



**2006
AUGUST**

PAD PRINTING PROCESS

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Screen Process and Digital Imaging Magazine

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If you think screen printing exponents have put pressure on themselves by applying less than professional techniques, that is nothing compared to companies who struggle on with Pad Printing. There must be more pad printing machines stuck in the corners of redundant machinery stores than any other piece of printing kit. Why, when it is such a versatile process. The surprising answer is that management is scared of the process. When you consider that its origin was in printing watch dials and fine china in the 19th Century then you have to wonder why so many departments are in such a state.

Most screen printers know about the stencil reclamation department as a no go area. Well, Pad Printing facilities often suffer the same fate. In both cases is unnecessary and destroys profitability.

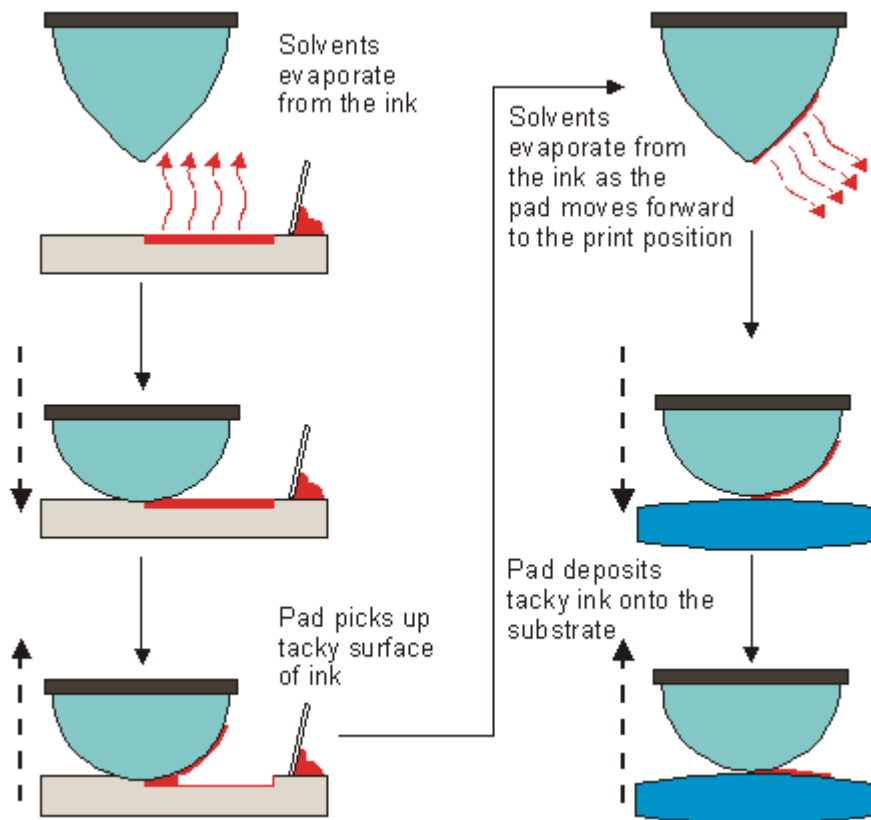
For those who are unaware how Pad Printing works and its many uses I will provide a quick resume'.

The main elements of the Pad Printing process are:

- Printing plate
- The ink
- Silicone rubber printing pad
- Doctor blade or ink cup
- Machine

The image to be printed is created on the printing plate, normally by chemical etching. The plate is generally steel or a photopolymer material. Mechanical engraving and laser etching can be used. Etch depth is approximately 25-30 microns. The thickness of the dried ink film varies between 2 and 20 microns. 20 microns is in exceptional circumstances where special ink systems are used particularly in the ceramics industry. Compared to screen printing this is a thin film process.

The etching is filled with ink; the action of the silicone rubber printing pad picks up ink from the etching and transfers it to the object to be printed. Filling the etched portion of the plate can be done in various ways, but the mechanism of picking up the ink from the etched portion of the plate and transferring it to the object to be printed is always the same in conventional pad printing machines.



A whole range of variables can affect Pad Printing. Etch depth, ink condition, ambient conditions, pad shape surface finish and hardness and machine speed are the key factors. It is sometimes necessary to print an item twice or more to achieve the density of colour that is required.

It is the management of ambient conditions by understanding how the solvents evaporate in the inks that is the key to successful printing and the phrase "Reduce the variables and maintain strict process control" is paramount. Shops that do not apply these precepts (unfortunately in many cases) are dirty and disorganised, nearly always badly lit and little effort is made to control ambient conditions. The effect of all this is that management cannot control the print shop.

A Pad Printing shop in that it is typical of this is one that has been left to its own devices. Over the years it will have slowly deteriorated until it has reached its current condition. Buying new printing equipment and putting it into this environment would be pointless. For the department to be efficient it requires a change in culture.

Pad Printing is a clean controllable process that will consistently produce high quality prints. To achieve this there are a series of operating procedures that when followed will maintain the quality and production levels. The department should perform as a conventional production line, as long as there is adequate scheduling in the supply of inks, pads, artworks, plates and items to be printed.



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Typical symptoms of this malaise are :

The department is

- 1) Extremely dirty.
- 2) Badly lit.
- 3) Has inadequate plate making facilities.
- 4) Machines are dirty and demonstrate lack of maintenance.
- 5) There appear to be no scales for ink mixing.
- 6) There appear to be no Standard Operating Procedures.
- 7) The "Cleaning Bath" is a misnomer.
- 8) There is little evidence of protective gloves or overalls.
- 9) The department would be considered an unacceptable Hazard from a Health and Safety perspective.

