The process of the 3D-Optimization

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Table of content

1 Used system configuration

This article relates to the following system configuration:

Software Version:

EFI Colorproof XF v3.0

Miscellanious:

2 Topics

This article gives a detailed description about how the 3D-Optimization tool works. The 3D-Optimization tool is part of the EFI LinTool which is always part of the EFI Colorproof XF Server. The following topics will be covered:

- The standard color workflow in EFI Colorproof XF.
- The iterative process of creating a L*a*b* correction profile.

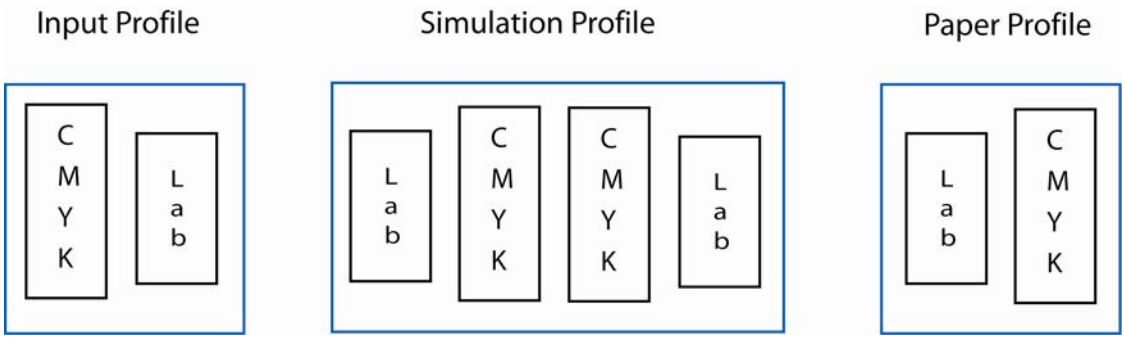
2.1 The standard color process in EFI Colorproof XF

2.1.1 General explanation

EFI Colorproof XF uses up to three ICC profiles for the color conversion from the incoming color space into the printer color space. The ICC profile which describes the incoming data is called input profile. Incoming data can be every supported file format like PostScript, PDF, TIFF, JPEG, EPS etc. These file formats may be in CMYK, RGB or greyscale. Even files with up to seven color are supported. The input profile gives the incoming color data a meaning so that they can be converted into L*a*b*.

The printer color space is described by the paper profile. The paper profile is an output profile which characterizes the CMYK color space of a CMYK inkjet printer. It is called paper profile because the behaviour of the inkjet, laser or LED printer will change with every paper. The paper profile is the end of the color conversion workflow and always converts into the final CMYK.

If necessary a so called simulation profile can be selected between these two ICC profiles. The simulation profile characterizes in most of the cases another print procedure for example an offset press. It is used as a kind of filter which reduces the amount of applicable color data to the reproducible color data of the press (or whatever profile is selected). The reduced color information will then be printed on the inkjet, laser or LED printer. But it is also possible to select a standardized RGB profile as the simulation profile. The simulation profile takes the L*a*b* values from the input profiles, converts them to CMYK (offset) or RGB and converts them back in order that the paper profile can convert into the CMYK from the printer. The following image will explain it more in detail.



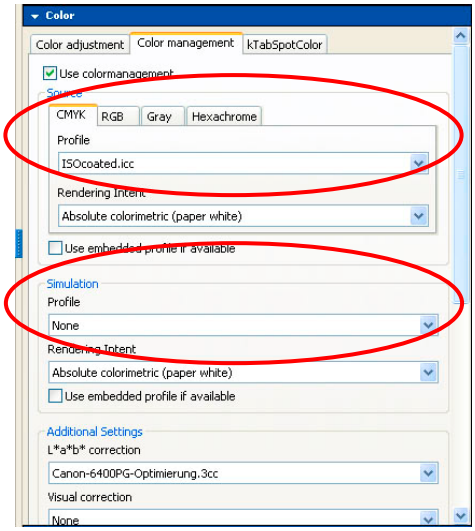
2.1.2 Appliance within Colorproof XF

The settings for the ICC profiles are in two different locations within EFI Colorproof XF:

