

Maximizing opacity in flexo whites

RECENT DEVELOPMENTS in narrow web flexographic inking and plate systems allow converters to approach the opacity of screen whites at faster speeds. Alexander James explains

High opaque white is a common challenge in today's flexographic industry. How much opacity can you achieve with high opaque UV white ink in a flexographic setup? More importantly, what is the opacity target?

With a rotary screen station you can hit 80 percent plus in opacity, but the downside is a restriction in production speed – not to mention the length of time required for the setup process. If everything goes smoothly and the screen does not get punctured, you should be up and running within a couple of hours. If by chance the screen does get punctured, then the re-setup for a new screen is costly in time and materials.

Back to the initial question – how much opacity can you achieve with high opaque UV white ink in a flexographic setup? In today's narrow web environment it is entirely possible to hit opacity levels exceeding 80 percent running at 150 – 200+ feet (45 – 60+ meters) per minute.

This article deals with the ingredients needed to successfully achieve opacity values of 80 percent plus for High Opaque UV white ink in a traditional flexographic setup. Thankfully, in today's environment there has been a tremendous advance in all the required ingredients, including anilox roller, ink, doctor blade, sticky-back, polymer, UV lamp, press and corona-treated substrates.

SUBSTRATE TREATMENT

How does surface tension affect ink adhesion? The basic premise is that the surface tension of a substrate must be higher than the ink in order to achieve proper ink lay-down or 'ink wetting'. The most common type of surface treatment for narrow web is corona discharge. Other types surface treatments are plasma, flame thermal and UV.

Regardless of the type of treatment, having freshly treated substrate can make or break the lay-down of any ink, in any format, be it wide web or narrow web, but it is especially important for narrow web UV white ink.

The treatment of any film will

dramatically alter the surface tension and will enable the ink to wet out and adhere to the surface. If using polypropylene, polyethylene or PVC, the dyne level should be between 40-44. Use dyne pens to test the substrate and confirm acceptable surface tension prior to starting your print trial. This could save you a lot of time and headaches.

For example, we conducted a print trial where the ink would not lay down smoothly; it had a mottled look to it. Knowing that this substrate was pre-treated, we never thought to double check it. Instead we did what the majority of printers do – troubleshoot by changing the ink, the sticky-back and the polymer. Finally, after several hours of lost time, we decided to have the substrate tested. Confirming that the substrate was not up to our needed dyne level, we had it re-treated. We went back to our initial setup and – low and behold - our problem was solved. The roughness of the substrate enabled the ink to adhere easily, improving the ink wetting and adhesion, and the job printed smoothly.

PRESSES AND UV LAMPS

Traditionally, printing thin gauge film was a challenge, but the majority of today's presses can handle clear film of two mil gauge or thinner. Shorter web path configurations and more control on the nip zones all contribute to a balance in tension zones throughout the modern

press. Coupled with the press is the need for strategically placed UV lamps. Your desired level of opacity will determine the thickness of the ink applied and the wattage of UV lamp required. You will need 400 or 600 watt lamps. If you go past twenty bcm in volume, you might need to double hit the ink with two separate lamps. Work with your UV lamp vendor the select lamps that are out fitted with longer wavelength bulbs. This will give you better penetration and curability of the opaque white ink. Also be sure to check that your lamp system is in good operating condition and that your reflectors are clean. Up to 70 percent of useful light energy comes off the lamp reflectors.

POLYMER AND STICKYBACK

Another ingredient is the durometer of the polymer in combination with the choice of stickyback. This choice can influence the smoothness of ink laydown and the level of mottle or pinhole. A good rule of thumb is that with a medium durometer polymer, use a hard durometer stickyback; with a hard durometer polymer, use a medium durometer stickyback. Results will vary depending on the formulation of ink and will affect the level of opacity and the quality of overprint. See the photos in figures 1 and 2 showing the difference when the only change made was the choice of stickyback.

