As screen printers it is easy to forget the flexibility of the process in terms of the range of materials than can be printed onto an equally large number of substrates. The term “Ink” covers anything that can be suspended in a fluid and caused to flow through a screen mesh.

To do this it must be possible to dissolve the material or turn it into a powder that can be held in suspension within a fluid. I could bore or amuse you with a list of materials that can be printed through a mesh. From Antibiotics to Zirconium with more unexpected materials including cement, butter, glass and deodorant, will all flow through the mesh with encouragement from the squeegee.

So how is this characteristic of the process going to improve your profitability? It could open new markets, or enable you to offer additional products to existing customers. Never assume your client understands the capabilities of the screen printing process.

Let us look first at the readily available specialist ink systems.

PHOTOLUMINESCENT

"The emission of light as the result of the absorption of radiation, and continuing for a noticeable length of time after excitation." Not to be confused with Fluorescence which is "The emission of light as the result of, and only during, the absorption of radiation of shorter wavelengths (time scale less than approximately 10-8 seconds)."

The photoluminescent effect is achieved by using a non radioactive, non-toxic zinc sulphide pigment that absorbs daylight or artificial light (fluorescent, incandescent, mercury vapour, metal halide, etc.). The pigment stores the light photons as energy, which excites the zinc sulphide molecules and causes them to emit a greenish-yellow glow best observed in total darkness. The pigment will continue to glow until exhausting this energy, but it can be recharged repeatedly by re-exposure to light. Depending on the zinc sulphide concentration and exposure to environmental conditions, the material can be reused for years before its ability to recharge and emit light fails.

Courtesy of Pröll KG www.proell.de

To become sufficiently charged, zinc sulphide pigment requires approximately 5-15 min of exposure to a light source that emits at least 30-50 lux. Natural sunlight and fluorescent tubes, which emit white light, work best to activate these materials. Under incandescent bulbs, which emit a "warmer", more yellow light at lower wavelengths, the pigment requires longer exposure times. Red light and yellow sodium-vapour light are not suitable for activating the pigment.

For applications where the emission of light needs to continue for several hours other much more expensive pigments are available.

Screen mesh needs to be 34-50 threads/cm as the pigments are very course. When mixing the ink the action has to be sufficient but not too fierce as the larger pigments can shatter and reduce the photoluminescent effect.

It is possible to buy photoluminescent substrate that can be overprinted with conventional ink. Alternatively clear films can be printed and over laid onto the substrate. This allows the message to be changed without incurring the cost of the expensive substrate.

Applications include: Safety signs, Marking evacuation routes, Toys and textiles.

MIRROR INKS

Courtesy of Pröll KG www.proell.de

These are solvent based systems for producing remarkable mirror effects on clear transparent high gloss films. The end results are dependant on substrate and printing conditions, as well as drying. Printed on the back of a substrate the mirror ink must be over printed for protection from ambient conditions and to ensure reasonable adhesion. Stencil, squeegee, floodcoater and substrate have to be absolutely free of any silicones. Cleanliness is essential when printing the ink. The results achieved make the care taken well worth while. Applications include: In mould decoration (IMD)

REFLECTIVE

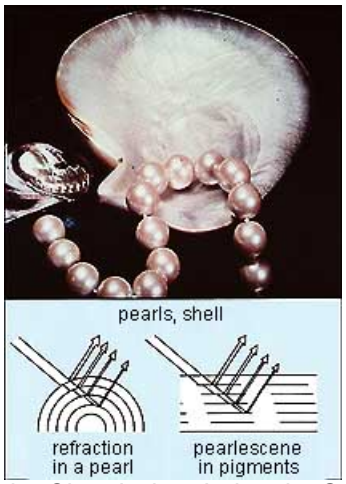
Courtesy of Reflec Technology

This ink contains millions of micro spherical glass beads that have been coated hemispherically with aluminium to make them retroreflective (my spellchecker is struggling with those two) so that an incoming beam of light is returned back to its source. Car headlights are reflected back to the driver. The reflected light can be modified by compounds that alter its colour. So the retroreflected image can be an attractive or informative design as well as an excellent safety feature. Safety being the main objective. Designed initially for use on textiles this technology is finding its way into other applications. It is effective up to 500 metres.

