



At times my job is a cross between a priest a brain surgeon and a nursery nurse. A priest in that what is said in the confessional is absolutely private and unattributable. A brain surgeon because I have to get into a persons head and a nursery nurse because of what is hidden there.

We all have these unattributable moments and during one training session the question was put to the group. "What three words are the keys to successful printing?" The answer was supposed to be "Reduce the Variables". All but one answered with those words or very similar. There was an exception. He was a novice printer whose chosen phrase was "DO IT AGAIN". You could almost feel the crack of his supervisors' hand hitting the back of his skull as the words were drilled in. Not very politically correct but when were politics ever correct!

Another classic quote by a "printer" was: "If only they would just let us get on and print, but they insist on us working to a Proof!!"

If you had glanced through last months article you would seen the theme was a thread of good practice was woven into a culture of best practice throughout the company. The attitude of the novice printer can be brought in line but the veteran squeegee basher is probably past redemption.

There are many positive things happening in the screen printing industry but our continuing prosperity is dependant on the adoption of tight process control without compromise.

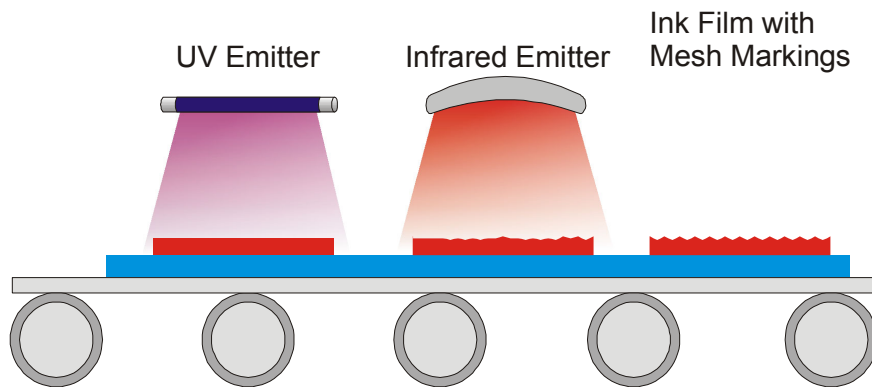
An area where there has been significant improvement is in the design of dryers. If you are setting up a screen print facility the very first questions should be "What ink or medium am I printing? What is the substrate? How am I going to dry the ink?" The second line of questions should start, "What type of machine am I going to use?" All too often the first question asked is what machine. I have two recent applications where the printer was chosen first only to find the drying was in one case inadequate and the second case impossible without a major machine redesign. In both cases the solution was very expensive unless you consider £60,000.00 and £1,500,000.00 small beer. Confidentiality does not allow me to detail the cases but examining the decision making procedure for selecting a dryer may well be of use. In August of last year I detailed the different types of drying techniques that can be applied. There are other issues that have to be addressed that will modify your thinking.

Is it Drying or Drying and Curing that has to be incorporated into the post treatment process? Drying is a physical change that in the case of solvent based inks requires the evaporation of solvents. This can be either partial or complete evaporation. With UV curing inks drying is the start of the polymerisation process. It occurs first on the surface and allows the ink film to be over printed. Curing of inks is a much more complex process it generally takes place over time. In most cases there is a chemical change that occurs.

The application of heat energy will always accelerate the cure. It can take up to 7 days to cure some inks at ambient temperatures although they can surface dry in seconds. UV curing ink will need several hours to develop a complete cure. Even though it can dry instantly.

You must be sure that the state of the printed substrate is in the condition you need it to be when it leaves the drying phase. What does this mean? The ink should have reached a point in its development that it is physically and chemically acceptable to you. Is it dry enough? Has it advanced sufficiently in its curing phase to either continue to a satisfactory cure within an acceptable length of time? If you are to overprint it will it still be able to accept the subsequent ink layers without adverse reaction? These adverse reactions can be from reduced adhesion or reduced chemical resistance to total breakdown and de-lamination.

Even with UV curing systems heat is an advantage as it assists in the curing mechanism and can improve the final mechanical and chemical properties of the ink film. An aspect that is often overlooked when drying UV ink is that it can dry so quickly that the surface still holds the marks of the mesh, as the ink has not had time to flow out. The way to overcome this condition is to subject the printed ink film to medium or long wave infrared before it passes under the UV curing system. This heat energy reduces the viscosity of the ink film and enables it to flow out and remove the mesh marking that can ruin the surface finish. The more viscous the original ink is the more likely this effect is likely to occur.



Even though UV ink is solvent less extraction to the outside of the building is vital. The obvious reasons are to keep the bulbs cool and extract ozone produced but equally as important is to remove the products of curing. Ultra Violet Curing systems are exothermic (they give off heat). After the cure is initiated by the ink film passing under the UV source a chemical reaction takes place that causes some of the monomers to leave the ink film and migrate into the atmosphere. It is these monomers that have to be removed from the working environment, as they can be harmful to the workforce.



When they are not extracted effectively they can build up inside the curing unit reducing the efficiency of the unit by contaminating reflectors. If, when extracted, they escape from the extraction system monomers collect on colder surfaces forming a sticky layer. It is whilst they are airborne that they can be harmful when inhaled.

If you are using heat, air movement and time as the drying mechanism unless you are using static ovens you will need a conveyor (tunnel) dryer. These can be big! Yes, size is important! The length required is determined by the size of the substrate, the drying time required and your production speed. Drying units generally come in 2 metre lengths. It is not unusual to have two or three units with a cooler to bring the substrate down to near ambient temperature. The cooler will need a transfer inlet belt that stops hot conveyor belt going into the cooler. Add to these the in feed and out feed and you can have a drying unit that is 13 to 14 metres long. That can make a big hole in the wall and a bigger hole in your pocket if you hadn't considered the drying mechanism as soon as the project was first thought of. It is not unusual to have a print line consisting of a feeder, printer dryer cooler and stacker of 20 metres. Cylinder presses run at speeds that necessitate long dryers.

Simple check list for selecting a dryer.

- 1) What ink system is required?
- 2) What are its drying/curing characteristics?
- 3) Is the substrate heat or UV sensitive?
- 4) What is the production rate?
- 5) How big is the substrate?
- 6) What must condition of the ink and printed substrate be when it leaves the dryer?
- 7) What power supply is available? You are almost certain to need three-phase electricity?
- 8) Is gas an option?
- 9) Is extraction an issue?
- 10) How much space do I have available?
- 11) What running costs can I tolerate?
- 12) What is the capital cost?

Then there is the issue of new or second-hand dryers. Some used dryers are excellent buys however older models can be grossly inefficient using a great deal of energy and not doing the job properly. It is always worth getting the price of a new dryer and comparing its running costs with the used unit. Whichever route you take it is not a decision that should be made casually. It is very easy to get your fingers burnt.

There are alternative drying and curing mechanisms available as well as UV, infra-red and hot air. Electron beam, microwave, flaming, contact with heated blankets or platens are all systems in use at the moment. Maybe one of these is the answer.



PRINT FOR PROFIT #18

SELECTING DRYERS

We are fortunate in the UK to have some of the worlds' foremost manufacturers of drying equipment. I am told they are very busy at the moment particularly in the export market. Who says our manufacturing can't compete? We will do better still with a buoyant home market. Take the risk of making more profit invest in the right dryers for the job. A good dryer can increase productivity by 50%. To say it is "Only a dryer" is like saying "Its only a heart beat".