never need a loupe to see whether colors are in register. . . my (much younger) eyes were able to see dots that were a half-row out of register from two feet away. Printing has always been a trade, long before it was a technology.

Intro Ramble #3

There has been a very unsettling spirit within me for the last couple of years. My roots run quite deep in the printing industry (I remember clearly the advent of moveable type). I've been present for all the major changes in printing technology over the last 35 years—both of them! There's one thing certain about printing: it doesn't change often.

However, of late there seems to be a strange and powerful disturbance in the force. The status quo of the printing trade is being pushed, pulled, and cajoled into adopting a new technology as its guiding light. The once heavily craft-driven profession is being forced to deal with a technology that is not only of recent birth, but whose origin is not even from "within the camp." Dare I say that the forces of the alien ICC workflow have stormed the hallowed gates of the printing industry and are now demanding the ear if not the respect of the old guard.

Introduction

When an Atlanta-based printing company contacted me about calibrating their monitors I sensed that there could be something more in this opportunity than a simple monitor tune-up. I saw that this could be a unique opportunity to clarify for myself if, how, and to what extent (ICC) color management systems would/could/should impact the printing industry.

My first challenge was to see if the fine folks at Bennett Graphics were willing to allow the project definition to stretch a bit beyond the original monitor calibration issue. They were – and it did. The scope of the project soon led to not only bow-to-stern calibration and profiling *within* the printing company, I even managed to

extend this alignment procedure to a couple of Bennett's more sophisticated clients. It seemed reasonable to me that all parties involved in the creative and production food chain should be involved in the (profiling) process. The way I see it, if this is going to work *at all*, it is going to have to work *for all*.

What I hoped for at the inception of this project was the establishment of a system-wide, color-integrated alignment of machines that made up the backbone of the print-production process. What I didn't know was how much skeletal adjustment this would require.

I remember playing a game as a child in which a number of kids formed a circle with one of us originating a detailed story that was then whispered, one-person-at-a-time, around the circle. By the time the story was recounted by the last participant, it had invariably mutated (sometimes wildly) from its original form. It was always a laugh to hear how things got so mutilated along the way.

In much the same way, today's color reproduction game is quite the same. By the time an image transfers from one "player" to the next down the production line, it often changes so significantly that it is hard to believe that the original and the end result are related. Unfortunately, there is very little laughter involved in the print mutation process.

The Dawn of Digital Chiropractic

What color management claims to provide is an overall system that will (more or less) safeguard each image's color content as it makes its way down the digital production line. At each stage in the production line this system would "adjust" and "correct" the image so as to retain and display its essential integrity and accurately forecast what the final printed piece would look like.

Color Management Basics

Keeping it simple . . . color management means making a picture LOOK the same every time it is seen . . . on computer monitors, over the Internet, printed from color printers or fresh off the press.

Before the advent of desktop publishing, the process of color management was maintained by a small group of highly educated color scientists and very experienced color separators. Unfortunately, there are few of those "trade shops" that have survived the desktop publishing transition. Many of the craftsmen of the established engraving trade became casualties of the desktop revolution. Also unfortunate, their contribution to the trade was not passed to the new publishing system. While it is a fact that those who desire to produce accurate color files for print *must* possess a basic understanding of how color separations work, it is also a fact that few desktop publishers do.

Something has to provide the same level of color savvy intelligence that was once provided by color separators and photo engravers. These were the folks that provided printing industry with the magic. Separators and Engravers were the precision color and fidelity guardians of the trade.

This may be new news to some, but *most* of the country's printers rarely ever produced their own color separations.

In the "old days" (10 years ago) graphic designers produced paste-ups (or mechanicals, or art boards, or keylines- depending on what part of the country you lived) and sent the finished boards along with the original pictures to their printer. When the printer accepted the job, he always called *his* engraver to come pick up the color work. Color separation houses produced the seps and delivered film and proofs to the printer.

The engraver was privy to each printing company's preferred style of color reproduction and separated each picture accordingly. The engraver was told which paper would be printed, the press on which the job would run, and the screen ruling (lpi) that would be used. On the wall behind every drum scanner I ever worked with was a brief "profile" of each printing company's separation preferences. We adjusted our scanners accordingly and the magic happened for each project.

Do you see where I'm going with this? Now that desktop publishers routinely produce their own color separations, there is a wide, gaping hole in the fabric of the printing/publishing industry. What desktop publishing has removed from the printing process is the key guardian of color integrity. What we must now discover is a reasonable replacement for the experienced engraver.

