Evaluation of Ink Transfer Theory

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Abstract: The ink transfer process has been a subject of interest for many years. Walker and Fetsko created an equation for the process in 1955. According to theory the three parameters controlling the ink transfer are immobilisation, splitting, and ink coverage (smoothness). Later, new equations have been developed, almost all based on the same theory. During recent years, some researchers have argued against the theory, because of correlation between the parameters. Also, some visual observations have created criticism against the theory. This study has concentrated on ink transfer in coldset offset printing using a rough uncoated newsprint surface. Some earlier results will be referred to also. During multi colour printing the earlier printed inks are influenced by subsequent ink coverage such that the first printed ink can flow readily under the surface fibres. This is not common if only one colour is printed, but the situation seems to be very sensitive to the amount and viscosity of the inks printed.

Introduction

This study is concentrated on the ink transfer mechanism in coldset web offset (CSWO) printing on relatively rough newsprint, and its simulation on the laboratory scale using a Prüfbau laboratory printing device. Generally, ink transfer in a printing nip has been discussed widely. Reviews for the item have been published (Parker 1973 published 1976, Oittinen and Lindqvist 1981, Mangin et al. 1982, Lyne and Aspler 1982, De Grace and Dalphond 1989). Ink transfer has often been presented in a form of mathematical equations. The oldest and best known equation for the ink transfer was created by Walker and Fetsko (W-F) (1955), as presented equation (1):

$$y = A[bB(1-f)+fx] \qquad (1)$$

$$A = 1 - e^{-kx}$$

$$B = 1 - e^{-x/b}$$

with

- y: the ink amount on paper (g/m^2)
- A: the 'coverage function', or the fraction of the area covered by ink
- k: a 'printing smoothness' parameter (m^2/g) indicates how fast full contact is reached between the substrate and an in-creasing ink film x
- B: the 'immobilisation function', or the fraction of the immobilised ink
- b: the immobilisation capacity of the substrate under a given set of printing conditions (g/m^2)
- f: the splitting factor
- x the total ink amount on the printing plate or blanket (g/m^2).