



“I love down time cause I get paid for doing nothing.”

I have held this comment by a printer in my mind for several months as the individual has to remain completely anonymous but I felt it must be heard. The thought of his wages going to waste is bad enough but the cost of lost production is staggering. If you are incensed by his comment, you should be, but your outrage should be directed at the team that are supposed to manage him.

I have an aunt of 94 who has been writing to me recently with Latin phrases inserted in the text, this drove me to renew my association with this wonderful language. Onto the net I went and found numerous Latinists websites with collections of Latin sayings some original and others contemporary.

**Respondeat superior:** Let the superior answer. A supervisor must take responsibility for the quality of a subordinate's work

**Malum consilium quod mutari non potest:** It's a bad plan that can't be changed.(Publilius Syrus 403)

**Semper letteris mandate:** Always get it in writing!

**Stercus accidit:** Shit happens

**Fortiter in re, suaviter in modo:** Resolutely in action, gently in manner. To do unhesitatingly what must be done but accomplishing it as inoffensively as possible.

**Omnia mutantur nos et mutamur in illis:** All things change, and we change with them

**Studium discendi voluntate quae cogi non potest constat:** (Quintilian Institutio Oratoria, iii) Study depends on the good will of the student, a quality which cannot be secured by compulsion.

**Fortunatus sum! Pila mea de gramine horrido modo in pratium lene recta volvit:** Isn't that lucky! My ball just rolled out of the rough and onto the fairway!

With two exceptions they are a text from at least 2000 years ago. We often feel that our challenges are all new, no they are old it is only our perspective that differs.

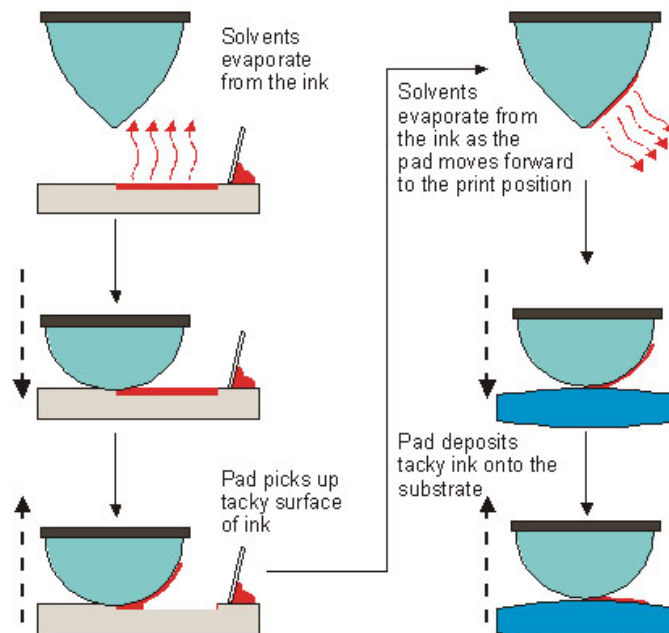
**Docendo discimus:** Teach in order to learn (We learn by teaching)

As someone who has evolved from engineer to printer to teacher and advisor. This phrase sums up my development more than any other. Thirteen years ago I somewhat arrogantly decided to take up advising and training others. You see I thought I knew quite a lot about the industry and how to run production units. It was not until a fresh faced young lady asked why she should set her machine in a particular way rather than listening to how she should set it that I realised how little I knew.

It was one of those moments when the grey matter really starts to function (Like when my mother found my first packet of condoms in a school blazer pocket and wanted to know why they were there.) I won't trouble you with the answer to the second question but the answer to the first made me realise to make a success out of managing a printing process we must have a good understanding of how it works. Once we know the fundamental principles of the process it is much easier to recognise how variables are likely to affect it.

Let us look at both Pad Printing and Screen Printing.

### PAD PRINTING



The printing mechanism of Pad Printing is based on the evaporation of solvents in the ink creating a tacky ink surface that enables the transfer of ink from the plate to the substrate. The speed of evaporation is dependent on the mix of solvents in the ink and the temperature and air movement around the machine. Ideally the machine should be operated in a stable environment at a temperature of 22oC and 55% Relative Humidity. No lower than 18oC.

The lower temperature slows the evaporation of solvents to such an extent that the speed of the machine has to be reduced to allow the solvents to evaporate sufficiently. The relative humidity helps to reduce the effect of static electricity. Relative humidity has no effect on the evaporation of solvents. It does affect items that are brought into the printing environment at a low temperature as water will condense out onto the surface and affect ink adhesion.



Of course not everybody has the luxury of air-conditioning. If you don't have this then pick as stable an environment as possible, away from outside doors and out of the blast of warm air heaters. Don't be tempted to put it on a mezzanine floor, as during the day the top of the building can get very hot. Sun shining through a window can play havoc with the print mechanism. It is better to be in an area that is cooler so you can use a hair dryer to alter the ambient conditions right at the print interface. As the area warms up during the day you switch off the hair dryer. It sounds pretty crude but it works. It is all about your quality needs and reject tolerance. A badly sited machine can produce rejects faster than you can make components.