ICC profiles, used properly and knowledgeably, can provide much the same service. Let's take a brief look at what profiles can and cannot do to fill this gap.

Profiles

A profile is simply an evaluation report. There are several kinds of profiles: input, monitor, and output. Each is a color performance evaluation of a unique machine's capability to capture/display/print a great array of color hues and intensities. A profile assesses the capabilities of a single machine so that color pictures sent to that machine, consider those capabilities, and portray color images as close to the original color as possible.

Input Profiles

Every time we get our eyes examined by an Optometrist, our eyes essentially get "profiled." The doctor checks certain visual functions, and then based on the results of those tests he prescribes the appropriate strength correctional lenses to compensate for any deficiencies he found in our eyes during his examination.

Scanners differ in their ability to "see" colors and tones. Some see quite well, some don't. One thing for sure. . . all scanners need "glasses" to one extent or another to correct for small errors in their visual perception. These electronic glasses are called "input" profiles.

Just as my prescription glasses will (most likely) not correct your vision, generic scanner profiles will (most likely) not correct your scanner's vision.

To carry the doctor metaphor a little further, we perform the vision exam on our scanners using specialized "profiling" software. The exam involves the scanner

equivalent of an eye chart called an IT8 target. By placing the chart on the scanner, and performing a routine scan (one without any special settings for color correction), we provide this software with the basic exam information. The profiling software then examines the chart and produces a profile (like human glasses) able to correct any visual misconceptions from that scanner

Typically, scanners are not able to see some colors quite as “true” as they should. By carefully measuring the difference between the known color values from the chart and the actual captured values from the scan of the chart, the profiling software is able to re-map those colors into what they should be.

Thus, just as glasses correct our vision from what we actually see, to what we should see, profiles correct the vision of scanners.

All input (scanner) profiles are placed in the System’s ColorSync folder (essentially, this is the “drawer” where we keep the scanner’s glasses).

The Case *for* Profiles

Clearly, there is a need for a method of insuring that a single image file can be portrayed on a number of different devices, with reasonable similarity. There are literally hundreds of varieties of devices that possess very significant *display* (in the broadest sense of the word) differences. Users need (and deserve) the assurance that files will retain their essential integrity when sent to another location or device.

There is nothing scarier than releasing a file to another user, service bureau, printer, or whoever. . . wondering if the file’s visual integrity will be compromised. The ultimate hope is that “what I see is what you’ll see” (wisiwys?).

ICC Profiles offer this and more. When all parties play by the same (ICC) rules, any file produced on my computer will look very similar (absolute perfect matching is probably never going to be possible) on your monitor. Further, if what I produce on my computer is going to be printed on your printer (or proofer), I can see in advance what the printed piece will look like by viewing the file on my monitor, “filtered through” the profile for your printer.

If all this sounds a bit confusing. . . that’s because it is! Only “geekie-tweekee” folks think the process is simple. But when color management is carefully orchestrated and accurately maintained, it really works.

The Case *against* Profiles

If you have ever gone to a tailor, or seamstress, to have a garment fitted to your measurements, then you know how good custom-fitted clothes can look. By the same token, you also know how bad that garment looks when you have gained or lost significant weight.

Precision profiles only work with precision when none of the characteristics of the profiled device change. Any variations from the conditions existing when the profile was generated (ink formulations, paper types, lamp/phosphor age, etc.) will produce varied results.

It's easy to hit a stationary target, but difficult to hit a moving one. In one sense, a profile is like a passport photo. It is only accurate if taken recently.

Generic profiles, are no more useful than the height/weight charts in a Doctor's office. Keep in mind that the "average man/woman" doesn't really exist, and an average profile will not address the particular behavior of any specific device. Close only counts in horseshoes. Color reproduction ain't horseshoes.

Output Profiles

While input profiles help scanners "see colors accurately," output profiles make sure colors printed to one printer look the same as the same colors printed to a different printer.

Sounds like something that ought to happen automatically, doesn't it?

Unfortunately, there are many different types of printers, and each prints color a little differently. While most printing devices print CMYK (Cyan, Magenta, Yellow, and Black) inks, some want to be fed RGB (Red, Green, and Blue) information. Some printers use powder toners, others use liquid inks, others transfer dyes from ribbons, and some actually use melted Crayons - and they all print colors differently. There are actually even *more* variables in this problem, but you get the general idea. . . what sounds simple, simply ain't simple! This is the basic reason why printing the same picture to different machines delivers different results. Sad but true.