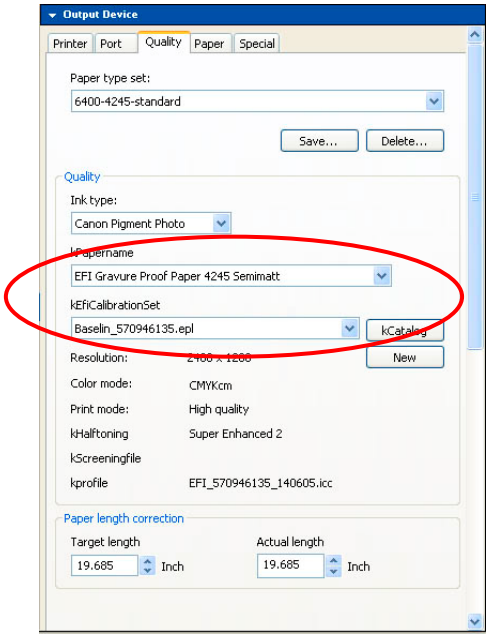
- System Manager\Workflow\Color\Color Management
- System Manager\Output Device\Quality

The reason for the two locations is the separation between device specific information (paper profile) and job specific information (within the workflow). This separation gives the user the possibility to switch a workflow between two workflow devices.

The input profiles and the simulation profiles can be found in the following window:



The paper profile can be found in the output device and gets selected by choosing a paper name.



2.2 The iterative optimization process

2.2.1 General explanation

The 3D-Optimizer uses the standard color workflow in order to print a test chart (IT8 or ECI 2002). This test chart will be printed by using all selected profiles. For example if there is a simulation profile selected in the color settings the target will be color managed to this simulation profile.

The next step is to measure all color patches from the printed target. The measurement device will measure L*a*b* values. The measured L*a*b values will be compared with the L*a*b* values from within the used simulation profile. The 3D-Optimizer is also able to compare with the original measurements from where the simulation profile was created. An example for this would be the FOGRA27L.it8 text file which contains the original measurement values for the ISOCoated ICC profile. This will even lead to better results. The reason is that the measurement file contains only the 928 or 1485 values from the target. If the 3D-Optimizer needs to extract the L*a*b* values out of the simulation profile, it needs to interpolate out of 33000 possible values. This will result into worse L*a*b* values.

But the selected simulation profile is still important for the process. This ICC profile gives the 3D-Optimizer information about the grid points with the necessary L*a*b* values. An ICC profile can be compared with a 3 dimensional grid with lots of vertices. Every corner contains a set of L*a*b* values. During the optimization process, the algorithm goes from corner to corner, and compares the set of L*a*b* values.

In most of the cases there will be a deviation between the values. The differences between the L*a*b* values will be written into a so called L*a*b* correction profile.

Example:

Target values: 50, 10, -12

Current values: 48, 12, -10

Correction profile: 52, 8, -14

This L*a*b* correction profile will be placed between the simulation profile and the paper profile because these are the two L*a*b* values which were compared before. Again, a target needs to get printed but this time with the created L*a*b* correction profile. Due to the correction of the L*a*b* correction profile the print out should be way better than before. The values will get compared again and if necessary another L*a*b* correction profile gets created. This procedure can be done a couple times until no further improvements are possible.

2.3 Advantages of the L*a*b* correction profile

The L*a*b* correction suits two different workflow:

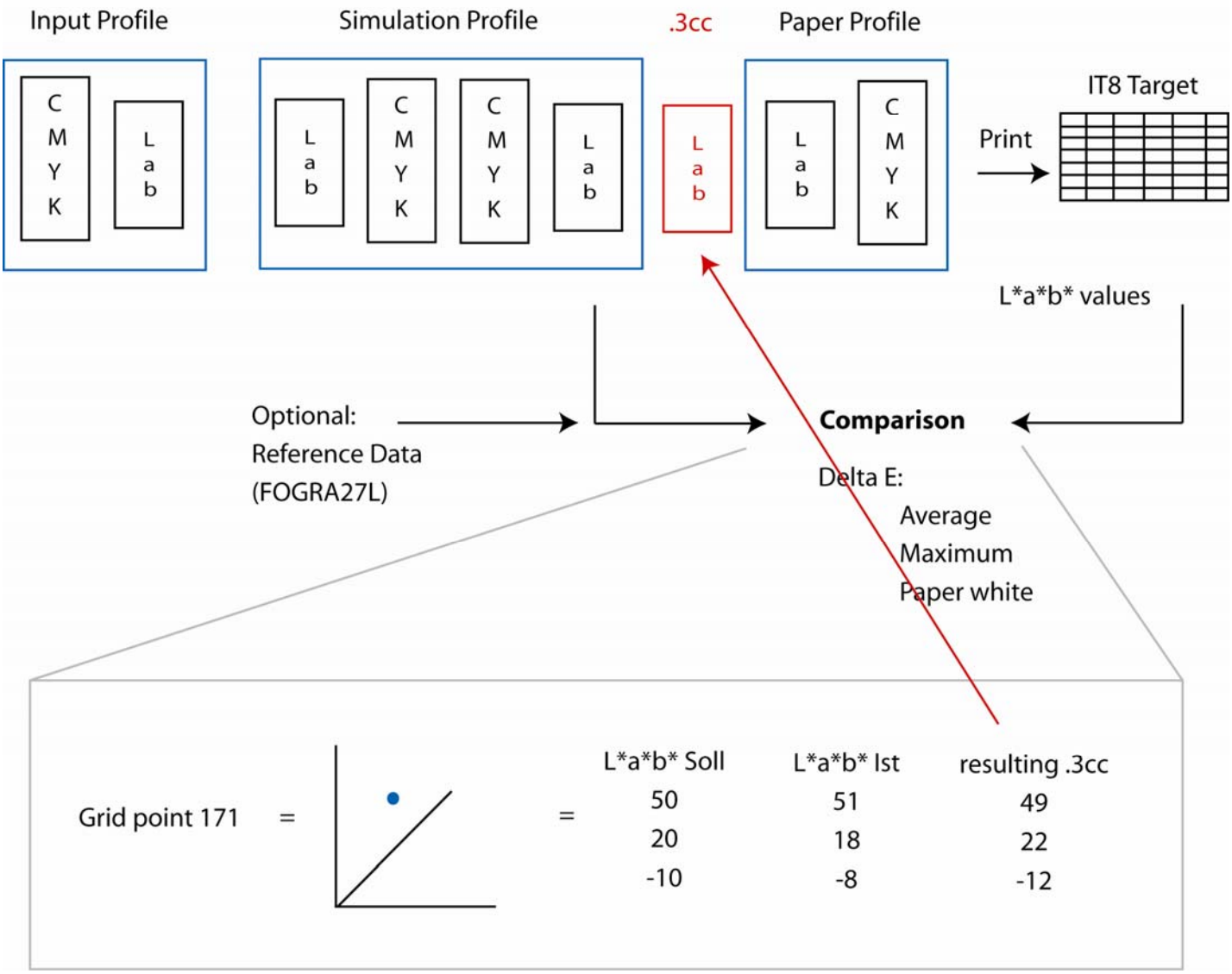
- Adjust a printer output as close as possible to a specific reference.
- Setup a workflow with multiple printer but the same paper profile and even the differences of the printer using the L*a*b* correction profile.

The best example for the first workflow would be a standard proofing setup which needs to simulate the ISOCoated ICC profile. The L*a*b* correction profile (3cc) can use the FOGRA27L measurement data in order to adjust the printer output as close as possible to the ISOCoated ICC profile.

The second workflow can be found in a multi printer environment. If a customer uses three times the same printer and the same paper it can be still difficult to get the same result out of all three printers. In order to compensate this problem the 3D-Optimizer can be used to create an L*a*b* correction profile for every paper printer combination. Every individual L*a*b* correction profile will align the behaviour of every printer and adjust the output behaviour to the simulation profile. It would be even possible to use the paper profile of one of the printer as a simulation and optimize the output of the other printer.

The advantage of using an independent L*a*b* correction profile is, that the paper profile will not change and can be used with different workflow in order to simulate different things e.g. gravure presses or even RGB workflows.

3D-Optimization Process



3 Executive Summary

3.1 Article summary

The iterative 3D-Optimization process is divided into the following steps:

- Set up standard workflow with simulation profile.
- Print test chart using this workflow. The test chart will get printed using the simulation profile.
- Measure printed test chart.
- Compare the measurements with the L*a*b* values out of the simulation profile (or original measurement values).
- 3D-Optimizer creates a correction profile which will align the differences between the compared L*a*b* values. These corrections will be saved as a .3cc file (L*a*b* correction profile).
- This procedure can be done until no further corrections/improvements are possible.
- The resulting L*a*b* correction profile needs to get loaded in the Color Management menu in EFI Colorproof XF.

3.2 Area of application

The L*a*b* correction suits two different workflow:

- Adjust a printer output as close as possible to a specific reference.
- Setup a workflow with multiple printer but the samer paper profile and even the differences of the printer using the L*a*b* correction profile.