2006
JULY

GIVE YOURSELF AN EDGE WITH SPECIAL INK SYSTEMS

Article reproduced with the kind permission of:
Screen Process and Digital Imaging Magasine
Author:
Peter Kiddell
PDS Consulting
e-mail: peter.Kiddell@pdsconsulting.co.uk
www.pdsconsulting.co.uk

These ink chemists are magicians they enable us printers to create all sorts of special effects on a vast range of substrates. Probably the area in which they are most innovative is in Textile Printing. This is where designers let their imaginations run loose and the ink technologists follow close behind pandering to their fantasies. (Hold on dear boy you are not writing for the tabloids. Ed) The non-textile inks are not far behind with printers having a wide range of special effects inks available to them.

The reality is that if screen printing is to secure its place in this increasingly digital world then it has to provide added value to the market. Wonderful though digital printing is and in spite of ink companies best efforts the range of inks that can be applied by the process in its various iterations is very limited. Screen printing is completely different. Being an ink friendly process if the ink will pass through the mesh then it is possible to print it. This characteristic allows the ink technologists to play to their hearts content. Of course the technologists are governed by what the producers of the ink components make available to them. The huge volume users such as the paint and cosmetics industry drive this availability. There are times when specialist materials such as precious metals and photoluminescent pigments are simply too expensive to apply with the volume application processes, these are then suitable for screen printing.

Starting with Textile printing inks what makes them so innovative is the ability to lay down ink on the material, into the material and have the ink dissolve part of the material. The main systems used for printing onto fabric are plastisol, sublimation, discharge and dyes. It is the plastisols that give the edge over digital printing.

The most commonly used ink in the Textile Printing industry is Plastisol. Pure Plastisol inks are 100% solids without any solvents. They consist of Polyvinyl Chloride (PVC) and plasticizer. The plasticizer is in liquid form with a very high boiling point. For good adhesion to the fabric the wet ink must penetrate into the surface of the material and the material must be able to withstand the curing temperature. When heated to 160^{o}C the PVC particles absorb the plasticizer forming an elastomer. This elastomer forms around the fibres of the fabric and create a permanent bond. The ink manufacturer can modify the ink film characteristics by incorporating specific additives into the formulation.

There are often two stages for the curing process. The first is flash curing where short wave infrared energy is used to cure off the surface of the ink film. Short wave infra red is at the visible end of the infra red spectrum. It can be switched on and off very quickly, hence the term flash curing. Once the print is complete the ink has to be heated all the way through so that a complete cure takes place. Without a complete cure the performance characteristics of the ink will be compromised. The plasticizer will not be

fully absorbed and the ink will crack and flake off. The curing is carried on a conveyor dryer, these can be gas or electric but they must bring the complete ink film up to the cure temperature and hold it there for 20 to 40 seconds. In this case medium and long wave infrared is used the aim being for the heat energy to penetrate right through the ink film. Take advice from your ink manufacturer as to the right drying regime and do not buy the cheapest dryer. As with most printing applications the dryer is the governing factor in production. When curing is taking place it is not the dryer temperature that is the most important it is the temperature of the ink. An infrared non contact thermometer is an ideal instrument to use to check this. Lighter colours take longer to cure than dark as infrared energy is reflected by lighter colours.

With most Plastisol inks PVC is the main body of the ink and Phthalates are the plastisizers. There is environmental resistance to the use of these materials and ink suppliers are bowing to pressures in the market to produce Plastisols without either one or both of these chemicals. The characteristics of these inks vary from the conventional systems and care must be taken in curing to ensure a complete cure. The suppliers technical Data Sheet will give provide recommendations.