If you've ever viewed a number of types of televisions all displaying the same channel in a department store and noticed that of all the various displays very few pictures look the same, you know the problem. Different manufacturers use unique electronic components, and each model produces its own look. Traditional televisions look different than rear projection televisions, small battery-operated LCD televisions look different than high-definition televisions. And so on.

Different televisions use different technologies, and therefore look. . . well, different.

The television department manager's job (lucky guy) is to make all these different televisions look as similar as possible. Let's call his job "Color Management." How does he accomplish his feat? First he shows a common test pattern on every screen. This test "target" contains the full rainbow of colors from red to orange to yellow to green to blue to purple, and a truckload of different shades of gray.

He then starts tuning the color adjustments on each television, one at a time, trying to display the test target as faithfully as possible on each. He works on each one until he is convinced that he has tuned-in the best possible color settings for that television. If all the televisions are optimally tuned to the test target, each television's picture display should look very similar to the others.

Although this is an extremely simplistic metaphor, the basic principle is accurate. If we are to produce the same color from different printing sources, we must "tune" the basic image uniquely for each device.

While we visually adjust a television to accurately portray colors, we tune a printing device by an electronic color adjustment tool. The color adjustment tool is known as a profile.

As described earlier, a profile is simply an evaluation report . . . a color performance evaluation of a unique machine. A profile assesses the capabilities of a single machine so that color pictures sent to that machine, consider those capabilities, and portray color images as accurately as possible.

In the case of output profiles, a test target (much more detailed version of the one used for the television) is printed from the printer. That printed test target is then carefully analyzed by very sensitive measurement devices called spectrophotometers to see how accurately the device produced the colors in the test.

From the measurements taken, color limitations are discovered (and recorded) about each device. Truth is . . . no machines print all colors perfectly. Special software then uses these limitations to create a characterization of that particular printer called a profile.

Each profile is like a rap sheet for a specific printer. A profile tells any color file sent to a printer exactly what the limitations of that printer are, and how to best compensate for its limitations, producing the most accurate, consistent results from that printer.

The Basics of the Project

I'm in a very tough position here. I have very good friends who are all very knowledgeable on this topic in their own areas of expertise, even though they maintain quite polarized views. There is one honest-to-litho workhorse (not unlike myself) who speaks and writes openly against a total ICC workflow mandate for the printing industry. I have other friends who may not hold a degree from Litho U., but certainly know the ICC technology inside and out, and they state rather adamantly that the printing industry will suffer severely if it does *not* embrace the full ICC workflow. The real tough part is that (in my eyes) both sides have very valid arguments. Nonetheless, I figure it's time that I dove into this issue and took a stand one way or the other. I've always considered myself as "being on the right track" concerning color reproduction, but frankly that is of little comfort. Even if you are on the right track, if you're not moving with the flow of traffic, you're going to get run over. I figure that I've been standing still way too long.

Once I sized-up the opportunity availed to me I called PEI's Editorial powers and told them that I thought this might be a meaningful story. I asked permission to pursue this story and try to write in a way that would help others in similar quests. As usual, I was given the green light and a good amount of rope (hopefully not with which to hang myself). I must confess that I came into this project with more than a slight amount of trepidation, though I am fueled with significant optimism and a sincere desire to see the system work. Perhaps my moniker should read "honest skeptic," since I would delight in having my reservations erased.

Assumptions and Definitions

I had held the belief for several years that *devices* (scanners, monitors, and proofing printers) *can* be accurately profiled since they exist within a state of relative predictability. On the other hand, I felt that printing presses could *not* be accurately profiled since they operate in the midst of a great number of variables and exist within a somewhat *unpredictable* environment.

Tom Whiteman, a long time comrade in the graphic arts reminded me that when a printing press is operating within its *zone*. This *zone* refers to those conditions in which the chemical balances, the paper feeder and delivery the ink tack, and pressroom humidity all exist in relative harmony. Within this “state” there *is* a relative stability (oxymoron?) that exists. All of the issues mentioned above certainly will vary slightly with the ebb and flow of the production run, though they will remain within a scope of behavior that we call a “mean” or normal value.

There is a tolerated deviation from this *mean* setup that will still fall within the “manageable” range. It is from within this range of consistent behavior that we can establish for each of our paper stocks within this program.

Before we start moving on the process itself, I will define the scope of the project. The basis of this project will revolve around the printing company’s normal workflow. While the general guidelines that we will establish for Bennett Graphics can certainly be adapted for any printing company I do not presume that my approach will be the answer or model for all. While any number of printing guidelines might be applicable for a general implementation of these issues, Bennett Graphics wanted to optimize their control systems and develop quality control mechanisms that would work within their particular day-to-day operation.

