Measurement of Trapping

TECHKON APPLICATION NOTE 4

1 Introduction

The phenomenon of trapping (ink acceptance) occurs in multi-color printing when the inks are overprinted: less ink is transferred onto an existing layer of ink than onto a blank sheet. The ratio is expressed as percentage trapping, where 100 % corresponds to the quantity of ink transferred to a blank sheet. Trapping values are typically less than 100 %, especially in wet-on-wet printing, where the value can be less than 70 %.

2 Sources of Error

Trapping values yielded by a color reflection densitometer are not absolute measurements, but depend strongly on the characteristic of the color filters actually used. A set of three measurements must be taken using the filter of the second printed color and always in the sequence:
1. first printed color
2. second printed color
3. overprint

Example C + M:
1. Solid density of cyan (D1)
2. Solid density of magenta (D2)
3. Solid density of overprint cyan + magenta (D12)
Filter for all measurements: magenta filter.

TECHKON densitometers R 410e and SD 620 select the correct filter automatically.

Trapping values can also be determined by weighing the quantity of ink actually transferred. However even this gravimetric approach does not yield an absolute measurement: recent research has shown that trapping depends not only on the quantity of ink transferred but also on the distribution (spreading) of the second printed color.

More important for the control of printing operations than the absolute value of trapping is in practice the way in which the value changes during the print run. Trapping should be measured whenever a key factor (such as damping solution, blanket, printing pressure, ink or printing carrier) is changed. Comparison of the value before the change with that afterwards shows clearly whether the change has made the trapping better or worse. Changes in trapping do influence the color rendering of the print significantly and should therefore be watched carefully.

3 Measuring Methods and Control Elements

The fact that no absolute determination of trapping is possible has led to the development of a variety of measuring methods, each of which has its own advantages and disadvantages. The TECHKON densitometers R 410e and SD 620 support
- Preucil's method
- Prof. A. Ritz's new method
- Felix Brunner's method

In the determination of trapping, the control elements are
- solid patches C M Y
- overprint patches
  C+M M+Y C+Y

The TECHKON print control strips TCS 300, 325 and 400 facilitate the determination of trapping in that the necessary patches are placed together and in the appropriate sequence.

These three methods (Preucil, Ritz, Brunner) require the same control elements to be measured, and in the same sequence. The methods differ from one another as regards the formula used to calculate trapping from the measurements D1, D2 and D12.

3.1 Preucil's Method

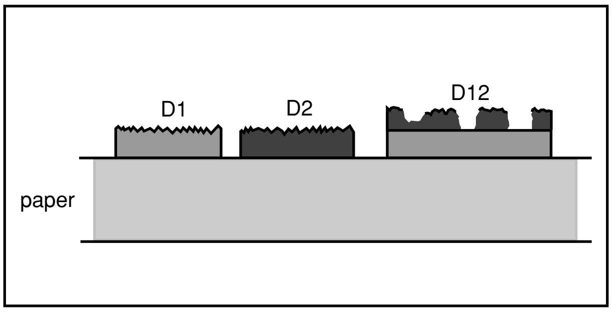
This method is the one most commonly used. If trapping values are quoted without specifying the method it can be assumed that the values are based on the Preucil method. The calculation is done using the formula:

$$TR = \frac{D12 - D1}{D2} \cdot 100\ (\%)$$

This results in a linear und thus simple correlation between the trapping value and the density value of the overprint D12. Resulting from the major influence of the filter characteristics, trapping values derived for the various color combinations can differ from one another, this can prove to be a disadvantage. When measuring the color combination M + Y, for example, the blue filter shows high density values D1 for magenta, with the result that trapping values close to 100 % are never reached.

3.2 Prof. A. Ritz's Method

This method is based on the assumption that differences in trapping are caused not by the transferred ink quantity but rather by uneven spreading of the second printed color. Tests have shown that the second printed color is not spread evenly but forms droplets. A trapping value derived using this method is sometimes referred to as a ‚pearl factor‘.



The behaviour of such a structured ink layer is similar to that of a screened ink layer and can be described by a modified Murray-Davies-formular. The Ritz formula is:

$$TR = \frac{1-10^{-(D12-D1)}}{1-10^{-D2}} \cdot (100\ \%)$$

This method offers three important advantages:

- the trapping behavior of proof, proof-printing and production print can be compared and systematic, comprehensible results are produced.
- The same is true for results measured on different paper grades.
- Even at the extremes of the range (around both 0 % and 100 % trapping), the method delivers plausible results, and in the range of prime interest (85 % to 100 %) a perfect differentiation is achieved.

Because of these advantages, TECHKON supports this method in addition to that of Preucil in the R 410e and SD 620 units.

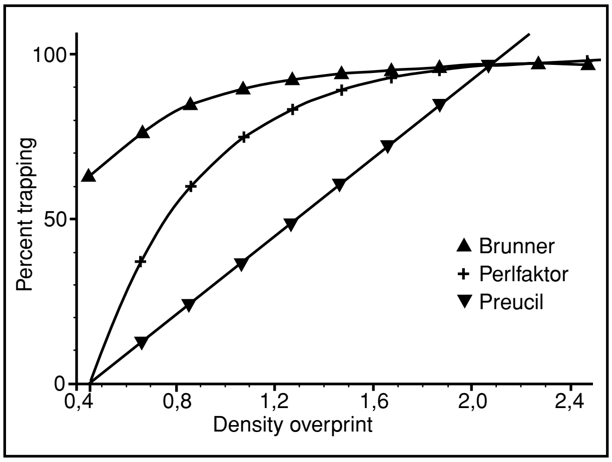
3.3 Brunner's Method

This method, like that of Ritz, uses a modified Murray-Davies-formula:

$$TR = \frac{1-10^{-D12}}{1-10^{-(D1+D2)}} \cdot (100\ \%)$$

Brunner's method also reduces the influence of the filter characteristics on the measured result. A disadvantage of this method is that very high trapping values result from values of D12 greater than 1.2, and so the differences are not sufficiently differentiated.

4 Graphical Comparison



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