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**SUBSTRATES**

Cucumbers and deep frozen inorganic materials are probably the most unusual substrates I have printed on in my career. Just don't ask about the cucumbers and I am sworn to secrecy regarding the inorganic materials. Have you noticed how many new substrates are appearing on the market to suit the needs of digital printers, or more correctly inks used in digital printers. The action of ink entering and ejecting from piezo ink jet heads is one of the keys to digital printing and the inks have to be engineered to negotiate this series of steps. This adaptation of the inks can compromise their long-term performance in their application and will certainly reduce the range of chemistries that can be used. Changing from one discrete chemistry to another on the same machine is not practical.

Screen printing is an ink friendly process that enables almost an infinite number of mediums and ink systems to be printed onto an even wider range of substrates. This gives the designer and the engineer a great degree of flexibility.

The governing factors in the selection a substrate are:

- Is the substrate suitable for the application?
- Will the ink wet the substrate and form an adhesive bond.
- Is there anything leaching out of the substrate that will reduce that adhesive bond.
- What is the useful life of a printed substrate?

A simple fact that is often overlooked is the understanding of what is the effective substrate. For example with anodised aluminium the print surface is aluminium oxide not aluminium. Mineral filled plastics may well have an inert mineral coating. PVC with a white UV flood coat will be cured UV ink that is a thermoset material, totally different to PVC. Then there are polymers that would not be expected to accept ink such as polypropylene that has a naturally low surface energy, only when it is pre-treated by corona discharge, flaming, plasma or liquid primer is the surface energy high enough for it to be wettable by the ink. All of these techniques alter the boundary layer of the material, that is the layer of molecules on the surface. These molecules are altered by the treatment to enable the ink to bond to the surface. Sometimes solvents in the ink dissolve the boundary layer other times highly reactive resins create a key. Whichever method is used the chemistry can be very complex. The simple rules are the surface needs to be clean, free of contaminating particles and wettable by the ink.

When you buy your substrates from reputable suppliers you can be sure that they have been designed for printing and the supplier should be able to recommend the ink systems that are suitable for their material. However always run a test on new material with the chosen ink system. It is not just a matter of adhesion. It could also be discolouration caused by the UV curing radiation or shrinkage due to curing temperatures or even embrittlement of the substrate.

Every substrate supplier will tell its customers to store substrate correctly. The ideal storage conditions for paper and board are 20°C and 50% Relative Humidity (Rh). This

when the paper is most stable. Paper and board should come in a moisture proof wrapper and should be left in the print shop to stabilise in temperature before removing the wrapper and printing immediately. If the material requires further processing cover it in a plastic film or if it came with a moisture barrier covering that can be used again, use that.

**ROBERT HORNE SIGN AND DISPLAY  
WAREHOUSE**



The paper and board industries have taken a tremendous hit with the unprecedented rise energy costs but usages have stayed at the same level. These rocketing energy costs have impacted plastics production so substrate suppliers are facing extremely difficult times with demands for lower selling prices yet carrying increased costs. Something's got to give and it is higher costs for the end user. When you look at the stunning warehouses of substrate suppliers and see the vast range of materials in stock it makes you wonder how they manage the twists and turns of the market, probably by being very efficient big players.

This vast stock includes all types of material both paper and plastic with a range of innovative finishes. Using these novel finishes and printing them with special effects ink gives a range of opportunities for screen printers to offer premium products to the market. It is easy to assume that your clients know all the substrates that are available to them.

Keep swatches of every substrate that you can print and show them to your clients. Don't just stick with plastics and paper products; consider denim, silk, stainless steel, glass, ceramic, wood or even pressed leaves. You may think I have been smoking hallucinogenic pressed leaves but expanding a client's imagination will grow your profits. Screen printers are special and can do special things.