The issues at hand here revolve around 1) the inks purchased and traditionally used by Bennett Graphics, and 2) those “house” stocks that are warehoused for Bennett’s clients. There are four main stocks that we accommodated on which we based all press measurements. These paper stocks formed the backbone for all our assumptions. For each paper stock, there would ultimately be a press CMYK profile developed. Each of these profiles would require a “mean“ density of ink appropriate for that paper.

The Foundational Premise

The aim of this project was to develop a dependable way to forecast print results based on 1) a specific printing process, and 2) the paper stock on which a color sensitive project would likely be printed. It was imperative that we establish specific repeatable production specifications for the major paper stocks printed on a particular press.

A #2 enamel (coated) sheet not only differs from a #5 text (uncoated) sheet in ink absorption capabilities (the cause of dot gain and its inherent muddy midtones), but also in its fundamental appearance (brighter blue-white versus duller yellow-white). Ink on an enamel sheet sits more *on* the paper than it soaks *into* the

paper. Obviously there has to be a carefully designed specification that maps out a clear specification for each (major category of) paper.

Everything in life has its pecking order. There must always be a foundational basis for every assumption. Every equation must have at least one *non-variable* reference point. What we needed therefore was one *foot* that we could nail solidly to the floor and hence revolve and relate the other variable (and discretionary) issues around.

As I began this exercise the key *non-variable* emerged as the printing press ink density itself. Let me explain. Ink colors are measured and defined by the amount, the density, or (forgive me) “thickness” of the ink laid on the printed sheet. While the ink density *could* be a variable inasmuch as putting too much ink on the sheet could certainly change the *color* of the ink, I chose to first determine those ink densities that produced the cleanest images when printed on each paper stock.

It made sense therefore to subject all other issues in the process to the foundational issue of how much ink should run efficiently and effectively on each major paper type. In this case I asked Bennett Graphics to provide four paper types; two text weight sheets (one coated sheet and one uncoated sheet) and two cover-weight papers (once again, coated and uncoated). Obviously a commercial printer prints on a multitude of paper stocks in the course of a month, but the majority of those projects that fit the color-sensitive category are (in Bennett’s case) generally printed on one of the four types listed above.

Calibration versus profiling.

There is a significant difference between calibration and profiling. Each device is designed to operate optimally within certain parameters. These parameters are established in the industrial design and set at the factory. These “factory settings” represent the optimal operating parameters. When a device is calibrated, it is reset to the manufacturer’s original specifications. Profiling, on the other hand, is the identification of color spectrum reproduction capabilities when the device is within factory specs. Profiling is the mapping of a device’s color “gamut,” measuring the breadth of each device’s color reproduction capabilities.

To produce a meaningful device profile, the device must exist within a state of established performance specifications. This means that for any profile of a device to be accurate at all, the device itself must be calibrated (brought into factory specifications). So the operative assumption is that a device profile is only meaningful for that period of time that the device remains in a state of calibration.

Control systems.

Control systems are those measurement devices and procedures that preserve a device’s calibration. Control systems are safeguards that must be enforced to assure the viability of the device’s profile. In short, if a machine’s output isn’t consistently repeatable, any profile of that device will be meaningless. Expecting a profile to deliver accurate reproduction is as silly as trying to nail Jell-O to a tree!

The control systems that played a critical part in this project included the exposure and development times for films, proofs and plates. Each of these processes is only as believable as its regimented maintenance.

Equipment manuals and technical specifications were pored over to make certain that all calibration procedures and guidelines were strictly followed and documented. Everything from imagesetter linearization to the freshness of the film processor chemistry and film development times to the printing plate exposure times and development chemistry had to be clearly established and religiously maintained.

When it comes to control systems on the press, entire books have been written. Having been a pressman for so many years, it is still a disturbing mental exercise to bring these issues back into clear focus. It certainly has reminded me afresh why I chose to close out my career as a pressman. I'll mention just a few of the press-related items that must be kept tightly in check:

- 1) Ink roller condition (swelling and glazing)
- 2) Pressure settings between ink "form rollers" to plate
- 3) Plate and blanket packing (up to specs and undamaged)
- 4) Blanket condition (glazed or smashed)
- 5) Cylinder surface conditions (plate, blanket, impression)
- 6) Ink tack levels and emulsification degree
- 7) Fountain solution pH balance
- 8) Pressroom humidity
- 9) Offset powder build-up

...you get the picture. Trust me, there are many more issues to be controlled before a "profile" can even be considered.

The Players

Bennett Graphics, Tucker GA.

