



**2007
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CRITICAL AREAS IN SCREEN PRINTING

With far too many years trouble shooting in screen printing behind me and probably many in front there are certain recurring critical issues with which I am faced.

This being the summer months, whilst you are sitting beside your flooded garden contemplating when the next power outage will occur, you may wish to divert your mind to screen printing improvement.

One of the most common questions I get asked by people who wish to start up in screen printing is "What machine do I buy?" My response to that question is that that is not the right question to ask. The limiting factor in the choice of machine can be how the ink is going to be dried or cured. This is particularly the case in industrial printing applications where temperatures of 120°C + for extended periods are sometimes thought to be necessary. The temperature is to trigger a chemical reaction in the printed film and the extended time is based on pre-production trials in static ovens. In non-UV curing printing mediums (inks) there is always some form of solvent that is used to make the mixture printable. To remove solvents from the printed film you need temperature and airflow. Just think washing on a clothesline, it will dry in no time at all on a crisp windy day. If it is high humidity and little wind it never dries. An efficient dryer has accurate temperature control, high velocity controllable air movement and if using infra red drying the correct wavelength of infrared energy. It is not just a matter of high air flow as just because you have fast moving air it doesn't mean it is impinging on the surface of the printed film. Just think about the insect on the outside of your windscreen in the car. The car can be travelling at 60 mph and the insect stays on the windscreen. This is not because your son has super glued it in place it is because when air flows over a surface there can be what is known as the boundary layer where close to the surface there is very little air movement. Dryer designers understand this phenomenon and design air manifolds and air orifices, which create airflows that overcome this boundary, effect and remove solvents from the ink film. Incorrect dryer design can actually inhibit ink drying by forming a skin on the surface of the ink film and blocking the egress of solvents from the wet under layer. We are fortunate in the UK with having Natgraph Limited in Nottingham who understands the science of drying; their equipment demonstrates the enormous strides there have been in drying and curing technology in the last ten years. This applies also to Ultra Violet curing where it is not just the effectiveness of unit but its efficiency. Significant power savings are achieved with the modern power packs used to drive the UV Emitters. The importance of drying technology is increasing, as engineers want to print several layers of exotic materials on a range of substrates. Answers to questions such as "Is it dry" are not sufficient. "What is the state of cure" is more likely to be asked. Why because if a film is fully cured it may not be possible for the next layer to form a full adhesive bond. Dryers may have to provide drying and curing from both sides of the substrate. It is possible to have two side curing, several infrared wavelengths, and UV curing and high velocity heated air on the same dryer. Some applications benefit from gas-powered dryers. Then of course there are chillers to bring the substrate back down to ambient temperature. A great deal of thought needs to go into selecting a dryer. Any potential user should carry out drying/curing tests on their printed substrate before producing a fill dryer specification. Having the wrong dryer can be a very costly exercise.



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Even in graphics printing using conventional inks, either UV or solvent based, the dryer has a tremendous influence on productivity. Maintaining stability of the substrate is always an issue. Typically incorrectly set and operated UV emitters will produce a great deal of heat in the form of infrared energy that will affect the substrate. Additionally badly focussed lamps will mean that the belt speed has to be slowed resulting in greater problems with heat. There are a host of issues that plague a printer with a badly maintained UV dryer. The cost of effective maintenance is repaid a hundred fold. There may well be a justification for buying a new dryer. If they ran their printed substrate through the test facilities at Natgraph they would soon see the difference modern technology makes.

A state of the art UV dryer will run cool, cure quickly and enable you to get the maximum speed out of your printing machine which is where the decision about which machine to purchase comes in. Flatbed up to 1000 per hour, cylinder presses up to 4500 per hour. Automatic feeders before the printer and stackers or collection trays after the dryer. The necessity for auto registration, image recognition, static elimination devices etc are all determined by the speed of print that is controlled by how fast the printed substrate will dry. So think about the dryer before you think about the printing machine.

Having already mentioned the importance of maintenance in the use of dryers, success in screen printing relies on using printing machines where the geometry is correct and consistent. The screen frame must always be aligned to the printing surface. On a cylinder press this means the stencil has to be parallel to the cylinder and its movement tangential to the cylinder. The squeegee has to also be parallel, as does the flood coater. Any of the elements being miss-aligned will mean that ink film thickness will vary across the printed substrate.

When using a flatbed press geometry is just as important. All too often the screen frame is mounted such that the snap distance varies from corner to corner. That will compromise the whole printing cycle. The attitude of the printer unfortunately is that it works so why bother. This culture is one of the reasons for the decline of the process in the POS sector. Another problem area is when peel off is applied, sometimes it is only applied with one colour and this causes registration problems because applying peel off alters the image size. If it is used (I don't like to) it must be applied on every colour. The reason given for using peel off is that it helps lift the stencil off the wet ink. If the tension were correct this mechanical movement would not be necessary.

One of the most abused elements of the process is the flood coater sometimes known as flood bar. The purpose of this device is to charge the mesh openings with a controlled amount of ink. It does this before the squeegee deflects the stencil into contact with the substrate and causes the ink to flow through the mesh. Most flood coaters I come across have nicks in the contact edge and are often distorted. The flood coater should have an edge that is absolutely straight and undamaged. If you are wanting to put down a thin film of ink it should be a knife-edge. Conversely if you want to put down a thick ink film the edge should have a rounded profile. How sharp the knife-edge and how rounded the profile depends on the film requirement. In simple terms a four-colour process job would



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need a knife-edge and a large solid area a rounded profile. The coaters should be stored when not in use with a protective plastic sleeve over the edge.

Just because squeegee material comes rolled up in a box it doesn't mean you store it in the box. Either lay it out flat or hang it up. If it is kept rolled up when you put it in the squeegee holder it will try to twist back because of its elastic memory, causing the squeegee edge not to be parallel to the printing bed. Have pity on the Quality Control team at your squeegee manufacturer. They take great care in ensuring that your squeegee edge is perfect and what does some hairy assed printer do but ram it in a squeegee holder bite off the ends and wang it in an excuse for a squeegee dresser only to destroy the carefully produced edge. This is the same as taking a new set of tyres grinding off the tread before you fit them on the car. "Oh!" says our hairy friend "I ave to do it case the effin things not straight when I puts it in the older!" Well my effin hairy friend, clean the effin squeegee holder. And then have a shave.

For those unaware of the customary discourse heard in screen print shops "effin" refers to flocculation, that is when pigments separate out in a tin of ink and are seen as a lighter colour on the surface before agitation. It has absolutely nothing to do with procreation. Before I leave this sceptred page. A final tip. Make sure your effin emulsions are fully dry before you expose them otherwise you will get pinholes all over a developed stencil.