Applications include: Safety clothing, novelties, signage

PEARLESCENT INKS

In Nature



Fonds der Chemischen Industrie, Germany

Screen Printed

Courtesy of Pröll KG www.proell.de

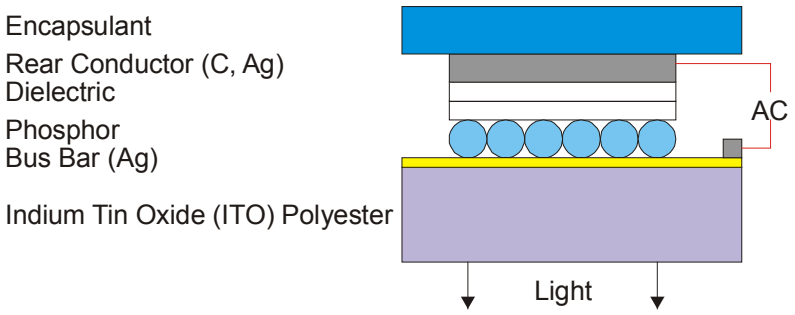
Pearlescent pigments are coated with very thin layers of titanium dioxide, which in their printed form scatter light rays indiscriminately, yielding a differing colour reflectance when viewed at varying angles and light sources. These products have extreme cosmetic appeal since the luster of the finished product yields a smooth, rich finish. His can vary from silk matt to sparkling depending on the size of the particles. The luster is further enhanced when printed over other colours, black and opaque white.

ELECTROLUMINESCENCE

Although the basic phenomenon of thick-film Electroluminescence has been known for some time, the materials and requirements for a practical lamp have until recently remained expensive, difficult to work with, and challenging to package into a useful and practical format.

The EL lamp is essentially a capacitor structure with phosphor sandwiched between the electrodes. Application of an AC voltage generates a changing field within the phosphor which causes the phosphor to emit light.

Graphic of Electroluminescent Layers



The recent ability to encapsulate Phospors in glass makes their stability and ease of printing much improved. EL is a practical, lightweight, thin, cool, and versatile means of illuminating controls and displays. Portable devices is its biggest market. Together with display backlighting applications, it is now also possible to integrate membrane (and other) switch technology with EL.

For EL to operate a power source is required, this must be AC. Originally the drivers were very bulky but the use of Integrated Circuit technology has miniturised the inverters and reduced power consumption by 50%. This means it competes very favourably will LED's. If you have been scared off EL in the past, reconsider, it could transform an otherwise mundane display into an animated sign with a high sales value. Screen printing is the best way to deposit the layers required in Electroluminescence. Go for it.

THERMOCHROMIC

Courtesy of TMC www.t-m-c.com

Thermochromic inks are based on thermochromic micro-encapsulated leuco dyes, which are similar to wax particles that "melt" as they heat up, changing their optical properties such that they lose their colour. When they cool again, they solidify, regaining their colour.

When used in combination with non-thermochromic ink, the colour can change to virtually to any colour with a temperature as little as 3°C. Also, when the ink is subjected to a "hot" or "cold" condition, a message appears. It then converts back to the original colour upon cooling. There can be different types of changes at different temperatures - limited only by your imagination. The range of colours is fairly broad, as is the temperature at which the colour changes takes place. Inks are available in 14 different temperature ranges varying from 25°C (-13°F) to 60°C (127.4°F) for full colour to 15°C (5°F) to 65°C (149.0°F) for no colour.

Thermochromic Inks can be applied to almost any type of substrate. This includes paper, polyester, vinyl chloride sheets and plastics. Many of the inks are low in VOC's as a result of being formulated with water and are virtually odour free. All of the inks are non-toxic upon drying, making them safe to apply to food packaging, beverage labels and children's products.

The coated dye capsules are relatively large compared to conventional pigments so mesh selection is important. Although mixing Thermochromic ink and conventional inks together can produce a vast range of colours. Care must be taken with ink formulation, aggressive solvents can damage the encapsulation. Water based, UV Curing, Epoxy and Plastisol systems are the most suitable with Water Based being the favourite.

For more accurate temperature indications. Liquid Crystal microencapsulated pigments will indicate temperature changes of 0.2°C. These are much more expensive than leuco dyes but can be used for thermometry. Taking a babies temperature is a typical example.

PHOTOCHROMIC

Change colour when exposed to UV light. The most common example of this is sunglasses that darken when in sunlight. Textiles can also be printed with inks using the same technology. The nature of this ink allows it to be used successfully in different security related printing as a deterrent to counterfeit and fraud.

The dyes used in this technology can be encapsulated and are suitable for use in all ink systems excluding UV curing.

A novel application is temporary tattoos which appear clear when indoors, but when you go outside in the sun, colour appears. Colour will turn back to clear when indoors. Photochromic inks will last as long as the Temporary Tattoo.

Applications for these and other ink technologies are endless. It is worth getting small quantities of a range of systems and carrying out simple experiments. Show the results to your clients or your marketing department you would be amazed what opportunities will open up for you in that endless quest for improved profitability…