PDS International Limited

AUTOMATION IN STENCIL PRODUCTION

By the time you read this, your Christmas Pudding will be a distant memory and your New Years resolutions are losing their immediacy. As a screen printer the annual promise to improve stencil production become more insistent as time goes by. You really can't put it off. The cost savings are beckoning you to bite the bullet.

Experience has shown that the majority of problems suffered on the printing press are associated with shortcomings in the stencil. The stencil is the foundation of the process if it is unstable so is the whole of the process. What is silly is that stencil production is relatively straight forward as the mesh, which is itself the core of the stencil, is a very sophisticated product produced to a very close tolerance, it is how users treat it and the rest of the stencil components that causes the problems.

What is remarkable is that many companies who consider themselves' to be screen printers and use justifiable numbers of stencils have continued in the process without automating their stencil making process.

People have been known to produce a stencil on mesh stapled to a wooden frame, emulsion coated with a piece of torn cardboard, exposed in sunlight and washed out under the tap. If we lose much more of the ozone layer we will have glass roofs on our print shops so we can cure the UV ink with the suns rays as well. However if you want to make money out of it the methods have to be quite different.

To decide on the best set up for your application you need to recognise the stencil characteristics that are critical to the type of work you are printing.

The governing factor is the image you are printing. Second is the number of stencils you have to produce in a day. Third is the type of ink you are using. I am sure there are others but an excess of earwax has fogged the brain. Tomorrow all will be clear.

If we start from the influence the stencil can have on the image:

The mesh meters ink onto the substrate. It has the greatest influence on the ink film thickness.

The amount of emulsion on the print side of the stencil and its roughness determine the edge definition and the thickness of the ink film only on the edge of the image. It does not influence the ink film thickness away from the edge it is the mesh that does that. If the emulsion is too smooth on the print side the static charge generated in the stencil could hold the mesh on the substrate.
The tension in the mesh has to be sufficient to overcome the ink tack and pull the stencil away from the ink immediately after the squeegee. It should be even across the print area of the stencil. Uneven tension can cause distortion of the image.

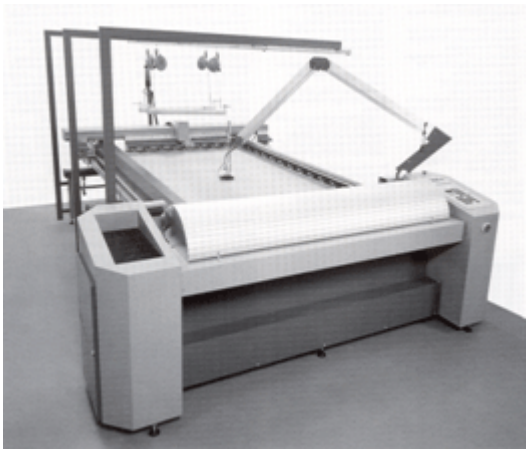
The frame has to be sufficient to maintain the tension of the mesh without excessive bow or twist. The twist must be less than 10% of the snap/off contact distance.

The aim is to produce a stencil using a suitable mesh with the emulsion over mesh dimension having a tolerance of 1 micron. The precise dimension will depend on application.

As a rule the ink supplier will recommend a particular mesh count and thread thickness because they have tested their ink using that mesh specification. Moving away from their specification will alter the amount of ink laid down and could also effect edge definition. Meshes with finer threads but the same mesh count are likely to give a thinner deposit and the thread will cause less of an obstruction to the flow of the ink. It may also be possible to run a press faster as the ink has a shorter distance to transfer through the mesh because it is not as thick as a mesh woven with a thicker thread.

Most stencil departments buy in mesh stretched on the frame. If the stretching company knows what it is doing this is the best approach because stretching mesh is a highly skilled process that requires sophisticated stretching equipment operated under controlled conditions.

Large Format Stretcher



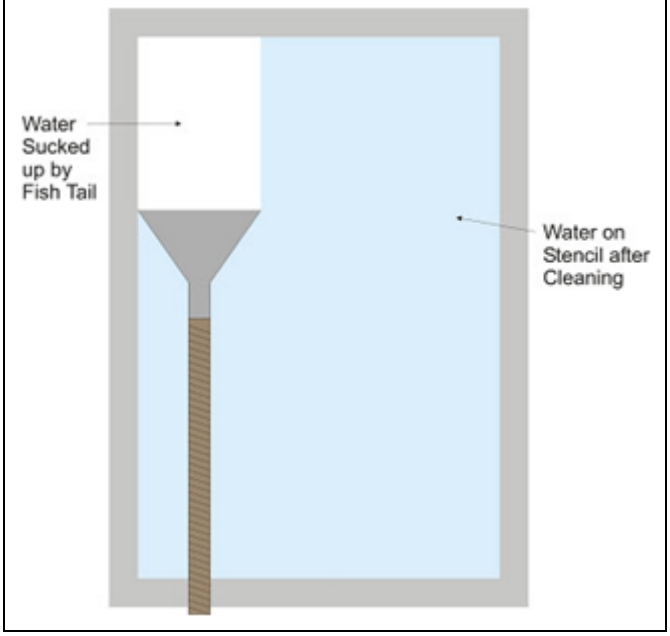
Courtesy of G Bopp

As a user what you have to do is provide a specification to your supplier. This will detail: Mesh type; Manufacturer, Mesh count, thread diameter, weave, colour and whether it is surface treated or untreated. Then you must specify the tension and tolerance, finally the angle of mesh relative to the frame. The frame has to meet the requirements already mentioned. Should you want to stretch your own mesh the stretching equipment has to be in first class condition and you should use a calibrated electronic tensiometer to measure tension.

