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# UV CURING THE INK

Remember the days when going to work on a Monday morning provided that additional pleasure, the hit of solvents as you walked through the door. A good deep breath and all was right with the world. For the more hardened members of the print crew, lifting the lid of a new tin of ink and taking an invigorating lungful of pristine solvents certainly appeared to add additional colours to the print. This brain addling practice is fortunately no more for those printers who use Ultra Violet Curing inks. In any case the recognised dangers of the practice have consigned it to the memories of the bad old days. Now we carry out risk assessments and monitoring of solvent levels. Where necessary extraction or even absorption techniques are used. The use of Ultra Violet Curing Inks has drastically reduced the amount of solvents in the print shop. This is just one of the benefits of UV.

Ultra Violet Curing is a part of the Photochemical sector. This makes use of the electromagnetic spectrum to cause a chemical reaction to take place. In the case of UV Curing it is at the Violet end of the visible spectrum. Ultra Violet light is invisible to the human eye but it does have special properties in that it causes a chemical reaction to take place. It is known as actinic light. Ultra Violet light is the basis of photosynthesis in plants in that it provides the energy source for the plant to create sugars. In printing we use it to change the molecular structure of chemicals contained within inks to bind in pigments and adhere them to substrates. The chemical reaction is to convert monomers and oligomers into polymers. The ink changes from a liquid into a solid in fractions of a second. The film formed is a tough chemically resistant coating. On first viewing the ink technology may appear to be more expensive than solvent systems. The reality is that increased mileage linked to dramatically reduced down time on the machine mean that Ultra Violet Curing inks are the systems of choice for most graphics applications. The virtual removal of drying in on the screen encourages other areas of the screen printing industry to adopt the technology. There are some sectors that are precluded these being where the reactive chemicals in the ink can have an adverse effect on their working environment, one of these is medical electrochemical sensor manufacture. Close proximity to foodstuffs is a limited sector.

The big plus point is the fact that pure UV Curing inks do not contain solvents. That does not mean that solvents are removed from the print shop altogether as they are still an effective means of cleaning screens and washing squeegees and flood coaters. If you used water based UV inks you can wash down with water that means the use of solvents can be discontinued in the print shop. For heavy solvent users the adoption of Ultra Violet Inks has been an essential part of keeping their solvent consumption below the level that brings them into the strictures of Environmental Legislation. The level below which you should be working is 5 Tonnes this is now the law. If you are using more than this and you have not registered with the Local Authority you are breaking the law. The SPA have published on CD an invaluable “Printworks Calculator” that enables to calculate your solvent usage and offers strategies for reducing consumption.

Certainly using UV inks is likely to have the greatest effect on reducing solvents. If you don’t yet use UV or are thinking of expanding their use the are a series of issues your should take account of. Many people who first go into UV do so because they can get a cheap second hand dryer. This may not allow them to experience all the advantages of

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the process. The ink doesn't cure completely, the substrate gets very hot and distorts, they get a high build of ink, certain colours are very difficult to cure, ink doesn't stick to the substrate. What do they do? Blame the ink supplier. No, probably your dryer is knackered.

UV Curing Ink cures by the photoinitiators in the ink being triggered by UV energy of a specific wavelength. For this to happen the spectral ranges of the lamp must correspond with the spectral ranges of the photoinitiators and then the UV radiation has to be of sufficient irradiance (intensity) to penetrate the ink film and get to all of the photoinitiators. For a lamp to be efficient it has to be clean, cool, focussed and within its useful life. (This applies to the writer, hopefully). The reflectors must also be kept spotlessly clean as 75% of energy is reflected from this. After 1000 hours running many UV lamps are producing insufficient UV and too much Infra Red (Heat). With the improvements in UV technology some lamps, particularly pulsed xenon can last much longer than this, but you need to check with your supplier.

If we don't have more multicolour UV Curing presses than any other country we certainly have more per head of population. It is rare that a graphics printer with more than £5,000,000 turnover is without a multicolour line. In the trade press it appears almost every month another unit is installed. Screen Printing must be pretty healthy if these major investments are still being made.

There are two approaches to curing the ink on a multicolour line, one is pulsed curing and the other is scanning. In multicolour in line printing the ink surface has to be dry enough to print the next colour. Either using conventional UV Curing lamps or Flash Curing UV lamps can achieve this drying. The majority of print lines now being produced use conventional curing lamps that traverse the printed substrate after printing and between colours.

The original leader in the field was Svecia who adopted the flash curing approach with the Sam X. The flash curing system which is rather like a series of high power flash bulbs produce generally low wavelength 320 –360 nanometre UV. This cures the surface of the ink prior to the next print. After all prints have been completed the print passes under a conventional curing unit with a mix of spectral ranges to cure the inks right through. The big advantage of this system over conventional curing is the energy usage up to 60% less. This reduction was achieved by a lower overall power requirement for the lamps that are powered from capacitors that are charged up between curing cycles. Additionally this reduces the size of the incoming power supply cable and can often avoid the need for the installation of an additional electrical substation. Another big plus is the lack of ozone meant that extraction was not necessary to remove it. However lack of extraction did not help when heat built up in the units.

When first developed the flash curing system needed inks that were considerably more expensive than normal UV systems. Different photoinitiator systems are required to achieve the cure. With 18 systems in the UK the price of inks has reduced. It is a little surprising that this system appears to be retreating in popularity. It is probably a

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combination of issues. The problems at Svecia must not of helped and initial claims of “Cold curing” were proven to be exaggerated. Add to this the higher cost of the equipment and its apparent demise is understandable. In spite of this it is aground breaking system.

The alternative conventional system deals with the issue of drying between colours by using conventional UV Lamps that scan (move) across the sheet at about 2 metres per second at the drying station. Normally a two-lamp system the power is between 100 and 300 watts per inch. These give a broader spectral range than Flash Curing Lamps that mean the inks used do not have to have the special photoinitiators required for flash curing. But they do produce ozone Also curing solid as against transparent colours is much easier. The normal constraints of printing Ultra Violet curing systems apply. You must control the ink film thickness, keep the curing units well maintained, guard against sensitisation to UV inks by wearing the correct Personal Protective Equipment. Don’t forget the extraction system as well as compromising the cooling and leaking ozone a poor maintained system could allow fugitive monomers into the working environment.

I am told there are 65 multicolour lines in the UK ranging from 2 colour to 6 colour, that is an enormous print capacity if you already have a market for large format multicolour work that can be more economically produced on such a line it is well worth considering converting that work over to it, but if you think by buying one customers are going to flock to your door you are much mistaken. Unless you intend to undercut the opposition and then you will be working for the ink supplier and the bank and eventually the administrator.

These are first class machines that can combat the onslaught of digital for some time yet. Have you looked on your shop floor and considered replacing your 15-year-old workhorse flatbed or cylinder line with the inefficient dryer. Think how much extra profit you could make with a state of the art single colour line. Halve the down time, halve the energy usage, increase the print rate, and improve the quality. Decisions decisions! You could sneak into the ink store and find a can of solvent ink lift the lid and breath deeply ahhh things were much easier in the good old days.

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