FOUR COLOUR PROCESS PAD PRINTING
PDS International – Peter Kiddell

As with most forms of printing using the four process colours; Cyan, Magenta, Process Yellow and Process Black; to create a full colour image of near photographic quality will sort out the novices from the experts. Although four-colour process pad printing has been practiced for many years it probably came of age when picture discs were first introduced to CD printing when the high speed multi-colour screen printing machines of today were not available. Additionally, the output requirements were much less. 500 printed discs per hour was acceptable. The background was a printed gloss white. A line ruling of 175 lines per inch allowed a tonal range from 5% to 95% or better to be printed. The resulting images were superb. Admittedly some of the designs were somewhat wild, their designers having apparently been taking something stronger than Earl Grey tea during their creative session. This was the pinnacle of multi-colour pad printing and arguably the best quality direct printing onto CDs ever achieved. The current high speed screen printing machines used in the CD industry can print at 4000 per hour plus but they are restricted to coarser line rulings and the inherent problems of moiré associated with screen-printing. Why were these Pad Printed CD's so good? Pad printing has characteristics that are ideally suited to high precision process printing. Thin ink films, very accurate register, excellent dot reproduction, the ability to print fine line rulings and no mesh induced moiré.

There are other consumer products starting to hit the market now that will require very high quality pad printing in multi-colours on uneven surfaces. These products will take the process to an even higher plane.

So how will you set about printing four-colour process with pad printing? The key to successful printing is reducing the variables. The first variable that is controllable is registration. Registration is affected by the accuracy of the index on the feed mechanism. It is assumed that you do not try printing one colour and then the next on a manually loaded single jig as this is both time consuming and impractical. A mechanical indexer should have positional accuracy of +/- 0.01 mm (approx. +/- 0.0005"), the pad pick-up and print require similar accuracy. Jigging of the object to be printed has to be stable and hold the object firmly. With these three factors stabilised the foundation for good printing is in place.

The decision to be made is then the type of plate to be used. I would recommend a high quality steel plate with a fine crystalline structure or a photopolymer plate. My preference is photopolymer because it generally enables a finer line ruling to be used, however controlling etch depth can be more problematic.

Whichever plate type you use, an etch depth of 20 microns is the target. A steel plate will resolve a tonal range of 10% to 90% at 150 lines per inch whereas a photopolymer plate will resolve a tonal; range of 5% to 95% at 175 lines per inch. Dot shape is normally elliptical with angles of: Cyan 67.5°, Magenta 22.5°, Yellow 90°, Black 45°.

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Stochastic screening has also worked very well on photopolymer plates.

Better quality could be achieved on steel plates if only many of the producers of steel etched plates had their production process under control. Definition is often lost and etch depth is uncontrolled. For the vast majority of printed images, the plates available are more than adequate. It is when you get into the small dots in fine half tone work that some suppliers are struggling.

Origination is critical but you do not have the luxury of test strips and grey scales that other printing processes have. And there's the rub. Your inability to measure the image with a densitometer means that decisions as to the quality of the image have to be against a standard and are subjective. On this basis you have to be sure of the etch depth and ink condition. Dot reproduction with pad printing is very accurate. There is a change, but it is not as significant as screen printing. The change in dot size will be exaggerated if you over pressure the pad. Consistent pad pressure on all the colours is critical. Pad condition has to be monitored, as degradation of the pad surface will cause a colour shift.

Ink condition is probably is the most critical area. It starts from the colour as received from your supplier. You need to be assured that the condition of each colour is to an agreed specification, this includes optical density.

Changing the density of the ink as supplied is only practical if you want to reduce it. Adding a transparent base does this. The only method you have of increasing the density of the printed colour is to increase your etch depth. Not a good idea! As you have to make decisions about colour correctness, without measuring densities, putting another variable into the equation is asking for trouble. The solution is to purchase ink of a higher density than you require and reduce the density to the required level by adding base. This gives you a tool to modify colour by altering only one parameter.

It will still be necessary to measure the correct solvent mix into the ink to obtain the transfer characteristics and maintain the mix throughout the run. The decision as to what density should be used for each individual colour is based on the values used when the separations are made. You have to replicate these in your print.

Successful four colour process pad printing requires a thorough understanding of the technique and strict process control. If your printing equipment is not capable of holding close register don't consider it. If you cannot control ink conditions in single colour printing don't consider it. If you do not have written procedures that you follow, you are running a real risk of creating a pile of rejects. If you do wish to take on the challenge, well done, but make sure you know what your customer is expecting and set agreed standards that you can maintain in production at the start of the contract.

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