The indicated production levels would be well below those that should be expected from the equipment that is available, but not a surprise when the operational conditions are factored in.

If you recognise any of these conditions in your pad printing facility you are creating losses.

It is possible to remedy this situation. You need an independent on site review of the department and the operators in a production situation. It needs to include a close look at all the written procedures and compare them with what is actually happening. The operators should be tested on their process knowledge and questioned about how they feel about their job role and the department performance. Almost certainly they will assert they do their best but under difficult circumstances and that there are several process improvements that could be made. You will almost certainly find that they will be demoralised but the mere fact that someone is talking to them about their plight will have a positive effect. Just imagine that the quality of work you producing was out of your control. Changes in temperature or humidity could stop the process. A dirty environment meant you had to redo work several times, no wonder you become demoralised.

There is great insecurity in the situation where, no matter how inadequate, there are a limited number of people on site who can get production out of the department. If they were to leave your production would stop! With the correct procedures you would have process security. Procedures mean that the operators have a structure to work within and they will feel secure.

An area in Pad Printing where many people trip up is when they are using Photopolymer Plates. They do not process them correctly.

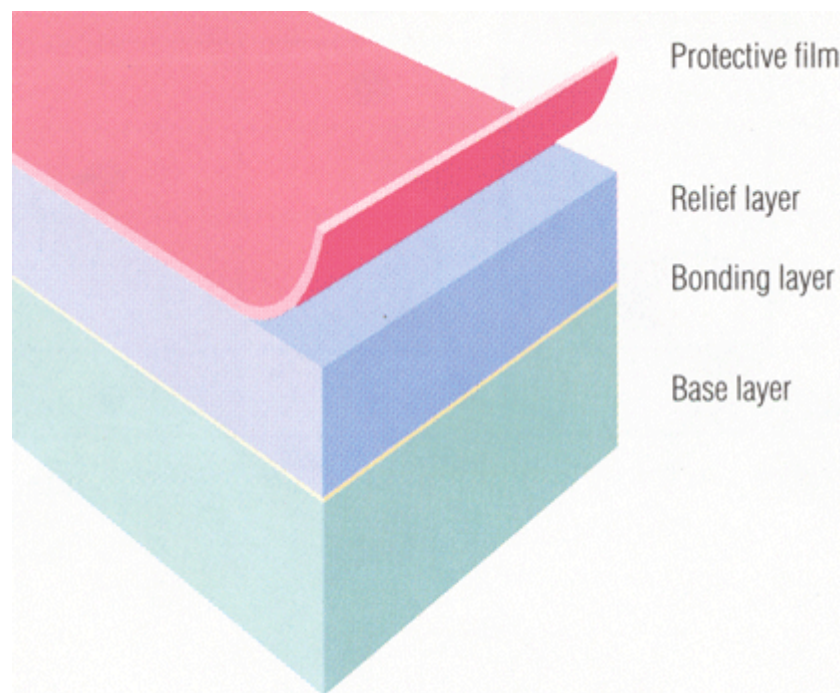
Photopolymer plates are an economical way of producing plates in-house for short run and sample work, where the cost of etched steel plates is prohibitive. Their resolution is extremely high and even the finest details can be accurately reproduced. A correctly processed and set plate will last up to 50,000 prints.

There are two basic types of photopolymer plates: -

- 1) Alcohol washout.
- 2) Water washout.

Alcohol washout polymer is the most widely used as the cured polymer is less susceptible to attack by the many solvents contained in inks. When using the alcohol water washout fluid, air extraction is necessary. The effluent must not be discharged into the drainage system.

Water washout polymer uses tap water without additives to process. This is obviously far less noxious than the alcohol water mixture and the effluent can be disposed of in the drainage system, as it is biodegradable.



The photopolymer relief layer is stuck to a thin metal base plate and comes with a protective film to prevent damage to the surface. The thickness of the relief layer varies depending on the manufacturer and the etch depth required.

Photopolymer plate making for pad printing is simple and fast. If large quantities of plates are used an automatic wash out unit is recommended.

Manual washing out with a plush pad in a bath of wash out fluid is the most common method. There are units available from BASF and other suppliers that will expose, develop and dry in the same unit. If you are more than an occasional user of photopolymer plates this equipment is recommended. It consists of: Exposure, Wash out and Drying. All functions can be programmed. This results in much better control of etch depth and more consistent results overall.



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As with stencil production it is the drying phase of plate manufacture that is often overlooked. Once the plate has been exposed and washed out it must be dried correctly. If you are using alcohol washed plates, place in an oven (ideally fan assisted) set at 80oC (176oF) for 15 minutes. Drying causes evaporation of the washout liquid absorbed by the polymer. Water washout plates require the same temperature but 30 minutes duration. Once dried correctly the plate should be put back in the exposure unit and exposed for 2 minutes without any film. If the plate is not dried before post exposure the polymer will remain soft and its useful life reduced dramatically. This condition is similar to a stencil where the emulsion can't be exposed correctly because it is not dry before exposure. This results in an underexposed and weak stencil. There is some comfort in that bad practice is not confined to one discipline. What is sad is that the correct processing instructions are given in the Technical Data Sheets that are available from the plate material suppliers but who ever reads the instructions!!

The market for Pad Printing machines in the UK has changed. Work requiring large numbers of manually loaded semi-automatic machines has disappeared from these shores. The most significant sales are in special purpose machines that are full work-stations. Here a component is processed with assembly, fixing, pre-treatment, post treatment and printing incorporated on the same feed mechanism and controlled by a single computer. Over the years pad printing machinery suppliers have gained a great deal of experience in handling a vast range of components. This is now being put to good use in rescuing work that had been lost to the East.