MacDermid
Printing Solutions

Tech Tip 3

Artwork, Negative Preparation

Artwork, Negative Preparation and Masking Techniques for Flexography

High quality art is essential to high quality flexographic reproduction. When preparing artwork for flexography, consideration must be taken concerning the unique characterizations of the flexographic process. Chapter 4 through 7 of "Flexography, Principles and Practices," Fourth Edition (published by the Flexographic Technical Association) may be consulted for details on this process.

Art Preparation Tips

All copy or artwork must be uniform in density (1.7 - 2.0) to minimize photographic manipulation or retouching.

- Keep reverses as clean and open as possible. Avoid reverse type below six points.
- Line copy should allow for the finest image detail reproduction that can be held with standard plate exposures (four-mil line width, six-mil isolated dot). Consider any size reductions that may be required.
- Use high contrast photographic papers for halftone art and copy.
- If possible, avoid same-plate combinations of large solids, fine details, tints and halftones. Separation of solids and fine detail will simplify press adjustments.
- Reproduction guides (register, trim and bleed marks, etc.) should be clearly noted.

Negatives

The key component of high quality reproduction is the film negative, since this is a direct reproduction process. Ensure that negatives are of high quality and developed on high contrast films.

Negative Preparation Tips

- For MacDermid plates the emulsion must be of a matte surface to facilitate proper vacuum drawdown and achieve full contact with the plate surface.

- A minimum optical density of 4.0 should be maintained in the non-image areas of the negative to prevent burn through during exposure and loss of relief depth. The clear areas of the negative should have a density not exceeding 0.05.
- Opaqueing and masking for MacDermid plates should be done on the base (back) side of the film. This prevents interference with the matte emulsion and possible creation of high, out-of-contact spots.
- Negatives should be free of kinks or "dings" that may transfer to the plate image, resulting in out-of-contact spots.
- Negatives must be properly distorted to allow for image elongation during plate mounting and printing.
- Image reading must be oriented with the emulsion to the plate. A wrong-reading negative (emulsion side down) is oriented for direct face printing, and a right-reading negative is suited for offset or back-printing.
- Halftone dots should be well defined and consistent. Dot edges must be sharp with no fog or fringe.
- Avoid scratches, scribing, or hickeys on clear areas of the negative as these marks will reproduce on the plate.

Flexographic Photopolymer Plates: Elongation and Compensation

About Surface Stretch

When a plate is mounted on a printing cylinder the face of the plate is stretched more than the back. The elongation of the printing surface will cause distortion of the printed copy unless it is compensated for in the negative.

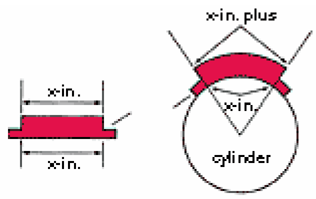

Image Growth Due to Mounting

Photopolymer printing plates with polyester backing has greater surface stretch than unbacked molded rubber plates. Although surface stretch is greater, image elongation is less of a problem with polyester-backed photopolymer plates for the following reasons:

Image elongation is uniform for all classes of copy; large solids stretch at the same rate as fine type. Image elongation is independent of relief depth.

Additionally, photopolymer plates offer advantages over molded plates because they resist shrinkage and will not stretch during mounting. Mathematical prediction of image elongation agrees closely with empirical determinations. However, special test runs to determine exact image elongation may be needed for the most critical jobs.

Factors Determining Image Elongation

Two factors determine image elongation in polyester-backed photopolymer plates. They are:

A. The thickness of the photopolymer layer above the neutral axis. The neutral axis on photopolymer plates is displaced to a point just above the polyester carrier.
B. The circumference of the plate cylinder, including the thickness of the stickyback or other mounting material attaching the plate to the cylinder.

Image Elongation on Photopolymer Plates

Following is the formula used to determine how much a film negative must be reduced in order to compensate for image distortion:

% reduction = K/R x 100%
R - repeat length of the finished job.
K - a constant for a particular plate thickness and construction.

Calculating the Constant K

The constant K can be calculated for MacDermid products using the following formula:

K = 2pi * (photopolymer thickness)

or...

K = 2pi * (plate thickness - platebacking thickness)

NOTE: Platebacking thickness includes tiecoat or adhesive. Polyester supports are typically .005" for MacDermid polymers. Exceptions include .007" polyester for .045" MPS polymers. Metal supports for plates are typically laminated to polyester supports and vary according to plate thickness. See the attached table for specific MacDermid K constants.

