



PRINTING ON PLASTICS AND FOILS ~ CRITICAL SUCCESS FACTORS ~

Printing on non - porous / non - absorptive surfaces requires both knowledge and preparation. Utilizing the offset and letterpress printing process to print on plastics and foils has its limitations and can be difficult at best. The importance of the following certain prescribed steps as found here cannot be overemphasized.

This technical bulletin has been created to assist the printer by providing guidelines and information basic to the printing of non - absorptive foil and plastic surfaces.

Critical Success Factor # 1 : Proper Press Setup

It is more critical to have printing press finely tuned when printing on foil or plastic. A complete and detailed make - ready is necessary. Rollers should be set and striped properly and checked for the correct durometer; blankets should be packed accurately and should be in good condition; ink fountains and rollers should be clean and free of contamination from previous inks; dampers should be in good condition; fountain solution should be clean and adjusted to the right pH and conductivity and plates should be in good condition.

Critical Success Factor # 2 : Substrates

For our purposes, non - absorptive substrates include foil, polyethylene, polypropylene, polyester, polystyrene, polyvinyl chloride, cellulose, nylon, Teflon™, poly coated carton stocks, Kindura™, and Teslin™. There are many other substrates, not listed here, that would be also included on this list.

GATF suggests the best wetting and ink adhesion to foil or plastic surfaces is obtained when the dyne level or surface free energy of the substrate is between 40 - 50 dynes / cm. Unfortunately, many plastics have surface energies that are too low for good printing (below 35 dynes) and should be treated to increase the surface energy to 40 -50 dynes. A substrate with a surface energy between 35 - 40 dynes is considered to be marginal. Below 35 dynes, the material should probably be treated. Treatment is usually done with an adjustable corona (electric field) or by applying a suitable primer coating. Corona treatment is a fast and relatively inexpensive, but surface dyne levels are susceptible to loss of decay during prolonged storage and upon contact with some fountain solutions. Precautions must be taken to obtain a uniform dyne level that is not too high or low.

Critical Success Factor # 3: Proper Ink Formulation

Many of the problems encountered on non - absorptive surfaces can be eliminated with inks that are properly formulated. Offset and letterpress inks must be specifically formulated for plastic and foil printing. Standard off the shelf sheet fed and letterpress inks are not to be used on non - absorptive surfaces. Contact your ink supplier to find the correct ink to be used. **We recommend testing the stock to be printed on .**

 **Critical Success Factor # 4:** *Testing*

Prior to printing, the substrate should always be tested for the know dyne level. Dyne level testing can be performed using special surface tension test solutions. Handschy Industries uses the following test kit:

Surface Tension Test Solutions
34-44 Dyne level, Test kit #2 (Catalog number c8101)

Test kits are available by contacting:

Cortec Corporation
145 Hyde Rd.
Farmington, Ct. 06032-2834
(860) 678 - 0038

If a customer needs Handschy to test the substrate for a job prior to printing. Contact your local Handschy service lab.

 **Critical Success Factor # 5:** *Fountain Solution Mix*

As with all printing, it is preferable for the fountain solution mix to be optimized for maximum printing performance. When printing on plastic or foils, it is imperative that the fountain solution mix is clean and adjusted to the proper pH and conductivity. Many problems can be avoided with proper ink / water balance. The dampening system should be functioning at its best when printing on plastics or foils. Most printed pieces absorb a portion of the fountain solution mix. With non - absorptive surfaces, all of the water is on top of the surface affecting the ink lay, colour density, dry time, ink film integrity and adhesion. When the fountain solution mix is out of control, variables are exaggerated. Too much ink is applied, too much water is applied, and colours are weak, scumming occurs, and things generally go wrong.

Alcohol substitutes or replacement should be closely monitored. Excessive amounts of substitutes will destroy the viscosity and film integrity of the printing ink.

 **Critical Success Factor # 6:** *Ink Film Thickness*

One of the major factors affecting printing on plastics is the characteristics of the ink film thickness. Although the printed ink film thickness applied (by any process) can vary greatly, the following numbers can be considered typical.

<u>Process</u>	<u>Mils</u>	<u>mm</u>	<u>Microns</u>
Sheet fed Offset	0.2	.005	5.0
Web Offset	0.3	.008	7.5
Web Letter Press	0.4	.010	10.0
Gravure	1.2	.030	30.0
Screen	1.0 - 5.0	.025 - .125	25.0 - 125.0

In the case of Offset printing for foils and plastics, ink film thickness is extremely important. A Heavy ink film may cause set - off and / or drying problems. On light forms, too little ink will allow an imbalance of ink

water to a point of destroying the resin system of the ink. This, in turn, can cause poor adhesion, light colour and chalking.

 **Critical Success Factor # 7:** *Other Precautions*

Set - Off Problems - Set off problems or ink transference can be avoided if jobs are piled in small lifts and left undisturbed until the ink dries. This allows for maximum oxygen to surround the printed piece to help cure or dry more quickly and thoroughly. When there is shortage of storage space, corner boards should be available so that the job can be stacked to conserve floor space.

