

AUXILIARY AGENTS AND ADDITIVES FOR UV INKS AND THEIR PROPER USE



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UV Ink Systems

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Generally, there is a standard for many production processes to ensure a high and continuous quality, mostly certifications according to various standards such as ISO or DIN. Still modern production facilities must be able to quickly react to changes of production conditions.

This especially applies to screen printing, which regardless of standardisation has many different printing parameters compared to other printing processes. A good example in that respect is the viscosity of a printing ink, which has a great influence on the print results.

Printed with the same fabric inks with a low viscosity result in much flatter ink films than inks with a high viscosity. Ink consistency reacts to temperature and fully air-conditioned production rooms are rare, therefore you can experience a significant difference in viscosity between summer and winter time. Printers need certain auxiliary agents to be able to react to such situations and adjust inks to optimum processing conditions.

THE DIFFERENCE BETWEEN SOLVENT-BASED AND UV-CURING INKS

Printers are used to adjust solvent-based inks to printing consistency by addition of about 10-20% thinner. Further additives such as matting agents are used to modify the inks to the required degree of gloss.

UV-curing inks are another story. These inks are generally supplied in a ready-to-print consistency as unlimited addition of auxiliary agents would cause a significant, unexpected, and unfavourable change of product properties.

UV inks are 100% ink systems, there is no solvent evaporation, and all components of the liquid ink are contained in the cured ink film. Addition of auxiliary agents will change the composition of the ink resulting in possible curing or adhesion problems. For a better

understanding you will have to consider the chemistry: when exposed to UV light the UV inks react by polymerisation and the liquid ink will change into a solid ink film within a few split seconds. This reaction is triggered by photoinitiators which break down into radicals under UV light. These radicals will trigger double bonds of the UV binding agents starting a chain growth. That way smallest components (reactive thinners) and medium components (oligomers) will form long chains and finally solid and tack-free ink films (polymers).

Basically, UV inks are supplied in adjustments not requiring use of additives and the inks can be processed with commercial printing equipment. However, in some exep-

tional cases a slight modification of the ink may be necessary to react to changed conditions, such as coarser fabrics or higher production speeds. For such cases we offer some special additives and auxiliary agents.

However, it is essential to exactly follow manufacturer instructions and not exceed the recommended addition to avoid unfavourable changes of the ink properties. For detailed information about addition amounts please refer to the individual product data sheets of our UV ink ranges.

The most essential additives for UV inks of Coates Screen Inks GmbH and their effects are listed below.

ADJUSTMENT OF VISCOSITY

The pre-set viscosity may be adjusted to a limited extent by adding UV thinner or thickening agent.

UV THINNER

(Reactive thinner oder uv-monomers)

UV thinners or reactive thinners are binding agent components of low viscosity. These are already used in the production of UV inks. Further addition of large amounts of reactive thinners to UV inks will cause quite a few problems as that would change the relation of the different UV binding agents resul-

ting in adverse effects on adhesion and flexibility. Also, this additional use of high amounts of reactive thinners will decrease the share of photoinitiator in the formulation triggering possible curing problems. Therefore, never exceed the 3-10% recommended extra addition.

THICKENING AGENT

Adding this extremely light and white powder – also called thickening powder or flakes - will increase viscosity and thixotropy of UV inks. To avoid flow problems of the inks, stir well with a quick running mixer or dissolver.

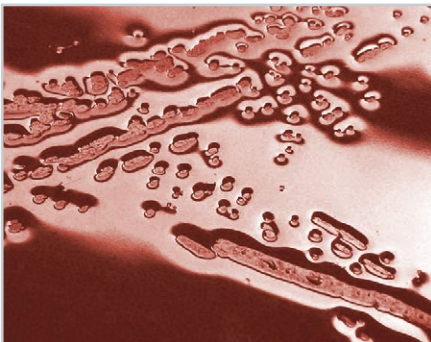
REACTIVITY INCREASE

Extra addition of photoinitiator solution or sensitizer will slightly increase polymerisation of UV inks.

This additional use of photoinitiator will increase the number of radicals formed under UV light. There will be a better use of the incident light.

Nevertheless, the sufficient curing of UV inks strongly depends on UV radiation, thickness of applied ink layer and colour shade. Thus, a photoinitiator addition alone will not always solve a curing problem. In special cases reactivity can be improved by adding a reactive resin to speed up the polymerization process.