GATF Press Diagnostics Systems

Praxisoft Compass-Profile software

Gretag/Macbeth Spectrolino/SpectraScan Hardware
and ProfileMaker Pro 3.0 software

X-Rite DTP41 AutoScan Spectrophotometer, DTP92 Monitor Calibrators

ImageXpress ScanPrepPro (Photoshop automation software)

Howard Bankston, Avanti/Case Hoyt – Miami

Andrew Rodney the Digital Dog

Scitex America

If I am certain of anything in this life it is that I am smart enough to know I am not smart enough to cover all the bases by myself, and thus I always surround

myself with others that are smarter than myself in their respective fields. It's fun to work with some of the best in the industry and see them do their stuff.

When it became evident that this project was going to happen, I immediately called a couple folks that I respect tremendously (Tom Whiteman and Greg Bassinger) at the Graphic Arts Technical Foundation. Tom had been a long-term trench-veteran in the printing industry and an instructor at GATF in color control systems. I had consulted with Tom numerous times during his tenure at GATF concerning color separation issues. Greg is in charge of the organization's control systems division. Greg is also a very knowledgeable resource in the field of digital photography and camera systems.

I appealed to GATF asking them to provide their industry-standard press performance evaluation tests so that we could diagnose the myriad of press-related issues and in particular, determine the optimal ink density for each press and on each sheet. The optimal level of ink density is determined by a number of critical press test measurements supplied and diagnosed by GATF. Once an ideal ink density for each paper stock had been established, other patches on the test files were measured (using a densitometer, a colorimeter and a spectrophotometer) to determine other issues. These issues included maximum amount of ink that can be carried on the page, trapping characteristics, contrast, black ink compensation for neutral gray components within the colors, and dot gain calculations for each cylinder. GATF (both people and test images) played an indispensable role in this project.

I also called on Robert Eversol, Director of Business Development at Praxisoft LLC, Sterling, Virginia to send their excellent ICC profile and color management software to the party. They jumped right in providing their Compass-Profile software. Though the Praxisoft folks manufacture the full gamut (pun intended) of color management solutions, I decided to put them to work on the RGB profiling side of the project.

To fill the hardware side of the RGB profiling toolkit I appealed to Bill Owens, Marketing Manager at X-Rite Incorporated, Grandville Michigan for his assistance. Bill supplied several devices for the project including X-Rite DTP41 Spectrophotometer and two versions of the DTP92 Monitor Optimizer (USB and Serial) to accommodate both G3/G4 Macintosh computers and Windows-based machines as well as other Macintosh computers that use ADB (Apple Desktop Bus) connections.

Next I called Patrick Endaya, National Sales Manager at Gretag/Macbeth to ask his assistance in providing both the hardware and software side of the CMYK device profiling systems. Gretag/Macbeth supplied not only their excellent ProfileMaker Pro 3.05 software suite, but also their Spectrolino/SpectraScan Hardware. Both Brian Ashe and Cathy Hofknecht proved extremely helpful. Cathy, especially when I experienced some equipment difficulties, and Brian on all matters technical.

I called on my long-time friend and long-term mentor in the graphic arts, Howard Bankston who is largely responsible for my early addiction to well-produced lithography. Howard is the lead sleuth investigating emerging (publishing-related)

technologies for Avanti/Case-Hoyt in Miami, Florida. What Howard doesn't know about press behavior doesn't need to be known.

I received some very insightful counsel from Don Hutcheson (Hutcheson Consulting) concerning the profiling of high-end scanners. Don is another of the real-world, experience-rich craftsmen that were the real "go-to" folks to know when real litho experience needs to be tapped.

Last but not least I called on a couple of my digital friends who were able to clarify the ICC vantage point and keep it clearly in focus. In particular, Andrew Rodney who helped me sort through the hip-deep minutia of color management theory. With Andrew tethered within cell phone reach, I strove to find the common thread that was ultimately to tie my blue collar graphic arts background to the new ICC workflow philosophy. I think we both grew from the exercise. Jeff Schewe (Schewe Photography-Chicago) is a one-of-a-kind consummate brain trust in fields of digital photography, color science and Adobe Photoshop usage of color management. Finally, I leaned on my friend Bruce Fraser for his grasp of color gamut issues and how they impact real print-production results. His insights on RGB color working spaces were extremely helpful.

With this amazing array of hardware, software and expert advice, I had about all the help I could hope for. I wanted to give this project all the supporting cast necessary to see if we could really pull it off. If I couldn't pull this off with all this help, perhaps the (ICC) process wasn't really quite ready for primetime yet.

