

Impact of pre-wetting on the subsequent absorption of water and its applicability to drying of multi coloured flexo prints

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Abstract

The absorption rate of fluid into uncoated and coated boards is an important criterion for optimal printing performance and an understanding of the relative roles of porosity, connectivity of the pore structure, surface topography and surface energy in impacting fluid absorption is vital. In print processes such as water based inkjet and flexographic printing, the absorption of significant volumes of fluid solvent whilst fixing the colour at the surface is a key requirement. The wet trapping of water based flexo ink on coated board, in cases where limited drying capabilities are available, can be problematic. Multi-colour printing can lead to slow drying of the first coloured ink applied and reticulation / rejection of the second coloured ink. This leads to mottle and a poor print quality. The problem is usually addressed by choice of coating formulation with appropriate combination of pigments and binders.

In this presentation the impact of pre-wetting on the subsequent absorption of liquid is explored for a range of different substrates, including both uncoated and coated surfaces. The hypothesis herein is that by pre-wetting the paper a much faster subsequent absorption can occur, owing to the adsorbed water molecules increasing the hydrophilicity of the capillary walls and facilitating further water imbibition. This is similar in principle to a dry sponge being less able to dry a wet surface than a damp one.

Our results show that there is an optimum amount of water that needs to be applied to a surface to enhance the speed of subsequent absorption. If there is too much the surface is flooded and cannot absorb more water. Too little water results in no change in the absorption rate.

Flexo printing and wet on wet “trapping” experiments were made using flexo ink applied to the surface of the board using a Prufbau printability tester. Yellow ink was first applied to the board and then in less than 1 s a second layer of magenta ink was applied over the wet ink surface. The degree of ink reticulation and show through of the yellow layer is indicative of the drying speed of the first down ink layer.

The results indicate that some reticulation of the surface ink is occurring allowing some yellow show through from the first down ink layer. When the surface was pre-damped with a thin layer of water and the board is printed with 2 layers of ink immediately after the damping – then the trapping became worse as the surface was flooded leading to rejection of both ink layers and considerable mottle. However when the coated board was pre-damped and a delay was implemented between the pre-damping and the flexo printing; the trapping / ink drying gave a result superior to the starting position. When the delay time was extended even further to around 30 minutes before printing, then the board began to dry and behaved in a similar manner to a surface without pre-damping.

Application of steam to the coated surface proved to be one useful way of application of low levels of moisture to the coating surface, in order to improve ink trapping.