

# Color Management Realization of Prepress System Based on the ICC- standard

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## Abstract

*Basing on the application of Color Management, the basic principle of Color Management is introduced; the processes of creating ICC- Profiles of the input, display and output devices are illustrated in detail. The ICC- Profiles of scanners, displays and printer of prepress system are created using ColorOpen of the Heidelberg, the results of GATF-standard images' color reproduction are compared, analyzed and evaluated.*

## 1. Forward

Color management technology is always one of our key research projects. Most of imported prepress systems contain color management software as matters stand<sup>[1][2][3]</sup>, nevertheless it was researched by certain standards, printing process conditions and printing materials of these systems' equipments and software, whose basic data were not suitable for our countries' printing situation. It's very difficult for us to realize real color reproduction at present situations. We need to do much basic and applied research works in order to fully make prepress system yield well, to raise productivity and to improve printing speed and quality<sup>[4]</sup>.

Based on the prepress system color management patterns, in the light of various input, display and output devices, goal of this research is to establish ICC profiles and to analyze characteristics of printing materials (paper, ink), thus to achieve transferring and conversion color accurately among various devices, to have the ability of effective color management, to bring about "what you see (set) is what you get" in the end. In the other words, we can get same color results of digital proofing and printing from different devices and different materials, which we can improve dramatically color quality and color stability of printing products.

## 2. The basic principle of color management based on ICC-standard

Color management project accounting for prepress system is built to improve digital producing and quality management controlling based on the ICC-standard color management according to existing material and technology combining with prepress system devices.

In order to manage color accounting for various output devices of prepress system having its own color reappearing space and color characteristics, we should, firstly, select CIE 1976 L\*a\*b\* as reference color space PCS( Profile Connect Space) and convert device-dependent color space to device-independent CIE 1976 L\*a\*b\* color space as device color converting standard and basis. Through various color management software describing

various input and output devices' color characteristics, corresponding ICC-Profile files were built. During carrying out color management, color management software convert data files to reference color space PCS accounting for ICC-Profile of input devices, and covert color information of data files to color space of output devices( monitor, printer) accounting for ICC-Profile of output devices, which keep same color characteristics throughout workflow and achieve effective color management. Basic principle is illustrated as figure 2-1.

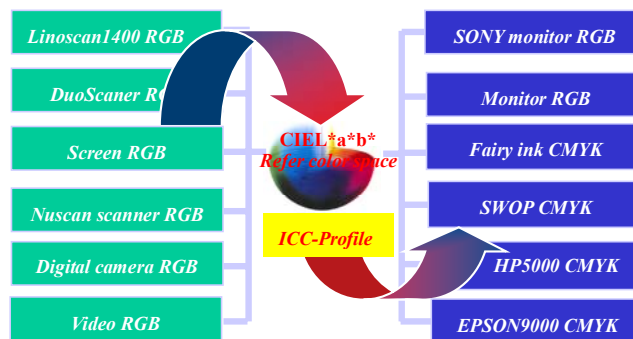


Figure 2-1 Basic principle figure of color management based ICC-standard

## 3. Realization of prepress system Color Management based on ICC-standard

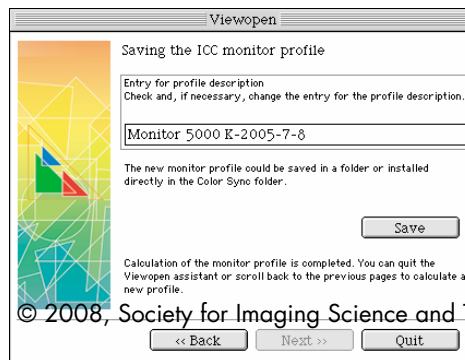
Input and output devices of prepress system, such as scanner, printer and monitor, have different chromic characteristics; moreover, chromic characteristics of .each device can change as time goes on. We can respond correspondingly to these changes with correcting devices and correct deviation that we can't allow, so wanted and same results can be got.

Detailed description of basic procedure getting ICC-Profile files with color management software Heidelberg Coloropen, which is composed with Viewopen, Scanopen and Printopen, is given below

图表 1

### 3.1 Establish ICC-Profiles Of Input Devices

Firstly, scanner calibrates to standard condition. Standard



sheets (such as Kodak IT-8/1, IT-8.7/2) are scanned into computer using software, such as Heidelberg ScanOpen software, which can produce Profile files by scanning. By way of comparing chromic values obtaining by scanner with existing objective data and analyzing the result, we can get related parameters and then generate ICC-Profile files with them, which can be seen in figure3-1. Chromic data of ICC-Profile files of Linoscan1400 scanner is shown in figure3-2.

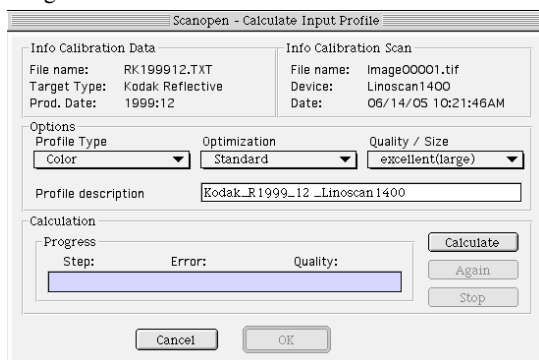


Figure 3-1 Establish Linoscan1400 scanner ICC-Profile

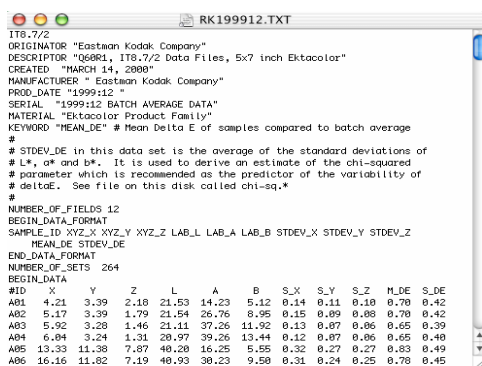


Figure 3-2 Chromic data of Linoscan1400 scanner ICC-Profile

### 3.2 Establish ICC-Profile Files Of Monitors

Appearance ability would be different dramatically among different monitors, and so it's important for us to calibrate monitor. Before calibrating monitor, we should adjust monitor to normal working status and keep it for more than half an hour (not using screensaver).

