COMPUTER SCREEN IMAGING AND DIRECT PROJECTION

It is true printers are known to still hand cut their origination, stick it to a coated mesh and carry out the exposure outside in the sunshine. I suppose if you were to do it in this country just wait for the next heavy shower and develop the screen. How's that for being in tune with the environment. Not a sure way to profitability but it can work in tropical climes.

Creating the image for the stencil has become increasingly problematic. Large films are expensive to produce, easy to damage and very difficult to modify. Having produced and used them if they are required in the future, storage can take a lot of space. Accepting that thinking printers no longer make additions to a design by the random placement of a size nine boot on the film, even the most fastidious have difficulty in managing significant numbers of photopositives. Few people realise how ambient conditions alter the size of a photopositive. A 10% change in relative humidity can increase or reduce the size of a 1000mm image by 180 microns. We have all seen printers (I use the term loosely) who keep their films on top of the dryer to dry to a crisp and then use them to check the size of a printed image. They then wonder why register is a problem. Even with the developments that are to be spoken about in this article there is still no substitute for a carefully produced and handled photopositive when printing four colour process work or using screen rulings above 100 lines per inch, how long this will be the case is another matter.

It may be that some of you have read this column over the last couple of years and I have been banging on about process control, reducing variables etc, well direct to screen imaging and direct projection are a further spin of the wheel towards improved productivity. Some people would say they compete against each other in reality they are also complementary.

The take up of multi-colour lines exposed the shortcomings of stencil production, traditional methods of printing down frames and large photopositive were both costly and time consuming. Although for ultra large format stencils had used direct projection systems for many years its adoption in general screen printing was restricted to multi-sheet posters where the system allows sequential selection of sections of the final image when exposing stencils.

Computer to Screen of the image to be exposed has moved along way from the corduroy effects that were suffered not so many years ago.

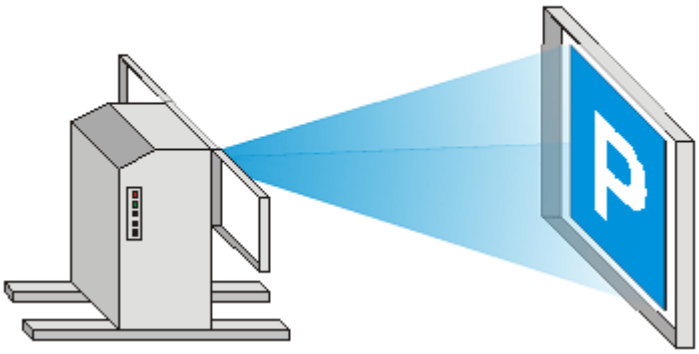
To make the comparison clearer it is best to explain the operation of both techniques.

DIRECT PROJECTION

The technique is not new up to forty years ago conventional cameras were adapted to project images onto large format screens. The current equipment has taken much of the pain out of the process with sophisticated technology. Direct projection allows small photopositives to be produced and then projected up in size with a lens system. These projectors have a high intensity Ultra Violet light source in front of which is mounted the film. A lens system projects the image up onto an emulsion coated mesh. The enlargement achieved is a function of the distance from the lens and its magnification. With magnifications up to 22 x the quality of the optics has to be supreme. Hence the capital costs are sobering, however the savings can easily justify the costs as long as the application is suitable for the technique.

The standard magnification varies between 4 and 15 times of the prepared film, depending on the camera model. The highest magnification of a customized camera installed is 22 times with which screens up to 9 m can be exposed. The maximum size photopositive varies between 280 and 510 mm (diagonal), depending on the model. Although the photopositive is relatively small it has to be high resolution and blemish free. The image setter has to be at least 2500 d.p.i. with the film density of 4.5 dmax. Any problems with the photopositive will be magnified by the projection system. In any part of the process cleanliness is important but in this area it is crucial.

