



Good Housekeeping with PERMASET® Inks: Air Flow & Humidity

This blog should be read in conjunction with:

- 1) [Switching from Plastisol to Water-Based Inks](#), and
- 2) [Good Housekeeping with PERMASET Inks: Ink Hygiene](#)

In the screen drying room:

In the screen drying room, the air should be clean, i.e. lint free and relatively dry, but not too dry. 30-40% is cited as ideal by emulsion manufacturers.

The air should be lint free to minimize or eliminate the risk of rogue (lint) fibres becoming trapped in the wet emulsion whilst it is drying but then compromising the stencil image and appearing in the finished print as unwanted artifacts.

If the room is too humid, then the dried emulsion films will re-absorb moisture. This absorbed moisture will interfere with the proper curing of the emulsion film when exposed to UV light and in doing so, compromise it's ability to achieve full cure.

This in turn will result in the stencil film being more subject to breakdown and failure, particularly with long print runs. Such failure will be first manifest as a slight sweatiness on the underside of the screen, then pinholes and eventually, shredding of the emulsion film under repeated squeegee strokes.

However, if the air is too dry, then that may cause embrittlement of the emulsion film, resulting in it flaking off the mesh filaments, which is also an undesirable outcome.

We recommend acquiring at least 2 hygrometers (meters for measuring the humidity in the atmosphere); install one in the screen storage room to ensure that the humidity is low enough and the other in the print room or workshop. It's a small investment in quality.

In the print room:

In the print room, at the print station, or more precisely, immediately above the ink on the screen, humidity should be kept above 40% RH and ideally above 50%. This is to stop the ink in the screen from drying out and clogging the screen.

The most targeted solution is to have a fogger that keeps a cloud over the screen. Some carousels now include this as a design feature whilst some printers repurpose a reptile fogger from a specialist pet supplies shop.



Alternatives include:

1. Simply using a humidifier (which can chew up quite a bit of energy),
2. Having a spray bottle on hand and spray a fine mist of water over the inks every 15–20 prints (which can be very labour intensive) or
3. We've heard of screen printers in very dry environments (e.g. during winter in very cold climates) watering their carpets each morning.

Another key goal with this air management is to minimize air movement above the screens to reduce or eliminate convective evaporation.

If using a flash unit, another key goal will be to keep the platen and screen temperatures to a minimum to reduce or eliminate evaporation caused by conduction of heat.

However, very high humidity right across the whole workshop can have downsides. One is absorption of ambient moisture into stacks of shirts that are waiting to be printed. Therefore, it makes good sense to keep blanks literally under wraps until you're set up and ready to go with the print job.

Why can this be a problem? Water based inks dry and cure through a distinct 2 phase process; first, all the water has to be evaporated and only then second, will the crosslinking start to occur. It's been calculated that the water removal component of the process can take up to 90% of the energy used.

If, for example, in a tropical climate, your shirts have been sitting on a workbench over a couple of days absorbing lots of ambient moisture, then that will add enormously to the amount of water that has to be removed and thus to the burden that the drying tunnel has to deal with. That will also be reflected in much higher costs.

If the shirts HAVE been sitting around and absorbed too much moisture, you might just run the blanks through the oven before you print them to get out most if not all of the moisture, but if you're going to do that, then ensure that they are kept under wraps until you're ready to print.

So, in summary, keep the air immediately over the screen as humid as possible and as still as possible to prevent evaporation of water on the screen. Also keep the platen and screen as cool as possible.

In the drying tunnel:

In the drying tunnel, or more precisely, as soon as the garment has been printed, the opposite conditions apply. Maximizing air movement will assist with convective evaporation while prewarming garments will also accelerate water loss by evaporation and in doing so, lighten the load on the tunnel dryer.

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Good air movement in the drying tunnel is key to removing air that's already saturated. If the relative humidity (RH) in the drying tunnel is at, or close to, 100%, then evaporation is going to be very limited and all the heat in the world will not get you the result that you need; cured prints.

If you have the flexibility and can adjust the heating zones, then more air movement and less heat at the front of the tunnel progressing to the greatest heat just before the exit. Too much heat at the front end on a relatively wet print can cause skinning of the ink and blistering on the print.

Adequate dwell time (in the oven) is also a key requirement to allow the two phases to work through in an orderly manner. Typically, the time required to both dry and cure a water based ink print is 2-3 times that required for a plastisol.

After the drying tunnel:

With energy costs increasing all around the world, warming or heating a large volume of air and then discharging it to the atmosphere is going to become increasingly cost prohibitive.

You will need to exhaust the gases from the drying oven; that's a given. However, particularly in cold climates, consideration should be given to heat recovery units that will allow at least some of the heat in the exhaust gases to be recaptured and re-used in your production processes.

Heating and cooling are the biggest drivers of global warming, so if you can recapture and reuse at least some of the heat that you've generated, then you'll be doing your bit, however small, to help reduce the rate at which the planet is heating up and save yourself some money in the process.

Conclusion:

Setting up your print shop to utilise a few or all of these techniques will help you produce better quality prints more consistently, use less energy, save money and help make the world a better place.

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