Calculating Film Reduction Factors

Using the film reduction formula is simple.

% reduction = K/R x 100%

For example: Assume a job has a repeat length of 20 inches and the plate is 0.112" gauge with a 0.005" polyester backing.
% reduction = .672/20 x 100 = 3.36%
The film length should be reduced by 3.36% to compensate for image elongation.

Usually, repeat length is specified with the job. If you are not given the repeat length, you can calculate it as follows:

1. Add together the cylinder radius, plus adhesive tape thickness, plus plate thickness.
2. Multiply this total by 2pi (2 x 3.1416) to get repeat length.

Empirical Test for Distortion

Try this test if the previous methods aren't exact enough:

1. Make a negative of very accurate rule, or of two accurately spaced bull's-eyes, then make a photopolymer plate from the negative.
2. Mount the plate using standard mounting procedures, so the plate will print in a straight line, parallel to the web direction.
3. Run the plate on the substrate in question, controlling web tension precisely.
4. With as much precision as possible, measure a standard distance on both the film and the printed sheet. It helps to make several measurements, then average the results.
5. Divide film length by print length to obtain K.

Troubleshooting

If the reduction percentage you calculate does not agree with results on the press, check the following items carefully:

Photopolymer plates should be dried at a temperature not greater than 140°F to reduce the possibility of polyester shrinkage. Use the minimum time needed to dry the plate to its original thickness. All plates made for a multi-color process job should be processed under identical conditions to ensure accurate registration.

When distorting for step and repeat, distort the original negative prior to stepping.

- Measure the diameter of all bare cylinders.
- Measure cylinder runout.
- Check the thickness of the stickyback to ensure that it conforms to gauge specifications.
- Check gear teeth for excessive wear or play.
- Check web tension to see that the substrate isn't being stretched in the press, and to determine if slippage is occurring.

K Factors for MPS Plate Constructions

POLYESTER BACKED						
Total Plate Thickness		Backing Thickness	Polymer Thickness		K Factor	
Inches	Millimeters	Inches	Inches	Milli meters	Inches	Millimeters
0.030	0.762	0.005	0.025	0.64	0.157	3.99
0.045	1.140	0.007	0.038	0.97	0.239	6.06
0.067	1.700	0.005	0.062	1.57	0.390	9.89
0.080	2.030	0.005	0.075	1.91	0.471	12.00
0.090	2.290	0.005	0.085	2.16	0.534	13.60
0.095	2.410	0.005	0.090	2.29	0.565	14.40
0.100	2.540	0.005	0.095	2.41	0.597	15.20
0.105	2.670	0.005	0.100	2.54	0.628	16.00
0.107	2.720	0.005	0.102	2.59	0.641	16.30
0.112	2.840	0.005	0.107	2.72	0.672	17.10
0.117	2.970	0.005	0.112	2.84	0.704	17.90
0.125	3.180	0.005	0.120	3.05	0.754	19.20
0.130	3.300	0.005	0.125	3.18	0.785	19.90
0.155	3.940	0.005	0.150	3.81	0.942	23.90
0.187	4.750	0.005	0.182	4.62	1.140	29.00
0.250	6.350	0.005	0.245	6.22	1.540	39.10

METAL BACKED						
Total Plate Thickness		Backing Thickness	Polymer Thickness		K Factor	
Inches	Millimeters	Inches	Inches	Milli meters	Inches	Millimeters
0.033	0.84	0.013	0.020	0.508	0.126	3.19
0.038	0.97	0.013	0.025	0.635	0.157	3.99
0.060	1.52	0.013	0.047	1.194	0.295	7.50
0.067	1.70	0.013	0.054	1.372	0.339	8.62
0.067	1.70	0.015	0.052	1.321	0.327	8.30
0.075	1.91	0.013	0.062	1.575	0.390	9.89
0.090	2.29	0.015	0.075	1.905	0.471	12.00
0.095	2.41	0.015	0.080	2.032	0.503	12.80
0.108	2.74	0.015	0.093	2.362	0.584	14.80
0.112	2.84	0.015	0.097	2.464	0.609	15.50
0.125	3.18	0.018	0.107	2.718	0.672	17.10