FIGURE 1

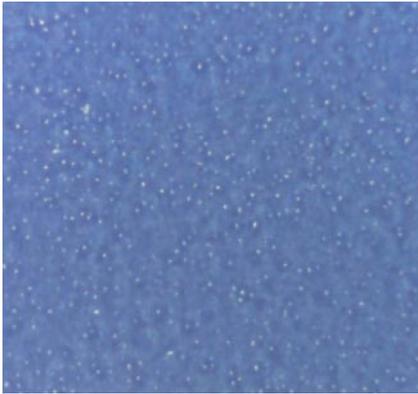


HARD DUROMETER stickyback with Hard durometer polymer



MEDIUM DUROMETER stickyback with HARD durometer polymer

FIGURE 2 – WITH CYAN OVERPRINT



HARD DUROMETER stickyback with Hard durometer polymer



MEDIUM DUROMETER stickyback with Hard durometer polymer

FIGURE 3



USING A SPECTRO-DENSITOMETER to measure opacity levels on site

DOCTOR BLADE

Another key ingredient is the choice of doctor blade. For this level of thick ink, doctor blades between .008, .010 to .012 will be needed to successfully meter these heavy volumes. Testing will be necessary to determine your best choice based on the lubricity of your ink vendors' formulation and your desired production speed.

INKS

Another key to success is the type of high opaque UV ink used. Testing will be required to determine the level of opacity possible with the other elements in the system, but the ink formulation will be a critical factor. Thankfully, over recent years new formulations have lowered the viscosity of most UV inks, including the white ink. Some have a smaller pigment grind for the titanium dioxide and others have proprietary carriers and additives, which aid in the printability and opacity of the inks. At any rate, the lubricity of the ink formulation will be a determining factor as to what combination will result in the desired opacity level at an acceptable production speed. Work with your ink vendors and anilox suppliers when setting up an opacity test.

ANILOX

Finally, the anilox engraving specification will be the biggest factor in achieving success. A key factor will be the volume and the type of engraving that works with your ink vendor's formulation. Ideally you will want to set up a banded roll trial with all the system ingredients to determine what level of opacity you can achieve.

For high opaque UV white with opacity of 70 percent or higher you will need a minimum of sixteen bcm or higher. Opacity targets for UV white require a difference of two bcm to get a percentage point difference in opacity. The lubricity of the ink will factor in to

what type of engraving works; traditional hexagonal engraving, forty-five degree engravings or channeled engravings such as thirty degree channel engraving, tri-helical channel engravings, or other proprietary channeled engravings.

Take the time to do your homework and conduct your testing. Just because an anilox engraving is new does not mean it is better. Over the last year and a half our HGS technical department has conducted countless tests with a wide variety of ink vendors and found that, depending on the formulation, the tried and true traditional 60° hex and 30° channel engravings work just as well as new channeled or patterned engravings.

MEASURING OPACITY

Once you have all the ingredients, how do you measure the opacity level on site? If you happen to have an opacimeter, no problem. If like most people you do not, here is a method for measuring opacity in the field (see figure 3 above). Using a Spectro-densitometer, select the La*b* option, and using the black part of the Leneta Board, place the clear film with the printed white area over the black Leneta board and measure the white solid print. Use the 'L' or lightness level as a measure of your opacity. If you are printing on a self-adhesive stock, remove the liner and stick the printed white to the black Leneta board. Be sure to rub all the air bubbles out between the layers of the film and the Leneta board.

DEFINE YOUR TARGET:

What is your opacity target? Defining your opacity target will help you work out how much change in anilox volume you may need. You can use one of your current acceptable anilox volumes as a gauge to measure the current level of your opacity value. After determining what your opacity level is, decide what your desired opacity target may be;

coordinate with your anilox provider and ink vendor and schedule a banded roll print trial.

Remember to verify the treatment of your film prior to starting the print trial. If you are having issues of 'mottling', the first thing to check is the treat level of the substrate. Then move on to checking the choice of stickyback and polymer choice before checking the inks.

Additionally, and an 'old school' approach, is to output plate separations in the 96% to 100% range for evaluation as solids; evaluate different screening technologies and test different polymer types.

Remember the relation of 'hard to medium' or 'medium to hard plate to stickyback. Additionally, depending on the formulation of the ink, you may find that an increase in speed will aid in the 'smoothing out' or 'wetting out' of the white ink. Therefore, when testing be sure to vary the speed of the press to find the sweet spot where the white levels out. Try varying the speed in increments of 50 feet per minute (15 m/min), flagging each change for evaluation. Finally, determine your opacity target and what cost difference is acceptable in order to achieve it. Keep in mind that an increase in opacity will require an increase in anilox volume and will also result in an increase in cost.

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Alexander James is the Eastern Technical Manager for Harper GraphicSolutions, a division of Harper Corporation of America, Charlotte, NC. Alex has a Master of Science degree in graphic communications from Clemson University and more than 15 years of experience in the graphics industry. James has presented at numerous industry-related events, including Tarsus Label Summits, and travels extensively globally assisting customers in improving efficiencies and productivity.