

DYE BASED INKS FOR FLEXOGRAPHIC PRINTING

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INTRODUCTION:

Printing inks generally are a mixture of three basic ingredients; a solvent, a pigment, and a resin. This statement is taken almost word-for-word from the Printing Ink Handbook prepared by the National Association of Printing Ink Manufacturers on page 6, (the reference is The Printing Ink Handbook, 4th Edition, National Association of Printing Ink Manufacturers, Harrison, New York, 1980, page 6). A very few inks for flexographic systems have been developed using dyes, usually blended with tannic acid or some other similar chemical, in ethanol or ethanol/toluene systems for printing on packaging. Generally speaking, dyes are not light-fast to the same degree as pigments. Dyes have very little hiding power; many are expensive for a given amount of tinctorial strength compared to pigments, and dye inks tend to have problems with migration, water resistance and so forth. One can legitimately ask, "why is Dayton Tinker considering the use of dyes to make newspaper flexographic inks?". This paper is an attempt to answer this specific question.

THE PROBLEM OF NEWSPAPER FLEXOGRAPHIC PRINTING:

Newspapers are printed at very high speed and have a very short shelf life. A paper printed at 3:00 in the afternoon may well be on the street at 5:00. Generally the life of a paper is not long. Hardly anyone can even find yesterday's

edition of the paper, and furthermore, the nature of the paper used for newspaper printing limits resistance to light. Newsprint in strong light will brown or become brittle or both, so that it is not necessarily a requirement that inks that print newspaper have a high degree of light-fastness.

The volume of newspaper printing is large so that relatively minor amounts of chemicals used in other kinds of printing become objectionable. It is desirable that an ink remain open on a press even when the press is stopped but the ink must dry very fast and be stable on the paper, that is not rub off either wet or dry.

FLEXOGRAPHY AND NEWSPAPERS:

Currently, in order to solve problems of quality with letterpress systems, the newspaper industry is evaluating the potential of flexography for newspaper printing, and a number of papers in the country have systems under development. One, Providence actually prints an edition with flexography on a daily basis. A problem has been that many of the offerings of ink for these systems suffer from some disadvantages. In order to get a fast drying ink, the solvents have been chosen to dry quickly. On the other hand, because of this very quick drying, the ink tends to dry on the anilox or the print cylinder upon stopping and may not rewet upon start-up. In any case, a considerable amount of dried pigment gets into the air and tends to move around over various elements in the system. The pigment tends to settle in the very fluid flexo inks. It thus seems desirable to have an ink that will not dry out in the ink system but which is instantly dry on the paper and permanent against either rub-off or bleed off, wet or dry. Naturally, such an ink should be cost competitive, pretty, and have good printability, and not need to be agitated.

DAYTON TINKER'S INK PROGRAM:

At Dayton Tinker we have been attempting to develop flexographic inks for the newspaper industry that have just the characteristics that were described in the previous paragraph; that is, we want to have an ink that stays completely upon on the press, is printable, and yet is almost instantly dry and permanent upon the paper. The basic approach uses certain kinds of dye called Basic Dyes.

Basic dyes not not mean an underpinning or a fundamental, or anything like that, but the description is given to a class of dyes that generally carry a positive charge. Sometimes these dyes are called cationic because they carry a positive charge and thus they behave as bases in solution. Thus they are called Basic Dyes. An interesting property of Basic Dyes is that they stain cellulose and dye hemicellulose or bleached lignin. Presumably the acid groups that are contained in the bleached lignin or hemicellulose components of newsprint are available such that when the dye comes in contact with the fibers of the paper, almost instantly they bond chemically such that they will not bleed off. It is this fact of nature which is a fundamental to the development of dyestuff inks for flexography by Dayton Tinker.

Most Basic Dyes are not very new, having been discovered before the turn of the last century by groups of chemists working primarily in Germany; thus such dyes is Malachite Green, Crystal Violet, Perkins Mauve, Rhodamine B, and others to name only a few, were all discovered a long, long time ago, and have certainly stood the test of time. Such dyes generally are not particularly lightfast, and as a class have extremely high tinctorial strength, brilliance and beauty of color that are unmatched by any other dyes. Thus inks made from such dyes tend to have true beauty of color. One can obtain absolutely gorgeous, almost fluorescent colors that leap off the

paper. Permanence is not their high point and a couple of days of July sun in Dayton, Ohio will remove considerable color from a color print. On the other hand, under the same conditions, the paper turns brown and brittle.

Now, of course, there are a few tricks in formulating with dyes. More particularly when one attempts to use dyes, questions of migrating, printability, wetting of the typeface, openness on the press and so forth do not seem to be easy, at least not to us. Things that one does, such as the inclusion of high boiling point solvents in the formulation with water, are inconsistent with the penetration of the ink into the paper so as to create objectionable show through, certainly as compared to pigmented inks. Some of our early runs had this problem.

We believe, however, on the basis of work that we have done to date that brilliant, beautiful inks that have a high degree of openness in the printing system, but have permanence on the paper are achievable, and that furthermore, the problem of show through and other such undesirables potentially with a dye system can be solved. We believe that printable inks can be achieved and that they will be benign and will behave well in a system. We hope that the development of such inks will encourage newspapers to switch to flexographic systems, since we believe that the colors available will help sell newspapers and add to the quality of life for all of us that like to sit a read a newspaper.

Many of the successful runs in our program have been due to the excellent help and support of Gene Manasco and the ANPA. We could not have developed our inks without the use of their press facilities in the early phase of our program.

Thank you very much for your consideration and time. I hope to be able to answer any questions you may have.