Static - To reduce static problems, the relative humidity should be above 35% preferably around 50%, the use of static eliminators and ionized air jets are recommended.

Fountain Solution - Fountain solutions should not contain any type of silicone. Silicone will interfere with adhesion of the ink. Over loading of loading of glycol or alcohol substitutes can destroy the backbone of the ink and cause emulsification problems as well as adhesion failure.

Minimum Water - Minimum water and minimum ink will produce the most consistent results both in printing quality and drying characteristics. This point is very critical since there will be no water absorption by the stock. The ink will be bombarded with a higher percentage of water per square inch than normal print job would have. When possible, 5 - 10% if alcohol is recommended to keep the water film thin.

Take Off - If there is light take - off on a particular colour or when a form has light overall coverage, take - off bars are helpful to ensure that turnover of fresh ink and reduce the chances printing emulsified ink onto the sheet. Jobs with small take - off usually take longer to dry because of high proportion of water to the small image area off the ink. A segment or split fountain can be used when the image is printed on one side of the form. An open pocket compound can be put into the other side of the fountain.

Colour Control Consistency - A densitometer should be utilized for colour control consistency. Density standards should be determined, written down for future press runs and maintained at +5 points for each colour. High densities will inhibit drying since they will require a heavier film weight that will take longer to dry.

PRINTING ON NON - ABSORBITIVE SURFACES

Pressrooms across America see more jobs printed on synthetic material than ever before. Proper planning and appropriate precautions can be taken to insure the success of these projects. When preparing to print on non - porous substrates three critical areas need to be reviewed.

1. Selecting The Proper Ink

- ✓ Use inks formulated specifically for printing on non - porous materials. These inks dry by oxidation and are designed with the special requirements of these stocks in mind.
- ✓ Use fresh ink only. Do not use ink more the 12 months old. Open cans should be discarded to prevent any possible contamination issues.
- ✓ Send samples of the material you intend to print on to your ink supplier for evaluation. The exact lot of the stock you intend to print should be supplied for proper drying and adhesion testing. This should be done for every press run. As with every batch process, there is a potential for differences in plastics from lot to lot. With that in mind, even jobs that are running on stocks that are identical to previous runs should be checked on the exact lot of stock being run each time.

2. Selecting the Substrate and Proper Handling

- ✓ Consult representatives from your supplier for all plastic projects prior to selecting the material. Sheet size, thickness, amount of ink, end use, printing on one or two sides, and many other factors may influence which product prints the best and works the best for your customer.
- ✓ All material should be conditioned to your pressroom for 2-3 days prior to printing. Cut all bands and open all outer packaging. This is especially important in the winter months. Material that is cold, below 70° F, will inhibit the drying process.
- ✓ The material should be handled as little as possible both before and after printing to avoid static accumulation and offsetting.
- ✓ GATF has recommended plastics maintain a surface tension of 40 - 50 dynes for the best performance.

Specific information regarding dyne levels and the availability of dyne level testing kits can be obtained from your plastic or ink supplier.

3. Selecting the Correct Fountain Solution

- ✓ Consult your ink and fountain solution supplier. They should be in agreement as to the proper formulation for this type of printing.
- ✓ Using fresh, accurately mixed fountain solution that has both proper pH and conductivity along with 5-15 % of alcohol has proven to be the most successful combination.
- ✓ Fountain drier stimulator offers an added boost of the drying speed.
- ✓ Be sure your fountain solution contains no silicones as the can cause ink adhesion issues.

4. Pressroom Preparation

After evaluating the various components it all needs to be put together in a pressroom. It is important to keep several things in mind as you run the job.

- ✓ Make - ready should be done as quickly as possible. If a long set up time is expected, use standard inks for your make - ready and then switch to plastic inks when you are ready to run.
- ✓ Run as little ink as possible.
- ✓ It is critical that you run as dry as possible. Back off until you scum up and then move back to just after the scumming cleans up. This is a major cause for inks not drying.
- ✓ Run in small lifts 2" - 3" high.
- ✓ Run as much spray powder as the job will permit.
- ✓ Static control devices such as static bars and or ionized air should be used in the feeder and delivery areas of the press. Static tinsel also works well.
- ✓ Relative humidity in the pressroom should be above 35%, preferably in the 50% range.
- ✓ Jobs with light coverage should have take off bars to ensure the turnover of fresh ink and reduce the chances of emulsified ink on the sheet.

5. Special Considerations

Careful planning can eliminate potential risks involved in printing on non - absorptive surfaces. Adequate time needs to be allowed for proper preparation and planning for these jobs. The nature of this type of printing dictates that special treatment of these jobs takes place.

Be sure to allow adequate time for ink drying before and subsequent post - press processes, such as film laminating, are carried out. Aqueous coatings should be avoided on this material due to drying and burn out problems.

Because of the potential difficulties involved in printing on plastics, foils, and poly - coated stocks, optimum conditions should exist in the pressroom for the best results. Fountain solution, roller, blankets, packaging, and all adjustments and settings need to be at their best.

Metallic inks, particularly golds, should be avoided. Imitation versions can be formulated to overcome any drying issues presented by real golds.