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METHOD TO IMPROVE COLOR UNIFORMITY CALIBRATION PERFORMANCE ON PRINTBAR BOUNDARIES

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Method to improve color uniformity calibration performance on printbar boundaries

1. ABSTRACT

Some Page Wide Array printers use color uniformity calibration by means of an image scanner in order to improve image quality by compensating color differences between dies – printheads. In this article we are proposing a method to improve such calibration for the dies placed on the boundaries of the printbar during the calibration procedure.

2. BACKGROUND

In some cases, the boundary dies involved in the calibration are not able to print the entire pattern that the printer uses for the calibration purposes since the paper does not cover the whole die-area. In Fig. 1 is represented such situation.

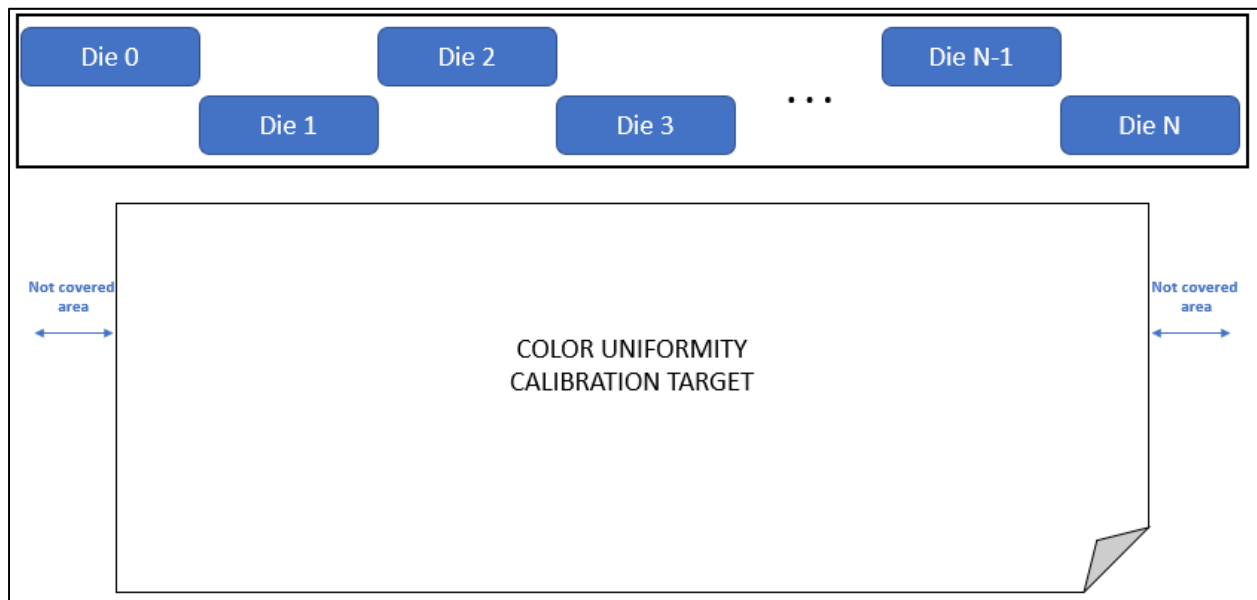


Figure 1 Explanatory diagram of the problem

The fact that the pattern of those dies cannot be printed implies that later processing via image scanner cannot be performed, ending up with uncalibrated die(s) that supposes a defect on image quality regarding color uniformity along the printbar.

Fig. 3 represents the printout of a non-calibrated printbar. In fig.4 is represented the expected printout of a calibrated printbar whose boundary dies were not printing the full pattern during the calibration procedure.