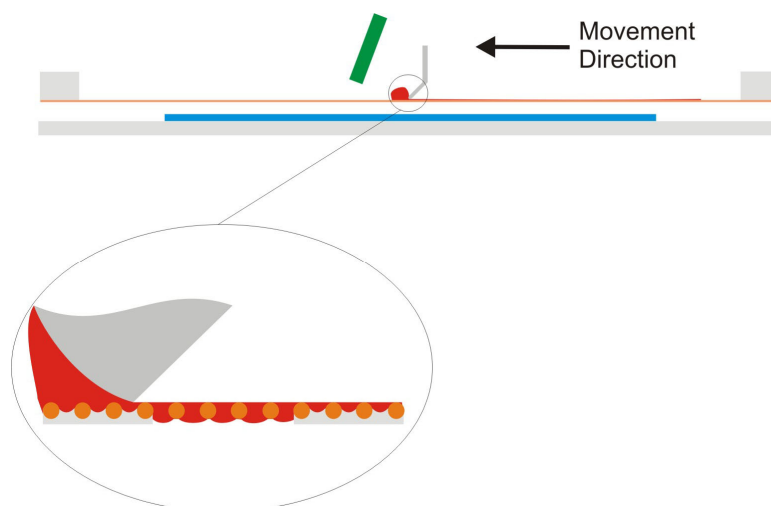
Controlling the ambient conditions is crucial. This makes it easier to maintain the solvent balance of the ink during production. You must start with the ideal ink mix where all the components are weighed into the mix and if the ink in the machine is open to the atmosphere you will need to add measured amounts of solvent regularly throughout the day.

The shape of the pad has to be such that the pad surface will roll over the image area to pick up the ink and roll over the substrate to release the ink. If the pad is too small or the wrong shape you will see distortion in the printed image.

## **SCREEN PRINTING**

### **ACTION OF THE FLOOD COATER**

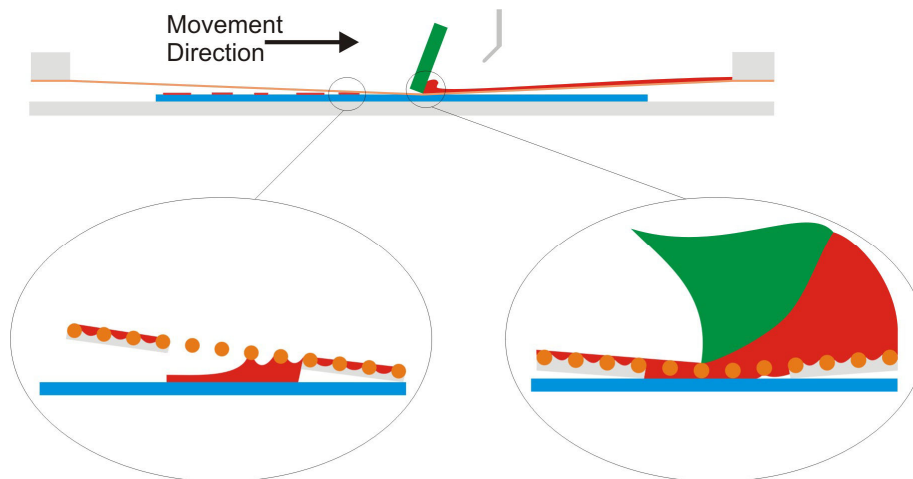
The flood coater fills the mesh openings with ink



#### ACTION OF THE SQUEEGEE

The squeegee brings the stencil into contact with the substrate

The squeegee moves through the ink and creates a wave that causes the ink to flow into the mesh and displace ink introduced by the flood coater.



The ink and the substrate form a temporary bond that pulls the ink out of the mesh when the screen tension overcomes the tack of the ink. If the ink does not wet the substrate well enough the temporary bond is not formed and the ink is not extracted from the mesh openings.

As with all forms of printing the condition of the ink is of prime importance to the process. It has to have characteristics that allow it to flow into and out of the mesh openings and yet stay within the boundaries defined by the underside of the stencil. The better the seal created by the stencil the more likely the ink is to conform to the image outline. In fine details the thickness of the emulsion over mesh on the print side of the stencil has a considerable effect on the build of ink. With large areas it only effects edge definition. In both fine and large areas the mesh meters the ink in large areas it has the greatest effect on the thickness of the ink film. Low tension in the mesh will mean that the print mechanism is less efficient. Unless the snap or peel off is increased the low tension mesh will lay on the ink film and instead of releasing virtually all the ink it will retain a proportion in the mesh openings resulting in uneven deposits of ink. Changing snap off and peel off is not advised. Simply use the correct consistent tension in the first place.

Then we come to the engines of the process the flood coater and the squeegee. Selecting the correct profile of the contact edge of the flood coater and setting the contact pressure and speed of traverse will determine how much ink is introduced into the mesh. Once the flood coater has done its job then the squeegee brings the stencil into contact with the substrate and causes flow of ink through the mesh openings and onto the substrate. This results in the ink wetting the substrate and the forces created pulling ink out of the mesh openings as the tension in the mesh overcomes the tack of the ink and pulls the stencil away from the substrate. If the process is in balance the mesh lifts immediately as the squeegee traverses the print area. The angles created by



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### THE PAD AND SCREEN PROCESS

the contact edge of the squeegee are crucial in determining the flow into the mesh. High pressure on the squeegee will flatten the edge and reduce the effective angle of the squeegee tip. Softer squeegees are more susceptible to increased pressure and hence have a tendency to put more ink down than a hard squeegee. Pressure is the greatest variable in squeegee setting and it is often misused. High squeegee pressures are generally used to compensate for poor set ups on the machine or machines that are unstable in their operation.

Set up is 80% of efficient printing. Once the machine is set up correctly the printer should concern himself with the output of the print unit. On a semi automatic machine you often see the printer loading the press and an unskilled person taking off and inspecting. Surely it should be the other way round with the printer checking the print quality. With automatic lines a printer can work between both feeder and stacker.

These are simply the mechanics and hydrodynamics of the processes. There is much more to know but you would be amazed how many printers do not understand these basics.