Q&A on profile optimization with X-Rite's I1Profiler

- **Profile optimization - What is it?** It re-fines the color accuracy of initially created profiles (from i1Profiler only) by adding more colors, when calculating the LAB<->Device Color connections (Look-Up Tables*) in output profiles. Global colors (test charts) or even specific spot colors (e.g. PANTONE colors or colors extracted from an image) can be defined, printed and then measured. These additional measurements will be considered when the profile is re-calculated.

  *Note: the Look-Up-Tables will not contain a higher number of grid points, however the determination (distribution) of the grid points is optimized.

- **Profile optimization –Why**? Main aim is to optimize the global color accuracy of profiles or even of specific, critical colors. It is the nature of an ICC profile, that it contains a limited number of grid points in the Look-Up-Tables, which describe the color space. When now converting colors that are not 'listed' explicitly in a profile, they will be interpolated. This can lead to small deviations, or vice versa explained, there is space to optimize the color accuracy (minimize deltaE) for some colors. If for example important company brand colors are intended to be reproduced most exactly in a digital printer's color space, it is a good application to create an initial profile for the digital printer and then perform an optimization to this specific brand color(s). How much effective the optimization results will be, is depending on a couple of relationships between the printer's color gamut size (depending on paper, inks, printing technology) and the properties of the colors to be optimized.

- **For what scenarios and applications is a profile optimization intended?** When the initially created profile was built with a test chart based on a smaller count of color patches (e.g. 400... related even on printer's color space capabilities) and if it turns out, that the profile delivers some limited color accuracy, a profile optimization might help. However there is even a risk to destroy a profile, when applying an optimization procedure (see notes in paragraph 'best-practice procedure). The alternative is to create already the initial profile with a larger number of patches (1500 -2000 patches is a good choice). This consumes more measurement time, but might deliver very good quality already in the initial shot.

  An even better scenario is optimizing a profile for specific spot colors like PANTONE colors. Those colors cannot be included, when generating the initial profile, because the Test Chart Generator does not contain the possibility to define spot colors. Creating an initial profile with e.g. 1500-2000 patches and then optimizing it to some specific spot colors is a good procedure to achieve well reproduced spot colors (in a device color space).

- **What is the best-practice procedure to optimize a profile?**
  - Select the Optimization workflow (under your selected Printer Type)
  - Select the profile you want to optimize in the appropriate pull-down menu
  - Next, define your colors, to which you want to optimize the profile
    (either create a general chart, or load some PANTONE colors, or load an image,
    from which you want to extract the dominant colors**
  - Next, layout your new chart for your desired measurement instrument and paper sizes
  - Save/Print your chart.

    IMPORTANT! It needs to be printed without any applied color management and with exactly the same printing conditions, like the chart printed for initial profile creation. Otherwise, the optimization procedure can lead to unexpected profile results.

- Next, measure the chart and save the measurement data
- Next, let (re-)calculate the new profile – that's it

*Note: when loading spectral colors like PANTONE colors out of PANTONE Color Manager, these values will be converted to a device color space (RGB, CMYK, CMYK+X) by applying the selected profile, which is intended to be optimized. This is done automatically by i1Profiler. When loading images; only LAB or RGB, CMYK, CMYK+X images with an embedded ICC profile can be used.

As you can see from the explanations above, there is a little risk on profile optimization. If the optimization chart is printed under different printing conditions (different driver settings, drifted printer behavior), the measurement data of this chart would not fit to the initially characterized printer properties. The recalculated profile might show artifacts or in worst case, a profile might even not be calculated at all (profile calculation error). So, it is highly recommended that the time difference between initially created and optimized profile is not too high (not like several days or so).

- **Is the optimized profile only good for those colors, for which it was optimized?** No, it can be applied to all print jobs, which are dedicated for the appropriate printer. The optimized profile does still represent the printer's color properties (as long as nothing changed on the printer configuration, stability and driver settings).

- **Can a profile optimization procedure help to compensate for color shifts on a printer over time?** No, this is NOT an intended application. As explained above, it is essential for a profile optimization procedure, that the optimization chart will be printed on exactly the same conditions like used for initial profiling procedure.

- **Optimizing profiles based on large test charts**… can fail! Optimizing profiles, which were initially created on a large or maximum number of color patches, can fail. This is, because depending on the high number of color patches, redundancies in the measurement data of the initial and newly created chart can confuse the color engine. Or explained in other words, if the initial chart has characterized the printer's color gamut already with a high concentration of color patches, there is not much space for optimization. And even the risk of errors, forced by slightly differences in the color behavior when printing the initial chart and the optimization chart, increases significantly.

  So, it is NOT recommended to optimize profiles with higher than roughly 3500 color patches.