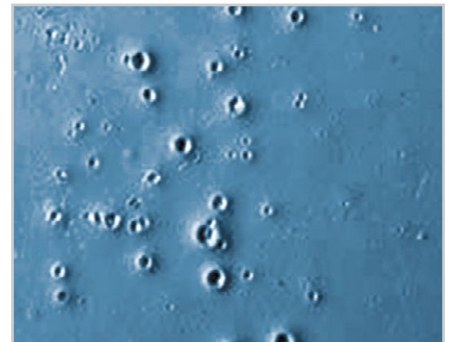
PRINTING PROBLEMS



Wetting problems



Orange peel



Pinholes

WETTING AND FLOW PROBLEMS

UV inks generally are produced to exhibit sufficient flow and wetting properties. Generally, it is not necessary to add further wetting or flow agents.

Should flow or wetting problems occur very small amounts of wetting and flow agents can be added.

IMPROVEMENT OF ADHESION

In case of bad adhesion on demanding substrates, adhesion of UV inks can be improved by hardener addition. The inks will have pot a life of 6-8 hours after the hardener is added which will slightly counteract the advantages of UV technology. Nevertheless, the inks can be cured in the usual manner and further processing is possible right away.

Full resistance of the prints will be reached following the complete chemical reaction of the hardener within a period of approx. 3 days at room temperature.

SUMMARY AUXILIARY AGENTS FOR UV INKS

The following chart comprises some of our auxiliary agents and additives for UV inks and their effects. For suitability for our UV screen printing ink ranges please refer to our product data sheet "UV Auxiliary Agents (HM) and Additives".

We would like to point out that the additional use of additives is not always the solution for a problem. Moreover, it is essential to choose a suitable UV ink for the printing job and existing printing conditions.

| VISCOSITY ADJUSTMENT | | | | |
|--|---|--------------------|--|---|
| | CHARACTERISTICS | AMOUNT | EFFECT | OVERDOSAGE |
| ADDITIVE UV/V Universal Reactive Thinner* (Not for MTR and PDH) | Clear, colourless liquid, low viscosity, non-yellowing. | 3 - 10% max. | Reduces viscosity of UV inks. Reacts within the ink film, does not evaporate. | Addition of more than 10% will reduce reactivity and curing of inks and change colour shades. |
| MTR/V Special Reactive Thinner* (For MTR) | Clear colourless liquid, low viscosity, non-yellowing. | 3 - 10% max. | Reduces viscosity of UV inks. Reacts within the ink film, does not evaporate. More elastic than Additive UV/V. | Addition of more than 10% will reduce reactivity and curing of inks and change colour shades. |
| THICKENING POWDER | Fine, white powder. | 1 - 3% | Increases viscosity and thixotropy of UV inks. Mixing with mixer or dissolver is recommended. | Deterioration of flow and printability. |
| REACTIVITY INCREASE | | | | |
| LAB-N 551564 Photoinitiator Solution | Clear, slightly yellowish liquid, medium viscosity. Highly effective, non-yellowing mixture of photoinitiators. | 1 - 3% | LAB-N 551564 will especially enhance final curing of colour shades and opaque colour shades. | Increased surface hardness. |
| LAB-N 560700 Photoinitiator Solution | Clear, slightly yellowish liquid, low viscosity. Non-yellowing mixture of photoinitiators. | 1 - 3% 5% max. | LAB-N 560700 will increase reactivity of UV inks, improves curing, especially of colour shades. Non-yellowing, therefore suitable for white inks and varnishes. | Increased surface hardness. |
| ADDITIVE UV/S Sensitizer (Not for MTR and PDH) | Clear, slightly yellowish liquid, medium viscosity. Mixture of photoinitiator and reactive resins. | 3 - 5% 10% max. | Additive UV/S increases reactivity of UV inks. Improved curing, surface hardness and chemical resistance. | Additions of more than 10% may result in over-curing of the inks. Over-curing causes overprintability problems, stamping and cutting problems, and changes of the colour shade. |
| WETTING AND FLOW PROBLEMS | | | | |
| ADDITIVE UV/N Wetting Agent | Clear, colourless liquid, low viscosity. Contains silicone. | 1 - 2% | Improves wetting on difficult substrates. | Impairs adhesion and overprintability. |
| ADDITIVE UV/VM Flow Agent | Cloudy, whitish liquid, low viscosity. Contains silicone. | 1 - 2% | Improves flow and slip properties, counteracts orange peel | Surface lubrication and reduced intermediate adhesion. |
| IMPROVEMENT OF ADHESION | | | | |
| ADDITIVE UV/H Hardener (For UV/K, UVE and 80UV) | Clear, colourless liquid, high viscosity. | 5% | Improved adhesion and resistances. Full reaction after approx. 3 days at room temperature. Pot life 6 – 8 hours. After that period inks mixed with hardener must be disposed of. | May result in reduced reactivity and curing. |

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* Attention: Do not use reactive thinners to clean contaminated skin and clothing!

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