The Scope of the Project

What we were intending to do with this project was to create a certain ultimately functional symbiotic relationship between the varied and various devices (and ultimately people) in the print-production process. I like to speak in metaphors because basically I am a person who understands new issues more readily when they relate to concepts that are already in place in my life.

In this case, since I have a music background, I relate this project to the process of tuning the various instruments in an orchestra. Just prior to the beginning of each performance there is a time that is reserved for the tuning of individual instruments in the orchestra so that they will play "in concert" with each other. The term "orchestration" literally means "harmonious organization." This is the ultimate purpose here. . . . to enable the individual players in this process to align themselves harmoniously. In other words, each device should participate in the program in such a way that *its* contribution harmoniously complements the offering of all the other participants.

As far as the various design and prepress devices go, some differ slightly and others differ significantly from each other in both sophistication and design. The obvious first task was to list the devices that were to be included in the program. The basic list included devices that could be profiled and some that couldn't. Those that couldn't be profiled had to at least be put into a seriously controlled and repeatable-behavioral condition. The outline of our chores went like this. . .

Profile-capable devices

Client

Computer Monitors
Scanners
Printers

Printing Company

Computer Monitors
Scanners
Proofing devices
Printing Presses
Control-system devices- all printing company
Imagesetter
Film processor
Contact frame
MatchPrint processor
Plate processor

The Order of Events- where in the world do we start?

Every journey begins with the first step, and such it was even with a project of such grand proportion as this. The real question to be decided here was where that first step was to be taken en route to establishing the full-press color management workflow.

One thing that became clear as I plowed through the mountains of materials on device profiling was the fact that for any *effective* profiling to do its job, each device to be profiled had to be first brought into its original factory-specified operating condition. You can't hit a moving target unless you're shooting Skeet, and color management ain't Skeet. Before one can accurately describe the behavior of *any* beast, one must observe it in its native environment. As far equipment is concerned, this is known as calibration.

First, since we would be both calibrating and profiling all pertinent equipment, I had to draw a clean distinction between calibration and profiling. *Calibration* is the process of bringing equipment into its intended operation condition while *profiling* is the measure of inherent color reproduction limitations of that device *while it is in its state of calibration*. This is what we call a symbiotic relationship— the living together in *intimate* association of two otherwise dissimilar entities for the purpose of mutual benefit. Calibration does not require that a device is profiled, but profiling (to be effective) absolutely requires that a device be set to, and maintained in, a calibrated state.

The obvious first line item on my “duty roster” then was to understand what each device was operationally conceived to do and then to find the proper way to

configure it to its original manufactured state, and then to maintain it within that state. I won't go into detail about what it took to make this calibration step happen for each device; but suffice to say that most manufacturers provided either the information or the service necessary to make this adjustment a reality.

Calibration and Profiling

Since the profiling and calibration processes were to happen on an individual basis, I was free to profile input devices, monitors, and output devices (including the printing presses themselves) in random order. This was a benefit to Bennett Graphics' production schedule since I was able to work with each piece of equipment, as it became available instead of interrupting the company's production schedule. Obviously, all equipment eventually had to be able to accept and deliver projects from one stage to another accurately in a production workflow, but that structured order wasn't necessary at this stage in the process.

The devices that I decide to calibrate first were the computer monitors. In Bennett's case there were only three monitors that "had" to be calibrated, and all three were in the production workflow. I ended up calibrating monitor was using the X-RiteColor DTP92 device. The DTP92 was used in conjunction with X-Rite's Monitor Calibrator software, ColorShop 2.6. X-Rite thoughtfully supplied both ADB and USB devices, which came in quite handy since the various monitors were hooked-up to a Power PC CPU (ADB connection), as well as both a G3 and G4 Macintoshes (USB connection).

Each of the three production monitors at Bennett Graphics were calibrated using the 6500°K (D65) white point and the 1.8 Macintosh target gamma. The actual measured monitor gamma varied depending on the readings of the three monitor outputs.

Proofing Devices- Traditional and Non-Traditional

In the traditional litho sense, proofing devices refer to 3M MatchPrints, or DuPont "Water Proofs," or the like. These are known as "contract" proofs. The term contract derived its meaning from the assumption that such a proof accurately predicted what the printing press would print. This was possible since the same film that will be used to produce printing plates was first used to produce the proof.