Direct Projection



Line resolutions of 55 l.p.i. are normally achievable but not always necessary and on smaller format applications 85 l.p.i. can be attained. A tonal range of 20% to 80% is about the limit. Much depends on the characteristics of the coated mesh. White mesh is necessary with a low stencil build. The emulsion is normally coated 1 and 1 and must be highly sensitive to UV light. There are now a range of suitable emulsions from all the main manufacturers but none of them will be satisfactory if the coating and drying of them is not very well controlled in a clean environment. The reason for this configuration is the relatively low levels of UV light projected onto the coated mesh. These levels would typically be a twentieth of that obtained from a conventional exposure system at 4x magnification.

Wash out (development) would normally be in an automatic unit where the pressures are kept to a minimum. Achieving the correct exposure is critical, moisture is the main problem keeping the emulsion dry before and during exposure is crucial. If you expect to be able to develop the stencil in an open developer in the same room as you expose you could be in trouble. You need to consider the whole of your stencil production process not just direct projection in isolation.

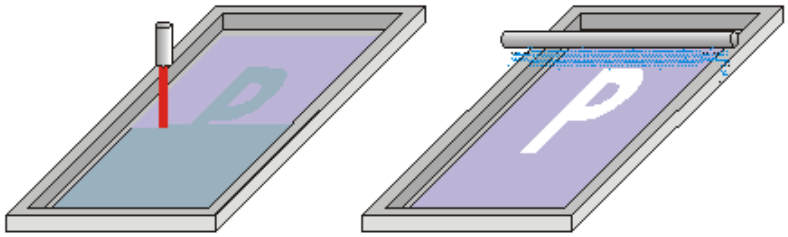
It sounds as if direct projection is fraught with difficulties. That is what its competitors would like you to conclude. Most of the problems experienced when it re-emerged in recent years was caused by poor process control and emulsions that had not then been sufficiently refined. With careful process control and utilizing its strengths users have found the modern equipment a fast and cost efficient method of producing stencils for large format and Point of Sale applications. The lower capital investment compared to Computer to Screen alone has to make it well worth consideration.

COMPUTER TO SCREEN IMAGING

As with all digital technologies techniques are constantly improving that is clearly the case with direct to screen imaging. There are two distinct methods of creating the image. One is where the system exposes the non image area on the coated mesh using an Ultra Violet Laser leaving the image area soft to be washed out (developed) conventionally. The other technique is when the image is printed onto the coated mesh with hot melt wax or water based ink, effectively forming a photopositive, the printed screen is then exposed with UV light to harden the non image area. The unexposed emulsion along with the hot melt wax or ink is washed out in the normal way to produce the image. An additional variation is that systems are either mounted near vertical for large format stencils or horizontal for smaller sizes.

Unlike direct projection these systems can use conventional emulsions that are coated to suit the printing application rather than the exposure method. Their main advantages are that photopositives are not required. The image is sent digitally from a processor through a RIP to the output device. In the case of the hot melt printed image the contact between the image and the coated screen is perfect so there is little chance of undercutting. With the laser exposure system the proximity of the laser to the coated screen is such as to provide very close tolerance imaging not unlike that of a conventional image setter.