We should generate an ICC-Profile file for a monitor in order to precisely display color on it, which we need a device measuring color of monitor and software generating screen Profile files, such as Heidelberg ViewOpen software. It can get ICC-Profile files through results of comparing actually obtaining data, got by screen testing device measuring a sample sheet directly shown on screen, with existing objective value. Figure3-3 illustrates the result. For screen changing frequently, we should calibrate monitor regularly in accordance with present conditions, that is, we should generate ICC-Profile files regularly in order to get with screen.

Figure 3-3 Establish ICC Profile of Monitor

### 3.3 Establish ICC-Profile files Of Output Devices

We can obtain output and printer Profile files by output Profile files generating software, such as Heidelberg PrintOpen software. With this software, we can generate a testing sheet file and relevant reference document. This testing sheet have three different types: standard testing sheet( CMYK four colors 210 color patches, RGB three colors 135 color patches) suitable for normal printing( offset printing, newspaper printing) or laser printer and ink printer, extended testing sheet (four testing pages, altogether having 840 color patches) and ISO 12642/ANSI IT8.7/3 testing sheet (altogether having 928 color patches). We can select any testing sheet and output it to output device which is already linear, output printing result and measure with spectral photometer.

It can be created automatically with PostScript file or TIFF file of testing sheet for an empty refer document, which includes information of printing types and color measuring values generating later. We can get output ICC-Profile files by comparing measuring values with objective values. File of ICC-Profile of EPSON9000 printer is shown in figure3-4. Figure3-5 shows chromic data of EPSON9000 printer ICC-Profile file.

In order to keep truth of Profile files, parameters of printing must have same steady with printing production output procession during measuring. Papers, inks, printing production density, and plate materials must be uniform, so that control and quality management of printing processing can be reached.

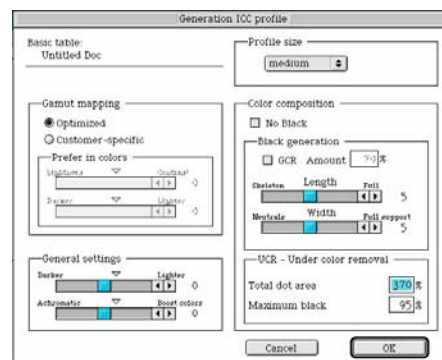


Figure 3-4 Establish EPSON 9000 printer ICC-Profile

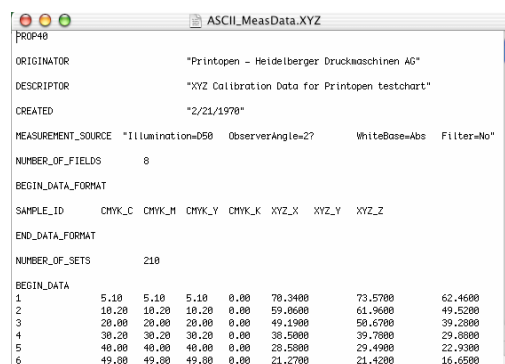


Figure 3-5 EPSON 9000 ICC-Profile chromic data

In addition to establishing different I/O devices' ICC-Profile files in a completed color management system, Reading and writing Profile files and converting program among color data, that is color management model (CMM), are also needed. Color management system fulfills color converting, displaying and managing ICC-Profile files through CMM. While putting color

management in effect, we can directly applying various I/O devices' ICC-Profile files in order to achieve color management of scanning, displaying and printing.

#### 4. Experimental results and conclusions

Figure 4-1 and figure 4-2 respectively shows display result of GATF standard sheet on Apply monitor through scanning correspondingly without and with color management using Linoscan1400 scanner. We can draw a conclusion from figures that there is a world difference of color effect of standard picture between without and with color management. Figure4-3 shows digital proofing effect of GATF standard sheet with EPSON9000 printer applying color management.



**Figure 4-1** Display effect pictures of GATF standard sheet through scanning without color management



**Figure 4-2** Display effect pictures of GATF standard sheet through scanning with color management



**Figure 4-3** Printing effect pictures of GATF standard sheet through EPSON9000 printer

By way of ocular estimate comparing among normal scanning, displaying and output standard sheet and measuring and analyzing standard testing sheet, we can show that an effective method is provided for color reappearance of color graphic printing by color management technology based on ICC-standard. Applying color management technology under steady printing conditions, we can achieve truly reproducing various color graphic colors.

#### References:

- [1] ScanOpen ICC User's Guide Heidelberg.
- [2] ViewOpen ICC User's Guide Heidelberg.
- [3] PrintOpen ICC User's Guide Heidelberg.
- [4] Sun Qun, Li Shaomei and Liu Haiyan. Complete collection of prepress system. June 2001.

#### Author Biography

Wei Bin received his BS in map printing from Zhengzhou Institute of Surveying and Mapping (1987) and his MS in printing technology from Zhengzhou Institute of Surveying and Mapping (1996). He has worked in the Institute of Surveying and Mapping since 1987. His work has focused on digital map publishing, printing digital workflow and printing color management in the graphic arts education, and he is an associate professor in this area.