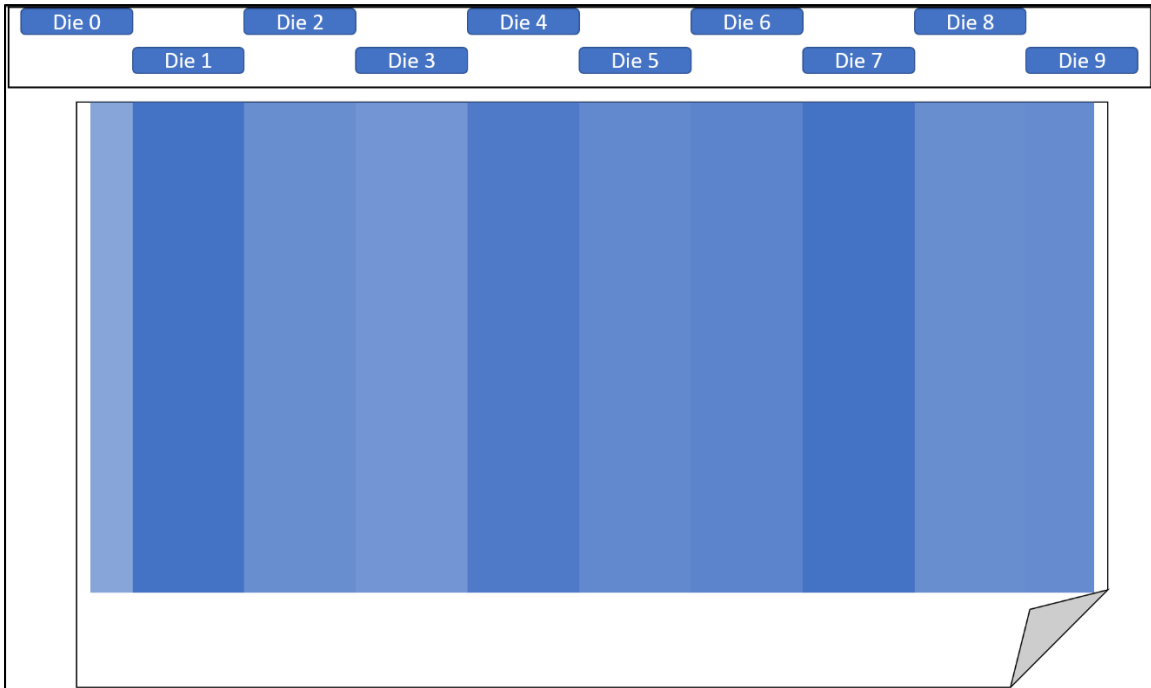


Figure 2 Non-calibrated printbar concept

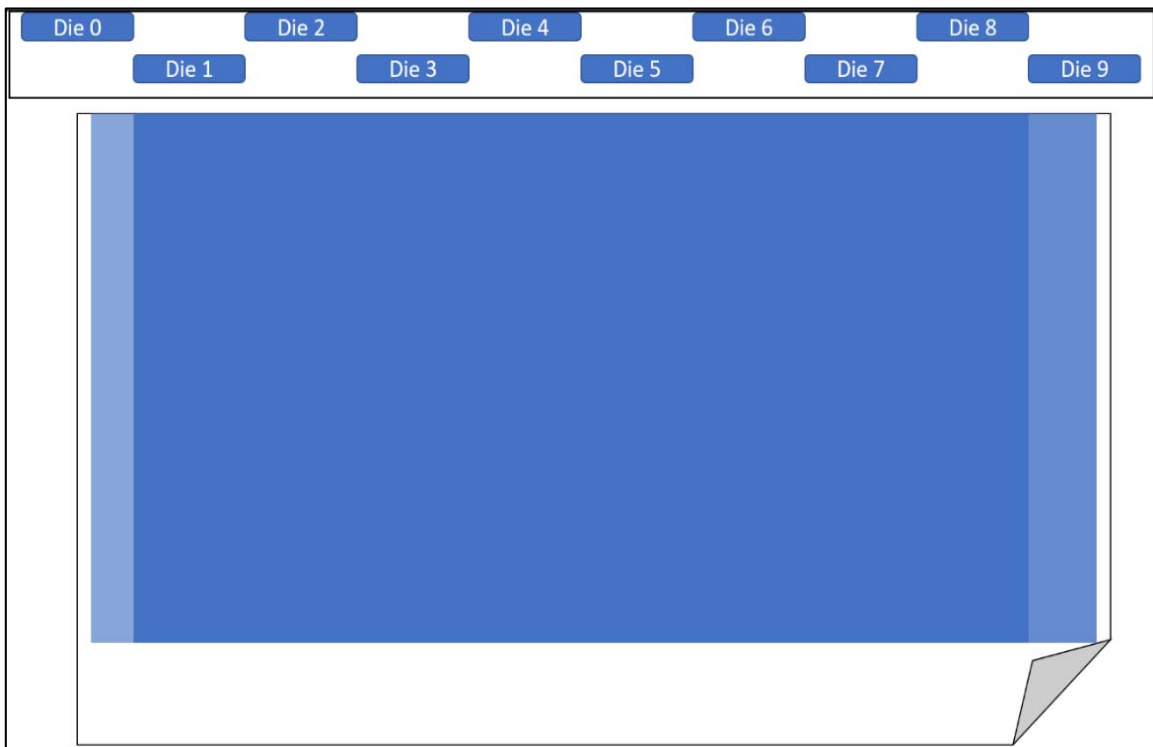


Figure 3 Full calibrated printbar except boundary dies

This given scenario might occur, for example, in the following cases:

- Full printbar media roll width with roll indexing in the drawer: the media roll does not match physically with the printbar
- Full printbar media roll (or single sheet) width with no full-bleed printing (as PageWide XL)
- Less than full printbar media roll (or single sheet) width that is not placed somehow covering the entire first and last die involved in printing

In Fig. 4 is represented the problem with a real example on a PageWide array printer. It is shown a 40 inches page width where neither first (RAMP #0) nor last (RAMP #47) dies are not printing the entire calibration patterns:

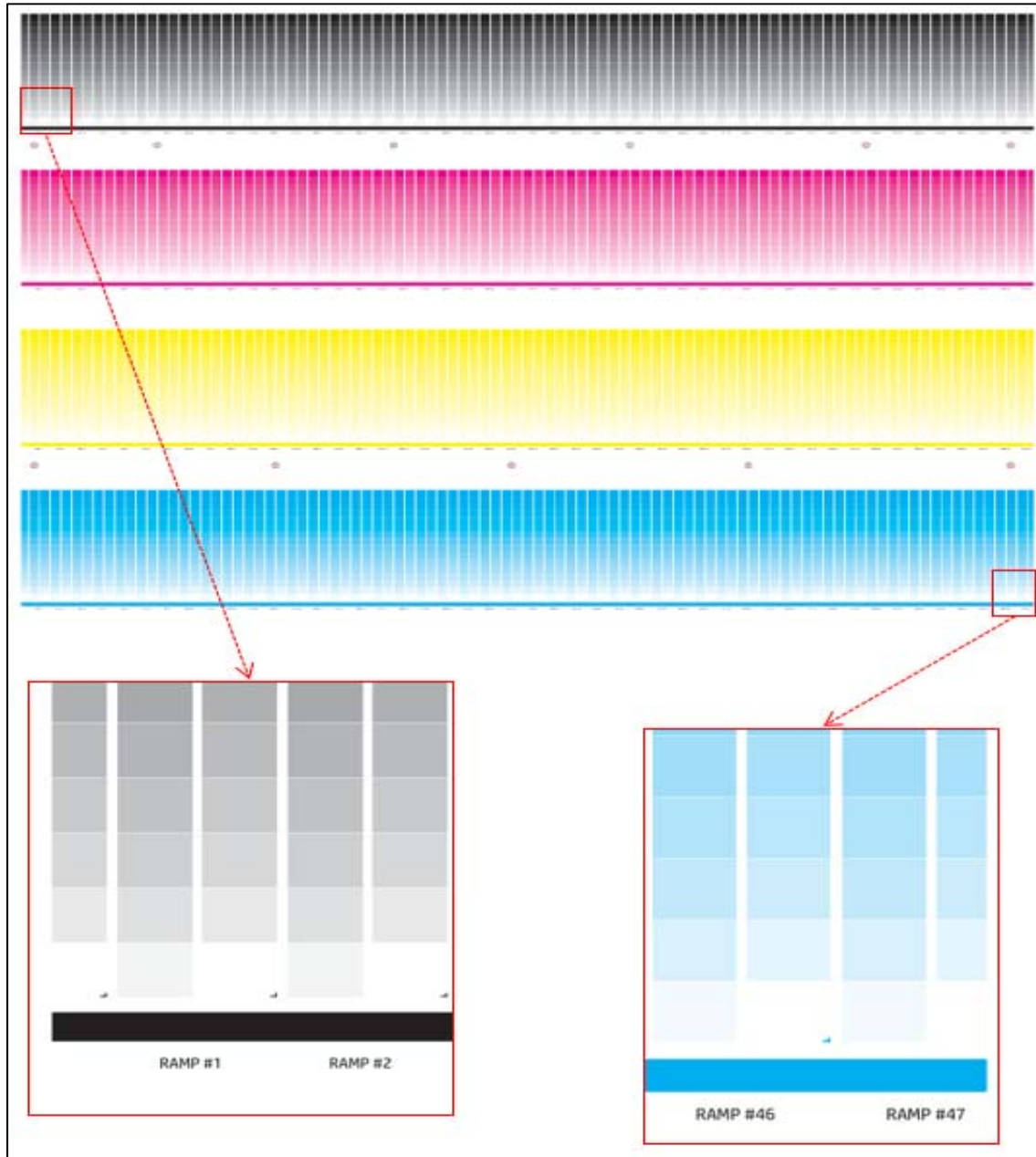


Figure 4 PageWide Array printer real case: first and last die are not printing the full pattern

3. CONVENTIONAL APPROACH

Other PWA printers try to overcome this problem with the boundary dies by applying the same calibrated compensation of its nearest neighbor. However, this kind of solution is not solving at all the issue since it is demonstrated that two given dies (even placed on the same printhead) can perform differently. This is because the thermal behavior can slightly differ and so two dies may require different compensation to print the same color.

Another prior solution consists on making use of an historic of compensation data. However, this presents the problem that the performance of the dies changes over time, making the compensation values useless for that specific status.

4. DESCRIPTION

The solution in this article proposes a method to cope with the aforementioned problem by printing a special calibration pattern on the boundary dies affected, so that enough data can be gathered by the involved sensor and then post processed to generate a valid compensation value. The Fig.5 represents an example of the particular pattern that the boundary dies should print during the calibration.

Notice however that this solution implies that the boundary dies are printing 16 patches instead 32 as the other regular dies.



Figure 5 Special pattern for boundary dies with 16 color densities (90 degrees rotated)

Considering that the system knows about the calibration page size being used and where is it exactly placed on the print zone, it is possible to compute which nozzles are involved in the boundary areas (see Fig.6). This information will allow to correctly print this special calibration pattern with the boundary dies as it represented in Fig.7

Once the patterns are printed, they can be measured with the sensor (e.g., Image Scanner) and then post processed by the regular color uniformity algorithm via firmware.

