



P rinters'  
N ational  
E nvironmental  
A ssistance  
C enter

Printing  
Environmental Technology

## Fact Sheet

**PNEAC**  
**www.pneac.org**  
**1-888-US-PNEAC**

### **UV Curable Inks: Will They Work for Everyone?**

by Mike Ukena

UV Curable screen printing ink is a 100% solid system: that is, it essentially does not contain solvent that must evaporate during the curing phase. The cure takes place through the interaction of the ink ingredients and a strong UV (ultra violet) light source in a dryer, or more accurately, a reactor.

Since UV contains little or no solvent, there is a lot of interest in using it because of the lack of VOCs (volatile organic compounds). Either reducing VOCs or eliminating the need to report them both have appeal. The reduction in VOCs also has an appealing environmental effect.

Why then, doesn't everyone just switch to UV curable ink? It is not that easy. As with any product, there are advantages and disadvantages. Solvent inks have wonderful coverage, they are relatively inexpensive, and they have good durability. But, they have a strong odor, the vapors can create health concerns, and they produce a large volume of VOCs.

#### **Advantages of UV Ink**

As we have already stated, the lack of VOCs is a very appealing aspect of UV curable ink. The cost savings in permitting, reporting, and personal protection can be very significant. There are, however, several other very strong reasons to use UV curable inks.

## **1. Very rapid curing**

UV cure reactors can be run at very high production rates. The actual cross-linking of the UV ink takes place in one to three seconds, depending upon the color of the ink and the intensity of the UV light source. High cure rates translate into very high operating speeds. UV inks can be run on high-speed production equipment without having to allow for excessively large dryers, as would be necessary for high-speed solvent systems.

The rapid cure also allows UV inks to be used on a new generation of graphic presses that can do multiple colors in succession without having to move the substrate. Historically, graphic screen printing has been done on presses that did one color at a time. The substrate was printed, put through the dryer (or racked for air-drying), and then returned to the press for the next color.

The new generation of graphic screen presses takes advantage of the UV cure rate and prints colors in succession with cure reactors between each print head. The production rates of these machines are very good.

## **2. UV Ink does not dry in the screen.**

Since UV ink does not dry in the screen, it is very easy to work with. Printers do not have to worry about the ink clogging the mesh if they stop printing. The printer can work for extended periods without ever having to touch the screen. The result is excellent production throughput. It is quite common, with a good quality screen, to be able to run an entire print run without having to clean the mesh. The chances of being able to print a long run of solvent ink without having to clean the screen are very low.

## **3. UV Ink has excellent color value**

UV inks range in opacity from very transparent to translucent. There are no real opaque UV inks. The high level of transparency produces a very clean color gamut. This quality makes UV ink an exceptionally good choice for four-color process graphic printing. This clarity of color, combined with the very fine pigment grind and the fact that the ink does not dry in the screen allows UV ink to be printed through extremely high mesh counts. It is not unusual to see UV printed through mesh counts as high as 165 threads/cm (420 threads/inch) although 154 threads/cm (390 threads/inch) is much more common.

## **Disadvantages of UV Ink Systems**

### **1. UV does not work on all substrates**

UV ink works great for many applications. However there are some graphic substrates that are not suitable. In most cases where UV ink does not work, it is necessary to use a solvent ink system.

### **2. UV inks cannot be printed on dark substrates**

UV inks are limited to transparent and translucent colors. The reason for this limitation is the nature of the curing process itself. In order for UV ink to polymerize, the UV light energy must reach all the way through the ink layer. If the ink were opaque, it would block the UV energy and prevent a full cure; causing the ink to fail.

### **3. Outdoor durability is more limited than with solvent ink systems**

Since its introduction in the late 1970's, UV ink's ability to last in an outdoor environment has been greatly improved. However, there are applications where UV ink just will not withstand the environmental effects like the sun as well as solvent inks. A good example: the decals used on the exterior of airplanes must be printed with solvent ink systems in order to have the specified durability. Inside an airplane, UV is suitable for most applications.

### **4. UV is not as good in an application that will experience high levels of abrasion**

One of the chief advantages of screen printing is that it prints a heavier deposit of ink than other forms of printing. For this reason screen printing is the preferred printing method for applications where surface abrasion may wear away at the surface. Of all screen printing inks, UV inks ink deposits are among the thinnest, meaning that in an abrasive environment, they will erode more quickly than other screen ink systems.

### **5. UV inks are less flexible than other ink systems**

One of the significant applications of screen printing is on products that will be molded into shape after they are printed. Historically, UV inks have not done as well in these applications as the cured ink tends to be more brittle than solvent ink films. However, in recent years, a great deal of progress has been made in making flexible UV inks. The flexibility issue is much less significant now than it once was.

## **6. UV inks are more sensitive than other inks to proper cure procedures**

A printer can not just slap on UV ink, run it through the reactor and be confident that it will be cured. There are issues with UV ink that must be addressed. These include inter-coat adhesion and proper cure level for each color. When UV inks are cured, if too much radiation is applied, the next color may not adhere properly. In addition, the effects of the UV radiation are cumulative and if an ink film is over-cured, it can become brittle and flake off.

### **Summary**

Do not be swayed by the fact that there are six disadvantages listed to only three advantages. The overwhelming majority of graphic screen printing applications can benefit from UV curable ink systems. Many products are printed almost exclusively with UV ink. The best known of these are CD-ROMs, which are printed on very high speed production equipment.

UV is an excellent choice for many applications. Most successful graphic screen printers include UV curable inks in their operation. For a great many, it is the main ink system they use.

Reasonable effort has been made to review and verify information in this document. Neither PNEAC and its partners, nor the technical reviewers and their agencies, assume responsibility for completeness and accuracy of the information, or its interpretation. The reader is responsible for making the appropriate decisions with respect to their operation, specific materials employed, work practices, equipment and regulatory obligations. It is imperative to verify current applicable regulatory requirements with state and/or local regulatory agencies.