UV Laser Exposure



Laser Exposure Image development

Inkjet Image Generation

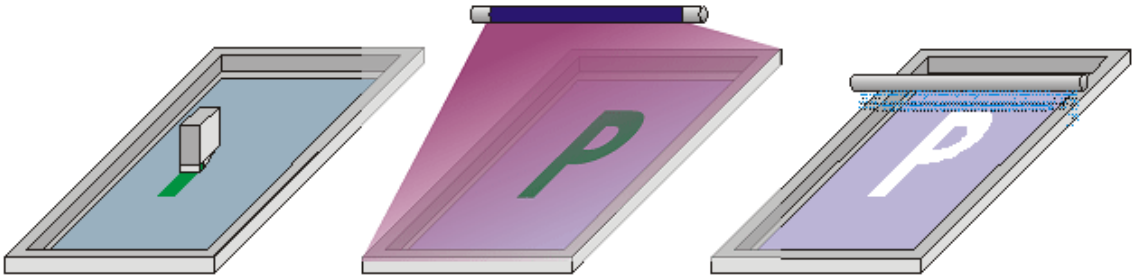


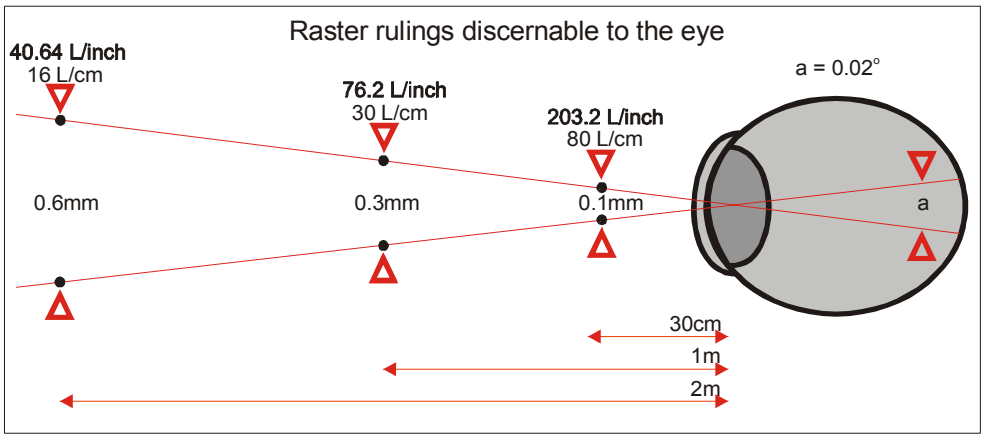
Image Generation Ultra Violet Exposure Image Development

So why don't we all throw away our traditional photopositive based exposure equipment and order on of these units immediately? They cost serious amounts of money starting at €80,000 for an image size of 650mm x 650mm up to in excess of €250,000 for 3000mm x 2000mm. Then there is the cost of the consumable inks. Of course the laser exposure systems do not suffer this consumable cost but their initial capital cost is higher. Remember also the maintenance charges and the working environment. Imaging times compared to direct projection are longer. Unless you have a culture where cleanliness is taken for granted and you believe in robust process control these technologies will be like a Saville Row suit in a in a flea market. Spotless mesh, automatic coating, controlled drying and automatic washout are all mandatory. If you don't intend to do it right when you purchase this equipment you are wasting your money.

In terms of the capability of the systems to enable you to print detail the following table is a guide:

Equipment	Line Ruling	Tonal Range
Direct Projection	Up to 85 l.p.i.	2% to 98%
Ink Imaging	Up to 85 l.p.i.	2% to 98%
Laser exposure	Up to 133 l.p.i.	2% to 98%

Whilst line ruling is being mentioned, its requirement is dependant on the viewing distance. There is very little point in using 133 lines per inch if the image is being viewed from 15 feet. The diagram below is a useful indicator:



The resolution that a human eye can discern is determined by the angular distance between receptors in the retina. This distance is 0.02°. The line ruling that has to be printed without the eye being able to see the dot is determined by the viewing distance. Hence the diagram shows a viewing distance of 30cm the line ruling has to be 80 lines per cm (203.2 lines per inch) where the dots are 0.1mm apart. For a viewing distance of 2 meters the line ruling has to be 16 lines per cm (40.64 lines per inch) where the dots are 0.6mm apart.

Don't assume you have to go to higher line rulings very effective direct projection is run at 45 l.p.i. and lower.

Ink imaging systems often are used at 55 l.p.i. The dot quality and large tonal range giving fine highlights and defined shadow. The higher resolution of the laser systems are used on industrial applications where the viewing distances are short.

As with any purchase the business case has to be made. Those who have been able to justify the move into any of these processes and managed them correctly have reaped tremendous benefits. Speed of the Computer to Screen systems has increased and will continue to do so. Direct projection is a cost effective solution for large format imaging. None of these will ever be "cheap" to buy but the savings can be enormous.