**CAST ACRYLIC FROM  
ROBERT HORNE SIGN & DISPLAY**



**COATED POLYESTER IN EXTREME  
CONDITIONS  
FROM MACDERMID AUTOTYPE**



Then there is the range of coated and uncoated polyester films that are available to the printer from companies such as Macdermid Autotype Ltd. Much of these substrates have been developed for the membrane switch industry or for IMD (In mould decoration).

These are very sophisticated combinations of polyester film and various coatings. Hard coatings, textures, matte finishes, antireflective and one remarkable coating that is antimicrobial. Here the base polyester has a hard coating that contains a material called Microban®. When microbes, such as bacteria, mould and mildew come in contact with the product surface, Microban® protection penetrates the cell wall of the microbe and disrupts key cell functions so that the microbe cannot function, grow or reproduce. This coated polyester is easily screen or digitally printed and is used in hundreds of applications where cleanliness of surfaces is crucial. Keyboards are a favourite place for germs to congregate but

the microbe killers in these coatings deal with most if not all of them. These coatings are increasingly used in hospitals where hospital caught infections are an ever-growing problem.

There are the more mundane applications of floor graphics where a hard coated laminate is used that that is easy to print, apply and remove; yet can withstand abuse from frantic children, careering trolleys and teetering stiletto heels.

Photoluminescent materials are available as pigments in ink and as substrate. They can be as self-adhesive vinyl, rigid PVC or paper. These materials are not radioactive non-toxic, lead and phosphorous free and present no danger to health or the environment.

**HARD COATED POLYESTER FILM  
FROM MACDERMID AUTOTYPE**



**ENLIGHT LED'S  
FROM RHSD**



The most common are Zinc based and the long life versions contain Magnesium Strontium Silicate. Time till complete decay for zinc based is about 10 hours whereas the long life versions are nearer 80 hours. Working life is likely to be 10 hours and 24 hours respectively. Health and Safety legislation specifies that these materials have to be used in certain signage applications. Where you need to be able to read signs and see escape routes even though there is no light.

Backlit substrates that traditionally would have used neon or fluorescent tubing are now moving over to Light Emitting Diodes (LED's.) These arrays use less power and produce equivalent light levels. As well as 85% less running costs their life expectancy is up to 10 years.

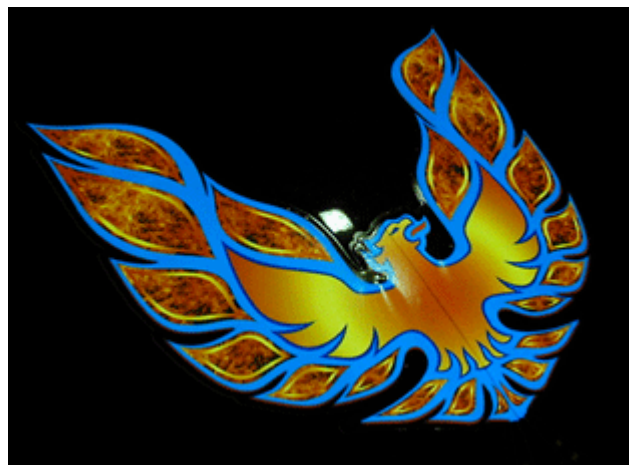
This makes these attractive light sources an ideal means of backlighting lettering, you will be seeing more and more of these systems and not just as Christmas decorations.

An alternative is the electroluminescent material supplied by Light Tape UK Limited. Mike Hardcastle the Managing Director has been deluged with enquiries from sign makers and POS companies for this product it can be used as back lighting or on its own.

LightTape is the longest and brightest electroluminescent lighting in the world. It can be supplied in a range of colours and widths, in lengths up to 100m. It can be readily used in flashing or steady state modes for indoor or outdoor applications.

We are being constantly presented with new and innovative substrates each one is an opportunity for inventive screen printers to create an eye-catching design or product. Combine special effect ink with an unusual substrate and you have a premium product.

**LIGHTTAPE IN USE AS BACK LIGHTING**



Use your imagination; let the mind float free, back to the pressed leaves again! Become the J K Rollins of the screen printing industry and create your own Philosophers Stone.