Stencil Developing and Finishing

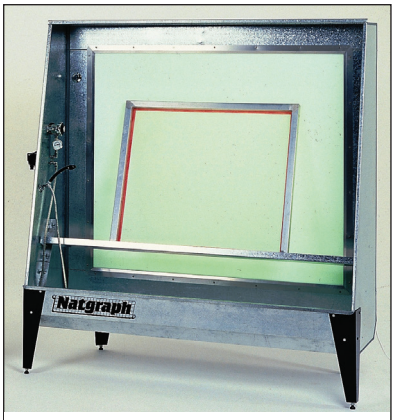
How to Guide

The final stages in screen making are washout, drying and finishing. Even though these are relatively straightforward processes, there are still a number of key factors that you need to get right in order to produce a good screen.

Washout booth

Screens should be developed in a dedicated washout booth that is separate from the screen cleaning booth. This will prevent potential contamination of the stencil from the decoating chemicals used to strip the stencil.

The washout booth should be positioned in a yellow safelight area to prevent the screens 'fogging' whilst waiting to be developed, but should be fitted with a white backlight to enable effective screen inspection during washout.

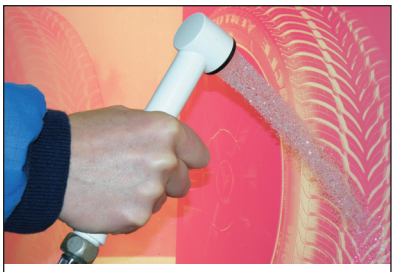


Dedicated washout booth with white light backlight

Water temperature and pressure

The water used for the washout should be filtered to prevent particles in the water supply from becoming embedded in the soft emulsion surface. The optimum water temperature for developing direct stencils is 15 to 30°C; too cold and it will slow down the washout and too hot may cause the emulsion to soften and swell.

The washout pressure should be quite strong (4-6 BAR) and with a good spray pattern. The object is to quickly dissolve and rinse away the unexposed emulsion without softening or damaging the stencil. For manual washout it is good practice to wet down the squeegee side first and then conduct most of the washout from the print side of the screen, as that is where the bulk of the stencil is.



Wash out with a strong water spray from the print side

If you are tempted to use a High Pressure Gun (HPG) to wash out the stencil, select a diffuse spray pattern and make sure that it is held at least 0.5m from the stencil. Never use the gun from the squeegee side as it will blow the stencil off the mesh.

For small screen development for ultra high definition applications, a compressed air accelerated washout can be used with great effect, as this opens up the fine detail with minimal risk of damage to very fine lines/tracks.

Automated washout

For processing large screens in a busy shop, an automated washout system can help significantly. These 'tower' developers wash out the screen from both sides and often reuse the developing water for the first part of the washout to minimise water consumption.

Stencil washout faults

Stencil breakdown – If screens break down during washout, this is often a sign of gross underexposure and/or insufficient drying of the stencil prior to exposure (See How to Guides on Exposure and Drying). Breakdown can also be caused by too hot water temperature, or too high water pressure.

When developing ultra thick stencils (>100 microns) avoid the temptation to pre-soak the screens, as this will soften the stencil leading to breakdown during washout. It is best to use a strong water spray from the print side only as this will give the best result.

Scumming – This can be seen as a transparent glossy residue in the open areas of the dried stencil and is caused by incomplete washout from the squeegee side (also a sign of underexposure), or possibly emulsion build up in re-circulated washout water supply.

Drying

After washout, the screens must be dried thoroughly before printing. It is best to use warm air (max 45°C) with a good air flow from both sides of the screen. You can speed up the drying by removing a lot of the excess water from the screen surface with a dedicated wet and dry vacuum cleaner, though take care not to damage the soft emulsion surface.

It is not good practice to dry the stencil with newsprint as you can leave paper fibres on the stencil surface that are difficult to remove later (especially if the stencil is underexposed).

Screens can be dried either vertically or horizontally, whichever is the most convenient for production, but it is recommended that a dedicated screen drier is used for this post washout drying. After drying it is good practice to let the screens stand for at least 24 hours before printing as they will continue to harden and this will maximise their durability, this is especially beneficial for photopolymer stencils.

Use a dedicated drying cabinet to dry screens after washout

Inspection and spotting out

After drying, the stencil needs to be examined closely to check for defects and to spot out any pinholes. For large screens, a near vertical light box is more practical than a horizontal inspection table.

The inspection must be with a backlight in order to pick up the smallest defects. Use a proprietary blockout filler, such as Regular Filler for all solvent based and UV curable inks. For water based inks, use a sensitised emulsion and remember to post-expose the screen to harden this emulsion. Large open areas can be blocked out using either an old credit card as a spreader, or a narrow coating trough. Spot out pinholes carefully with a retouching brush, but make sure that the surface is flat after application.

A near vertical light box makes inspecting large screens easier

Post exposure

There is considerable debate about the benefits of post exposure. Post exposing the screen to UV light after it has been dried is essential if you have spotted out with a sensitised emulsion, but it has little or no effect on single cure Diazo sensitised photostencils. It will improve the water resistance slightly of a dual cure photostencil but post exposure will have a noticeable effect on photopolymer stencils. Post exposure is no substitution for the correct initial exposure and will have no effect on a grossly underexposed stencil as fundamentally you can't harden emulsion that isn't there!

Taping out

Most screens require some form of taping out for added security during printing. The type of tape chosen will be dictated by the inks you are printing i.e. water based or solvent based. It is important to avoid using thick tapes as this will affect the contact with the substrate and/or the squeegee travel. Take care not to overstretch the tape or flex the mesh when applying the tape as it can actually distort the image for printing. Taping multiple screens is a high cost, labour intensive operation that can be minimised by effective screen making in the first place.

Summary:

Every stage in the process of screen making is important and contains variables that may affect the final output. A basic understanding of all elements of screen making and a methodical approach to fault finding will pay dividends in the long run.

Contact us today to see for yourself how our range of products can help you.

Call: **Europe: +44 (0)1235 771111**
US: 888 910 1008
Asia: +65 (0)643 00701
Email: **salessupport@macdermidautotype.com**
Local Distributor: **macdermid.com/autotype**

MacDermid AUTOTYPE