Once the mesh has been stretched and the tension allowed to stabilise; normally 48 hours; the mesh has to be prepared to take the emulsion. Even the modern pre-treated meshes need rinsing with water to remove dust contamination. Those untreated meshes have to be degreased using a detergent and high pressure water. Most people do this manually using a brush to apply the detergent and a high pressure lance to blast it off. If your volumes are high it is worth considering an automatic washer where the screen has

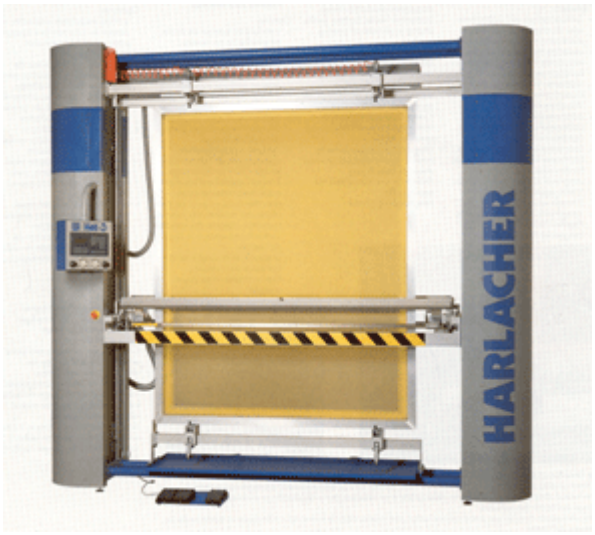
the detergent applied and is then traversed by high pressure jets of water at a controlled pressure and speed. Whichever method you use the most useful device is a wet and dry vacuum with a fish tail attachment. This not only removes most of the water but any solid particles that may be caught in the mesh, a good suck clears most dirt. If vacuumed thoroughly the mesh should be dry enough to coat. You may want to put it in a dryer for a short period to remove all the traces of water. If you want to store it keep it in a dust free environment. It is preferable to process it immediately.

Vacuuming Mesh



Coating the mesh is best done automatically. Manual coating is acceptable if the numbers used are low and the image quality is not crucial. There may be howls of protest from highly skilled manual coaters but they are almost extinct. The reality is you will not beat a well set automatic coater.

Automatic Coater



Courtesy of Harlacher AG

The automatic coater can coat on both sides of the mesh and can be programmed to give a particular coating regime. Speed is adjustable as is the angle of the coater. The edge of the coater can come with different radii typically 1 mm and 0.5 mm. The larger radius will apply more emulsion than the smaller. Tests have shown that the amount of emulsion in the troughs will affect the coated thickness. You will need to establish the range trough fill that will give you an acceptable tolerance of Emulsion Over Mesh (EOM) also known as stencil thickness. When setting up the unit you must have a thickness gauge to check your results.

Thickness and RZ

Should edge definition of the image be critical an Rz meter to measure the roughness of the print side of the stencil will also be necessary.

An automatic coater can also be used for applying capillary film if it has the necessary attachments.

If the conditions of coating, the mesh, the mesh tension and the emulsion remain the same so should the results obtained. If you change any of these you will need the instrumentation available to check the finished stencil. Buy them when you buy the coater the additional few hundred pounds is an excellent investment.

So you have coated it now you have to dry it. You may have noticed I have not mentioned those integral dryers that are sometimes fitted on coating machines. These would serve a much better purpose if used for warming your feet when standing beside the coater! What you must have is a drying cabinet with high volumes of filtered circulating air. The temperature ideally at 30oC, certainly no more than 40 oC. Drying would normally take about 20 minutes unless it is a very thick stencil. The stencil should be exposed immediately in a dry environment. If the emulsion is not dried sufficiently then it will be underexposed and full of pinholes. If you see a large number pinholes you haven't dried the emulsion sufficiently. Please try to keep the processes that create high humidity separate from the dried emulsion until after exposure. Direct to screen imaging will be dealt with later in the year.

Once exposed the stencil should be washed out in an automatic developer. Yes I know people think they can do the job with a hand held spray, probably true if again the image isn't critical but when printing fine lines and halftones you really do need an automatic developer. These consist of a spray manifold that traverses the stencil at a specific speed for a chosen number of cycles. These really do wash out every piece of the image. You will find that fine halftones that were previously difficult to develop will wash out every time.

Automatic Development

The equipment can be automatically fed or even be in line with exposure/imaging station. If you were to consider improving your manual stencil production unit. Make sure you have an efficient dryer with lots of air movement internally. Then pick an automatic coating machine. Next priority is an automatic developer. Direct to screen imaging is a future discussion but what ever you do don't forget your fish tail vacuum. This will suck many faults from your stencils.

The increasingly challenging area of mesh reclamation will be dealt with later in the year. New equipment and chemicals are available to meet these challenges.