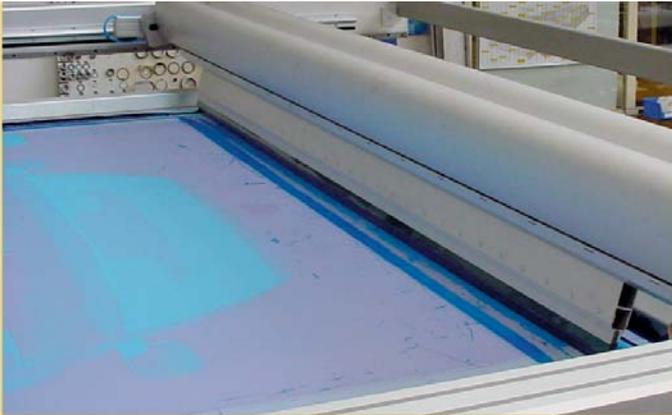




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# REACTIVITY OF UV-CURING SCREEN INK SYSTEMS

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These days most screen printers can hardly abstain from using UV-curing ink systems in their manufacturing processes. UV-curing technology offers chances and possibilities to the screen industry for the coming decades. UV-curing inks can be processed on graphic multi-colour lines and moreover they give screen printers the chance to partially outstrip digital and offset printing. Thanks to the increasing use of screen printing for finishing applications – spot coating, anti slip coatings and anti slide varnishes - UV-curing screen printing has experienced a substantial growth.



Basically processing of UV-curing screen printing inks is easier than that of solvent-based ink systems, but it is still necessary to consider some important features. Especially for graphic screen applications the reactivity of UV-curing screen inks is a very important quality aspect, as highly reactive inks only require a low UV-energy to produce large numbers of stack proof prints. Compared to ink systems used about 5-6 years ago modern UV-systems can be processed with only a fraction of the energy required at that time.

There are several important factors influencing the reactivity of UV-curing screen printing inks. It is the task of the technicians to ensure optimal curing properties of UV-curing ink formulations.

## PHOTOINITIATOR

It is commonly understood that the concentration of the photoinitiator contained in an ink system is responsible for the reactivity. This, however, is only true to a certain extent. Using a combination of various photoinitiators you can ensure that the different UV-curing colour shades of an ink range show nearly identical curing properties. The problem is that different pigments show different UV-absorptions in the UV-range. If these absorptions superimpose the reaction peaks of the photoinitiators, curing will be considerably inhibited. The distribution of the radiation of UV-lamps also plays an important role. Generally mercury high pressure lamps are used for curing equipment used in the screen process. Other radiators with other emission spectra are also available, these are doped, so-called metal halide lamps which in addition to mercury also include gallium, iron or gallium indium. For instance, iron-doped UV lamps are especially suitable for curing various industrial products such as highly opaque white UV inks.

The photoinitiator or the concentration of that chemical has a very high influence on the raw material cost of a UV-curing ink. Many customers use ink systems, which are mixed with reactive thinners or photoinitiators prior to processing. These additives are generally quite expensive. Often that way the actual ink cost of low cost ink systems are quite high in the end. Therefore cheap UV screen inks are often a bluff package.

## MONOMERS

Monomers are used in UV-screen inks to adjust the viscosity of the ink system for best possible processing. In addition monomers have a high influence on the reaction speed of curing. Basically one can distinguish between 1-functional, 2-functional and 3-functional monomers. The higher the functionality of the monomers, the higher also the reaction speed, however combined with inflexibility of ink films. A highly reactive and flexible UV curing ink can only be manufactured with a combination of individual monomer types

## PIGMENTATION

Solid or line colours should have the same opacity as that of solvent based inks. This is no problem with colour shades. Exceptions are black and white adjustments as both pigments have a high absorption across the whole spectrum of UV radiation. All the same Coates Screen Inks GmbH has developed optimally adjusted inks.

An excellent example is the highly opaque white UVX 60/688-HD-A, an extremely opaque white enabling screen printers to manufacture double-sided stickers.

## OTHER INFLUENCES ON CURING OF UV-CURING SCREEN INKS

The most important thing to be considered here is the substrate itself. An example: plasticized PVC foil can be processed with ink type "X" and a curing energy of 150 mJ/cm<sup>2</sup> and results

in stack proof prints with good adhesion. On the other hand a rigid PVC foil may require the double amount of energy to achieve a satisfactory result in respect to stacking and adhesion.

The substrate colour itself also plays an important role in regard to curing speeds. Generally bright substrates require much less energy for curing of the ink films than dark, especially black, substrates.

## HIGH REACTIVITY – AN ADVANTAGE FOR SCREEN PRINTING

Highly reactive UV-curing screen printing inks require low amounts of UV-energy for curing. Thus temperature applied to the substrate is also low and therefore the register obtained in multi-colour printing is much better. Also UV-driers using low amounts of energy have low energy costs. Moreover, generally addition of expensive photoinitiators is not necessary. Highly reactive ink systems also do not cause any problems during stacking and thus printing speeds are also high.

Naturally the UV-drier or the model also plays an important role when processing UV-curing screen printing inks. Maximum printing speeds can only be achieved when using suitable and efficient driers. With modern drying systems energy input can be adjusted, which again considerably reduces printing costs.

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