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The Ink Shop and Screen Printing

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It has been the experience of this author that the significant advancements in the technology of screen printing, over the last 20 years or so, have left the printer pretty much in a cloud of dusty confusion. Each supplier claims his product to be as good, if not better, than the competition's; no two ink manufacturers have inks which are compatible (unless it is by accident); and the ingredients of these products are so secret that some companies won't even divulge the components of their solvent blends—despite the fact that many chemical companies which handle organic solvents will do an analysis of the blends for their clients at little or no charge.

When shopping for an ink, the printer is well advised to look at all the products on the market, determine the range of substrates they will stick to, their relative drying properties, etc. This may seem to be a long and complicated procedure, but it need not be so. The purpose of this paper is to outline a set of indexes which can serve as a collection bin for information that will give order to the ink shop and allow quick and easy comparisons of inks on the market.

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The Color Indexes

Very important to a printer who wishes to sell to a customer more than once is his ability to duplicate colors he has mixed before. Obviously, the best way to achieve a match like this is to mix the same ingredients in the same proportions. It is for this reason that color formulations or recipes should be kept on record. Figure 1 is an example of the data sheet used at our company for the storage of this information. The sheet, when consulted later on, will remind the printer of: (a) client's name; (b) job numbers using that color; (c) the sample of the color requested; (d) the color supplied; (e) the type of substrate printed and the number of sheets; (f) the finish requested, i.e., glossy, satin, matte; (g) the application, i.e., was the job to be used outdoors, was it subjected to detergents, etc.; (h) the type of mesh printed through; (i) the weight of ink used for a job—allowing estimates of coverage to be calculated; (j) the formula for the color; and (k) any special remarks.

These sheets are stored in folders which are indexed alphabetically according to the clients' names.

A second index can be kept and organized by color. The information kept here is: (a) client's name; (b) job numbers; (c) color formula; (d) a sample of the printed color; and (e) special remarks. This arrangement enables one to take advantage of previous formulations by making it easy to look up a color without having to remember the client who first requested it. (To someone familiar with the Pantone Matching System this may seem redundant, however, experience has shown that the color range demanded by advertisers far exceeds the P.M.S. range.)

For this system to be most effective, the printer should decide on an unchanging selection of colors to be kept in stock for color matching. The following section describes how to compare inks when choosing this "set."

Standard Tests[1]

There are an overwhelming number of little tests one can do to compare two inks. However, at a reasonably low cost, one can set up a series of three to four standard tests. Following are the materials necessary for the test laboratory.

1. A laboratory oven (or other heat source) and a thermometer;
2. A viscometer (Brookfield viscometer is recommended);
3. Metal spatulas (4-5" blades);
4. Scotch tape; and
5. Soft squeegee blade (5" long, rounded edges)

The tests found most significant for general evaluation are:

1. Viscosity

Viscosity, a property of all fluids, is the resistance to change of form, a sort of internal friction. For

[1] *These tests are not a complete quality check on inks (it is presumed that the manufacturer tested his product before shipping it); this is, rather, a list of checks a printer can do to compare ink products without having to risk a job or buy gallons of the inks to do it. The results of these tests are not intended to be translated into absolute performance data, but they will reflect the relative performance of the products being tested.*

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example, motor oil has a high internal friction which prevents it from pouring like water, which has a much lower viscosity.

The viscosities of the inks being compared should be adjusted (a) as they would be if the inks were going to press. This is usually done through the addition of solvent; (b) use the solvent that would be used if the ink were going to press; (c) be sure that all viscosity measurements are done at the same temperature, say 25°C. These three recommendations are very important if the comparisons are to mean anything. For example, two samples of the same ink will give widely varying results if one is tested "thick" and the other "thin," or if one were diluted with a retarder solvent and the other with a fast solvent, or if the solvent content was unequal because the viscosities were adjusted at different temperatures.

2. Drying time

Print a sample of an ink and immediately place it in the oven at 45°C (110°F). This temperature speeds up evaporation but doesn't bake the ink onto the substrate—which would lead to inaccurate adhesion results.

At 1 1/2 minute intervals, take the sample out and try to smudge the surface with a soft round squeegee blade. Record the time when smudging no longer occurs.[2]

3. Adhesion

Take the sample which has just passed the smudge test and try to scratch it with (a) fingernail, and (b) metal spatula. Record "Pass" or "Fail" according to performance in each case. Next, cover the ink with a piece of scotch tape. Quickly tear the tape off and record the percentage of ink removed. (The cross-hatch test in which a cross-hatch pattern is cut into the ink and then subjected to the tape test, is even more demanding and can give a more accurate percent value.)

Put the sample back into the 45°C heat and leave it there for a few days to really dry out. Repeat the scratch and tape tests. If an improvement in adhesion is noted, this probably means that the ink was not completely dry after the smudge test. In this way the tester can be sure his results are not unknowingly affected by residual solvent. The same procedure should be followed for all ink samples under study.

4. Light Fastness

This is a supplementary test which can be useful when deciding which ink should be chosen for an outdoor application. Many ink manufacturers have equipment which can give a reasonable estimate of outdoor life expectancy. A "weatherometer" or a "Fade-O-Meter" can each test several samples at the same time making these the simplest and most effective ways to evaluate performance.

It is recommended that the printer make samples (printed) of the inks he wishes to compare and send them to his supplier for testing.

Figure 2 shows how all this information is neatly recorded on one sheet. The pages are indexed according to the substrate being printed. Thus, a given ink must be tested for each plastic, paper or metal the printer expects to print.

Conclusion

This paper set out to outline a series of indexes and tests the printer could use to help him sort through the increasingly complicated selection of screen printing inks.

The proposals presented here could be adapted to other types of printing, computer storage methods and/or just about any breakthrough we may experience in this rapidly advancing field. These are ideas, which it is hoped, will go some way toward standardizing the last stop of an ink before the press—the printer's ink shop.

[2] *These tests cannot be accurately translated into absolute terms that will apply for everybody. The volume and temperature of the air varies from one jet dryer to another and this directly affects drying time. The test results are strictly for comparative use.*

Figure 1: Color Sheet

Client:

Job #	Date

Sample to Match

Stock/ #:_____

Finish:_____

Application:_____

Mesh:_____

Color Used

Ink
Wt. Out:_____ **Wt. In:**_____
Recipe:_____

Remarks_____

Figure 2: Ink Evaluation Sheet

Stock	Ink (color):	Date

I. Viscosity

II. Fineness of Grind

III. Drying			
		Temperature	Solvent
Time	Oven:		

IV. Adhesion			
Time baked at 100˚F	% removed by Scratch Finger	Spatula	% removed by tape

V. Lightfastness	
Exposure/Equipment	Anticipated Ext. Life