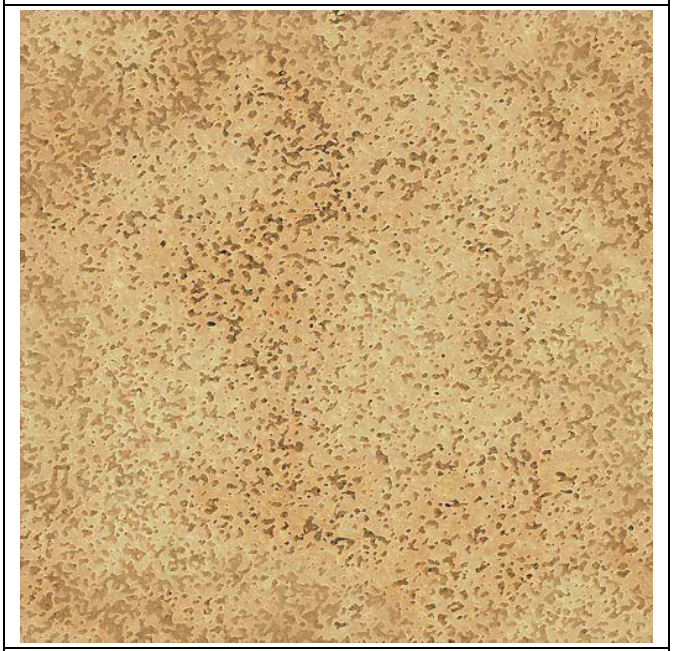
The effects that can be achieved with Plastisol inks are varied and numerous. The Plastisol base can be adapted to carry many different materials and altering the cure process can produce variations on a theme. That nice piece of suede leather sewn onto the T-Shirt is actually Plastisol Ink.

SUEDE EFFECT

Courtesy of Colenso Screen Services www.colenso.co.uk

Then there is a cork effect that looks good enough to stopper a Champagne bottle.

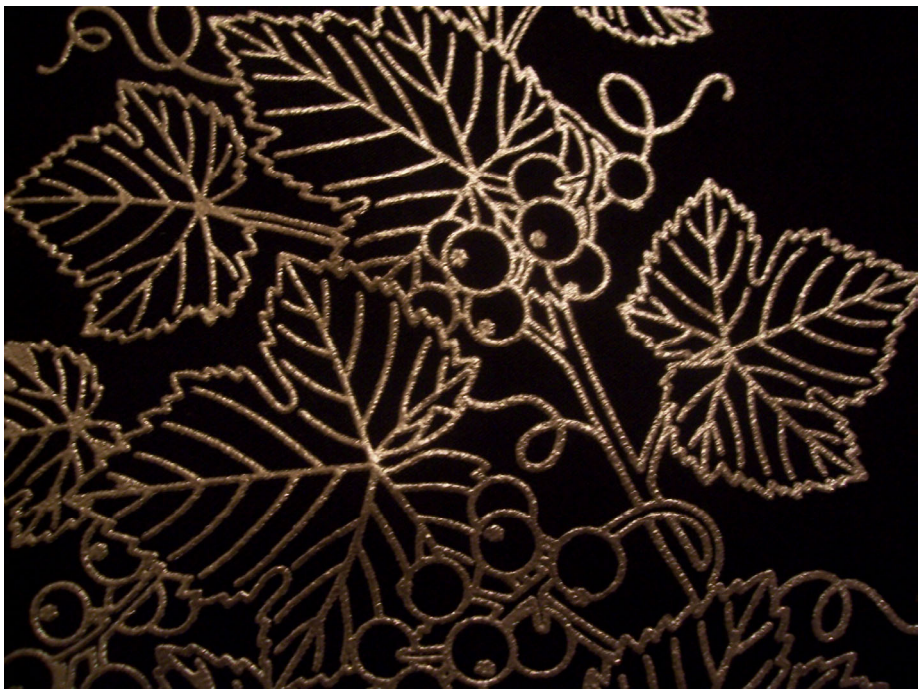
CORK EFFECT



Courtesy of Colenso Screen Services

Is that real gold on the dress? No its Plastisol ink!

METALLIC GOLD



Courtesy of Colenso Screen Services. www.colenso.co.uk

A whole range of different textures and effects can be combined to provided the remarkable images seen on t-Shirts and other garments.