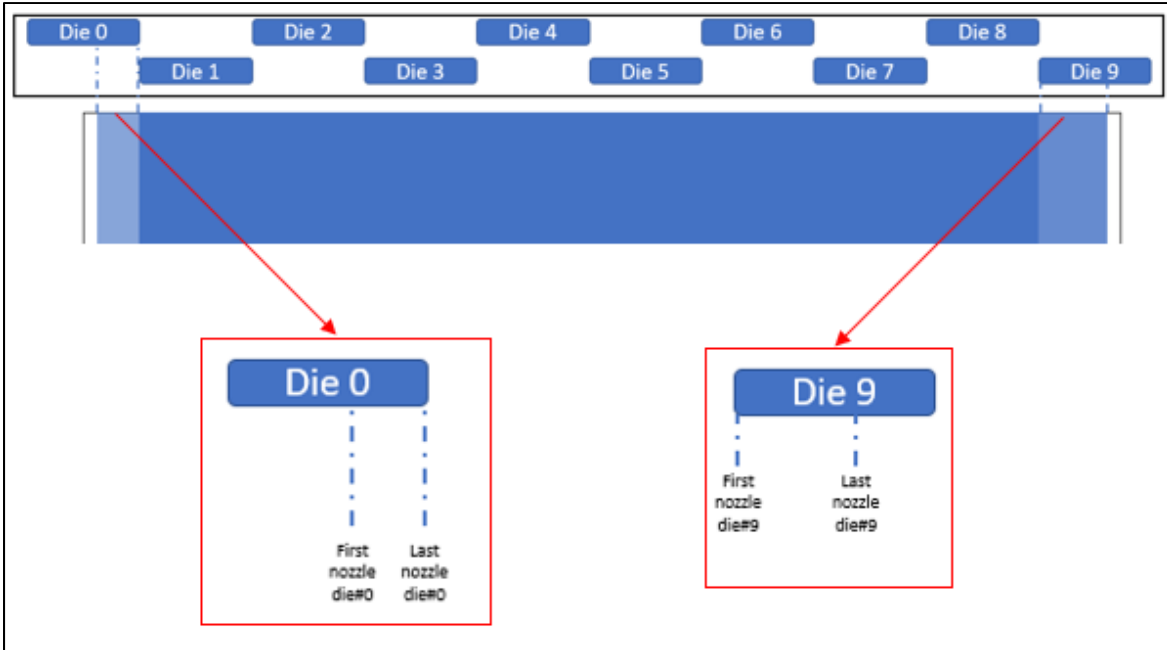


Figure 6 First and last nozzles from boundary dies information to the system

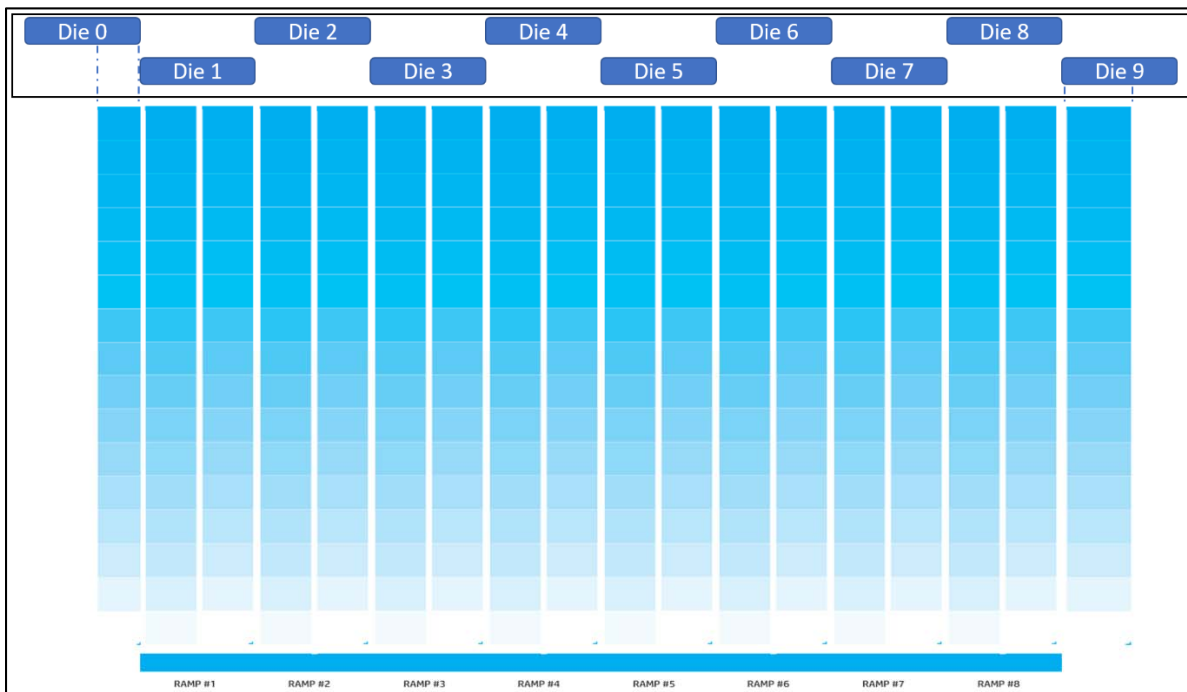


Figure 7 Example of full printbar calibration pattern by printing special patterns on first and last dies (only cyan colorant is represented)

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