In today's publishing/printing industry less expensive devices than the MatchPrint are regularly being used to produce job "proofs." In the case of Bennett Graphics (as it is with a great number of other printing companies) the employment of a sophisticated Iris inkjet printer has stolen the spotlight from the more costly MatchPrint proofer. While this may be a more economical move from a purely equipment/supplies vantage point, the fact that the film that would produce the plates was not used to produce the Iris proof. The Iris is basically a large-scale and very sophisticated inkjet printer.

However, there is a more significant difference between the two proofing systems than the price tag alone can show. The fact is that there is that there is very little “official” tie between the results viewed from the Iris and those that are produced to film. While the Iris proofer receives the *same file that is sent to the imagesetter, there the similarity ends. Bennett’s Scitex Brisque RIP processes image data for both the Iris and the Scitex Dolev imagesetter. But therein the similarity ends. The Brisque RIP produces halftone dots on film separated (Cyan, Magenta, Yellow, and Black) for printing plate production, generating a separate piece of (plate) film for each color to be printed. The Iris sprays microscopic (Cyan, Magenta, Yellow, and Black) colored ink drops on a single piece of paper.

The term “contract” doesn’t have much relevance in this situation unless the Iris proofing device can be taught to display the same color information that the combination of film, plates, and ink-on-paper delivers.

Since more and more printing companies seem to be migrating steadily from the tried-and-true lithographic proofing systems of the past, it seems imperative that we (the industry) embrace a reliable system that will guarantee an accurate forecast of what the press will print. All of this simply solidifies the case for ICC profiling.

The obvious intent of this entire project was to establish a believable visual forecast of the final printed piece as early in the production process as possible. The condition that existed at Bennett Graphics when I entered the scene is actually a rather common one. . . the image on the monitor didn’t match the Iris proof, which didn’t match the final printed piece. Here was a professional printing company that had invested in all the latest whiz-bang technology and yet they couldn’t tell what a given job would look like until it was coming out the delivery end of the press.

Probably the most shocking fact about this situation is that it is not uncommon at all. As a matter of fact, I would venture that *most* printing companies are in exactly the same revolting predicament!

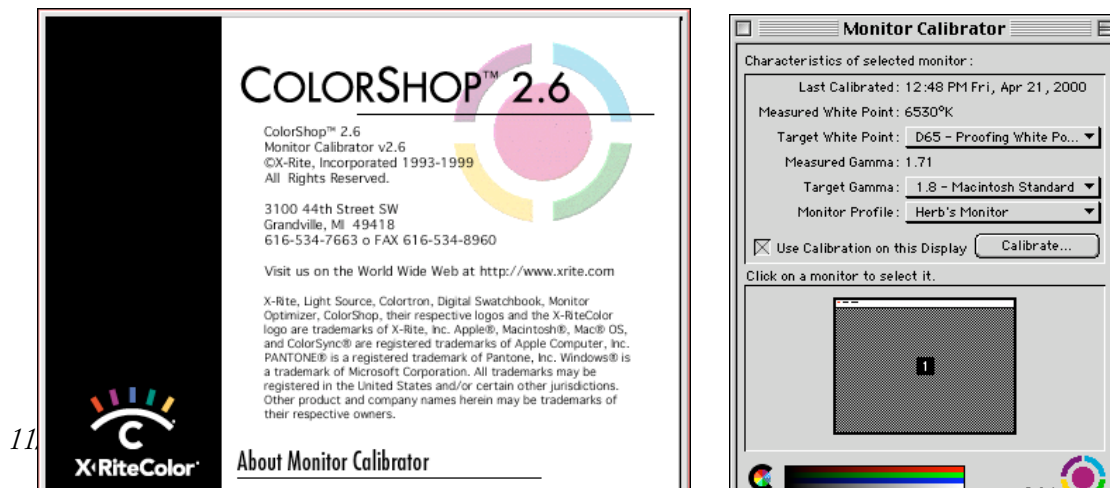
Does that surprise you? I would hope so.

Is there a functional, dependable solution to this problem? You bet!

The Devices

Monitors

I chose not to go with the full profiling of the monitors since they don’t



directly influence image values, they more monitor the image appearance. I say this with tongue-in-cheek since much of the decision-making about color is ultimately performed by eye, and trusting the image on the computer monitor. This is certainly not to intimate that monitors are a less important part of the equipment mix, far from the truth!

Monitors can imitate other devices by performing what we refer to as a “soft proof.” A monitor soft proof provides a preview of what other devices will deliver in “hard copy.” I think of monitors more as the Chameleons of the print production process. Monitors can show each image in all of its incarnations; from the raw scanner RGB file, to the scanner profiled version, to the robust RGB working space, to any number of preliminary printers as well as the contract proofers and even the final press sheets.