DIFFERENT TEXTURES

Courtesy of Colenso Screen Services www.colenso.co.uk

Add to this the softer feel of water based inks and dyes along with discharge inks. Discharge inks actually bleach the material so that the final colour is much brighter on a dark fabric. Selection of the fabric is important otherwise there will be real problems. It is a shame there is such a divide between POS, Graphics, Industrial and Textile printers. There is no doubt the most innovative are the textile printers. Photochromic, thermochromic, wet and reveal, photoluminescent, glitter, metallic, high build etc etc are all ink technologies that have been widely adopted by the textile printing trade. The great shame is that much of it has disappeared with the rest of our manufacturing to the Far East. We can recover some of this work by being even more imaginative and showing the designers houses what the UK industry is capable of.

THE NEW INK TECHNOLOGY FROM SERICOL

BALANCEDMATRIX
TECHNOLOGY

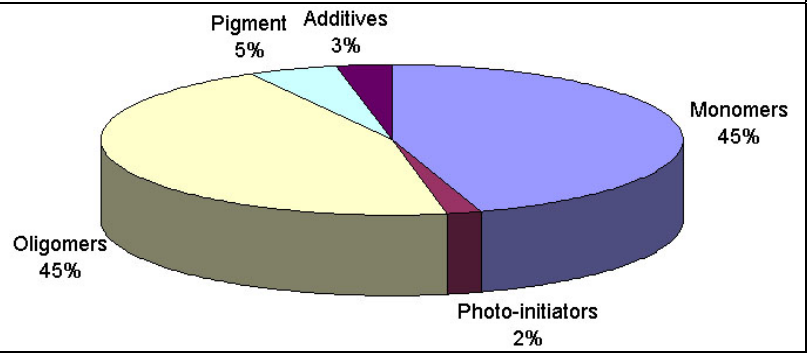
GIVE YOURSELF AN EDGE WITH SPECIAL INK SYSTEMS

As printers we have often been faced with problems when printing UV Curing inks onto Self Adhesive Vinyl and Polystyrene. An ink with good adhesion normally embrittles the substrate during the cure process as the ink film shrinks putting stress on the substrate. Flexibility can be improved by reducing the chemical bond to the substrate so any ink film shrinkage creates less stress, but this comes at the cost of print adhesion. Displaymaster XX unique chemistry eliminates shrinkage of the ink film so that stress at the ink/substrate interface is neutral.

Displaymaster XX is based on a new oligomer chemistry that gives excellent adhesion and flexibility. These two characteristics are normally a trade off.

BASIC CONSTITUENTS OF UV CURING INK

- 45% Monomers
- 45% Oligomers
- 2% Photo-initiator
- 5% Pigment
- 3% Additives



The Oligomers are long chain molecules that are effectively the part of the ink that acts as the glue and are equivalent to the resins in a Solvent based ink system. The Monomers are short chain molecules that act in a similar way to the Solvents in Solvent Based ink systems they assist the inks flow characteristics. Unlike solvents they do not evaporate so the UV ink does not dry in the stencil. Typically when the whole ink system cures the monomers and oligomers transform into solids. With traditional systems this curing causes the ink film to shrink. Sericol have reduced this effect considerably using very sophisticated chemistries that include Cationic Curing and the likely adoption of Nanotechnology in parts of the formulation. This is very clever technology and could lead the way to a whole new range of ink systems that have a combination of physical and chemical properties that previously could not be combined in one ink system.

For those who may be interested Nanotechnology is the development of materials the building blocks of which are from 1 to 100 Nanometres in size. A Nanometre is 1 Billionth of a Metre. The effect on our lives will be as great as the discovery of the transistor. Already there are ink systems which when printed will develop internal structures in the ink film that will perform as miniature pipelines with valves that control the flow of materials within the pipe. What the heck is this to do with inks you may say. It means the same to inks as it does to all formulated materials. The rules are changing. Not just improvements in adhesion but ink films that are fully active devices. Ink films that heal themselves after they have been scratched, ink films that are loudspeakers. Talking inks now there's a thought. Do you think they will nag us if we want to get in late?