Proofers

Since we only *calibrated* the monitors, the first device that we actually *profiled* was Bennett’s Iris “contract” proof printer. Frankly, we had a difficult time profiling this printer, simply because of the apparent inaccessibility that the user/owner of Iris equipment has to the calibration tools needed to put the device into factory specification. As I mentioned earlier, without an accurate calibration of the Iris, generating an accurate profile would be impossible, and thus the Iris would be of little value as a “press-forecasting device” if we could not calibrate it. In my attempts to profile the Iris, there were serious inconsistencies concerning the linearity of the unit. I called Scitex America’s sales and marketing firm, and spoke with their local tech support specialist who, in turn, had their color specialist, Vicky Bogart return my call.

I knew within the first five minutes of her call that she and I were broadcasting on the same frequency, and I figured we were within reach of workable solution. Vicky possessed a solid graphic arts background as well as a good grasp of color management *and* she knew exactly where I wanted to take this project. We spoke for a short period and I told her about some of the inconsistencies that I was experiencing in the process of profiling the Iris printer. My greatest fear was that without the calibration of the Iris and its subsequential profiling, we would not be able to complete the clean sweep of the project.

The Scanner

The next device to be profiled was the Scitex SmartScanner. Our initial quest was to develop an unadulterated RGB scan. This proved a little more of a challenge than I anticipated. There are some “production-grade” scanners that are simply predestined to deliver an CMYK conversion immediately following the initial scan. This auto-conversion is an attempt to save time, and is a legacy workflow concept from the high-end drum scanners of ten years ago.

Back then, separators knew what press type and paper they were scanning for, and therefore an immediate conversion made sense. Today, however, that’s not always the case. This is a bad idea when an ICC profile workflow is being

implemented, because such a move predisposes the image to a single, specific conversion algorithm that may not be the ideal conversion for the printing or proofing process in the production chain.

Forcing some of these devices to record only basic RGB data is more difficult than it should be. Were it not for a tech note (*Scanning for Color Management* by Don Hutcheson/Hutcheson Consulting) forwarded to me by Andrew Rodney, I would have had an even more difficult time figuring out how to override the default CMYK conversion that the 342 was predisposed to generate.

I spoke to Don Hutcheson directly about the various ways to set up the Scitex for production workflows. He offered additional suggestions such as setting scan highlights and shadows. He suggested that when scans are produced for “pleasing color” rather than “exact match,” adjusting highlights and shadows *after* the scan and profile conversion would be quite appropriate.

Taking Don’s advice, I used the following workflow. First the scan was made with settings that produced nominal highlights and shadows (RGB values of 15-18 for shadow and 235-240 for highlight on an Agfa IT-8 target), a slight gradation curve favoring shadow detail, and no sharpening was incorporated from scanner. From this base scan, a scanner profile was generated using Praxisoft CompassProfile software.

Since input profiles are rather dumb, they have no way of knowing the actual white and black points of a subsequent scan. It is therefore recommended that further adjustment for establishing these points in Adobe Photoshop.

The recommended scanner workflow starts like this.

- 1) Scan the image at the base RGB values mentioned above.
- 2) Open the file in Adobe Photoshop (set up with a healthy RGB working space).
- 3) Open Photoshop’s Profile-to-Profile dialog and convert the file from the scanner profile to your RGB working space.
- 4) Open the Levels Window and (using the Info densitometer) set the highlight and shadow points to their optimal levels.
- 5) Perform any other image adjustments either locally or globally.
- 6) Re-sample and re-size the image to the final output size.
- 7) Sharpen the image appropriately.
- 8) Open Photoshop’s Profile-to-Profile dialog and convert the file from the RGB working space to the appropriate CMYK (proofing/press) configuration profile.

Another production option here is to follow steps 1-3 in Photoshop and then open ScanPrepPro software, set the output results desired and let the software handle all the litho calculations and conversions automatically.

Running both of these methods produced pretty much the same results. Both proofs were quite remarkable. The only difference between the two was the amount of time and calculation required to produce the file manually instead of automatically.

Profiling a Press?

Next came the ultimate challenge. In some ways profiling a printing press is akin to spray painting a car while it is traveling down the street. There are indeed a great number of variables involved in the printing process making the profiling of a press a particularly volatile endeavor. These issues have already been mentioned, so there is very little point in repeating them here.

The Bennett/Scitex connection

Considering the fact that much of Bennett's equipment (SmartScan 342 scanner, Iris proofer, Brisque RIP, and Dolev imagesetter) bears the Scitex name plate, I placed a call to the