Tech INFO

Marabu

Pad Printing Auxiliaries and Additives

Appropriate use of Marabu's Additives and Auxiliaries for Pad Printing Inks

Pad
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Pad printing is a universal printing method of virtually unlimited potential, most commonly used for the decoration of 3D objects, and information purposes in industrial production processes. Considering the wide variety of applications and pad printing devices, naturally the pad printing ink must be fine-tuned individually, according to the required demands. The relevant auxiliaries and additives are described in this TechINFO.

Content

Marabu offers a range of solvent-based inks, and a UV-curable ink for pad printing. The specific characteristics and applications for the different types of ink are described in detail on the Marabu homepage.

1. Viscosity

Viscosity describes how thin (low viscous) or thick (highly viscous) an ink system is or how it is adjusted. Before starting the print run, it is important to adjust the ink to the correct viscosity, as this will have a very strong influence on the release of the ink from the pad, ink flow, edge definition, possible drying-in in the cliché, as well as adhesion of the ink.

Owing to the variety of machines and requirements in the market, solvent-based inks are not press-ready. Before printing, the ink´s viscosity must be adjusted by adding solvents. The UV-curable ink series Tampa® *Cure* TPC is no exception to this.

Basic shades are always adjusted to a relatively similar viscosity range, with two exceptions:

- Due to high pigment levels in White, Opaque Whites, and high-opaque shades, the viscosity is always higher than all other shades
- 4-colour process inks feature a higher viscosity than the basic shades in order to ensure best dot definition

Thinner

The addition of thinner influences the viscosity, flow properties, and release characteristics of the ink from the pad but also has a substantial influence on the drying speed, packaging characteristics, as well as adhesion to the substrate. Special thinners offering specific characteristics are also available. The standard range of thinners includes thinner TPV and the fast thinner TPV 2. The recommended thinner is listed in the Technical Data Sheet of the respective ink series.

Retarder

Retarders are solvents with a significantly slower evaporation rate. They are only added to the ink if the drying of the ink on the pad or in the cliché is to be

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slowed. This may be necessary if the cycle time is very slow or if a shuttle is used on multi-colour machines.

Product overview and properties

Thinners and retarders are generally a combination of different solvents that are formulated to achieve specific properties. Important criteria are the rate of evaporation as well as the dissolving strength. In general terms, thinners dry faster than retarders.

Thinner

	Evaporation rate*	Solving strength	Odour
TPGLV	35-55	good	average
TPV	30-50	good	mild
TPV 2	10-20	very good	average
TPV 3	200-250	very good	mild
TPV 6	30-50	very good	average
TPV 7	30-40	satisf.-good	average
TPV 8	65-75	good	mild
TPV 9	20-30	good	average
GLTPV	10-20	very good	average
PPTPV	30-50	satisfactory	mild

*compared to Ether = 1

Retarder

	Evaporation rate*	Solving strength	Odour
SV 1	450-500	good	mild
SV 5	250-300	good	mild
SV 11	380-420	good	mild

*compared to Ether = 1

Cleaner

	Evaporation rate*	Solving strength	Odour
UR 3	30-50	good	mild
UR 4	80-100	good	mild
UR 5	180-200	good	mild

*compared to Ether = 1

Remarks

The evaporation data is based on proportional figures of the relevant solvents and theoretically calculated values without considering the interactions occurring through solvent mixtures and the influence of binders. In practice, one may not draw an automatic conclusion from the evaporation value to the direct quality of the ink transfer.

The data in the "odour" column is subjective and may be judged differently from one person to another.

2. Ink adjustment

All pad printing inks must be adjusted by adding thinner before printing. The adjustment of the ink generally depends on a number of parameters such as ink type, type and depth of cliché, ink cup system (closed/open), machine speed, as well as shape, size, and hardness of the pad. The quantities given on the following pages are based on a room temperature of 20°C and are intended to provide a quick start formulation. However, both temperature and humidity have a huge influence upon the evaporation rate of any solvent ink system.

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	Tampa® *Star* TPR	**Tampa® *Plus* TPL**	**Tampa® *Pol* TPY**
	Single or 2 component ink which should be precisely adjusted with narrow limits otherwise ink may build up on pad, and may cause static problems	Single or 2 component ink, easy processing and full ink film transfer; free of aromatic compounds	Single or 2 component ink, easy and trouble-free processing with full ink film transfer
Hardener H 1, slow	•	• (not for sensitive applications)	•
Hardener H 2, fast	•	•	•
Hardener HX	•	•	•
Hardener HT 1, heat reactive	•	-	•
Mixing Ratio, ink : hardener	10 : 1	10 : 1	10 : 1
Steel cliché, etch depth	18 – 21 µm	18 – 28 µm	20 – 28 µm
Ink well (open)	10 – 20 % TPV	10 – 20 % TPV 10 – 20 % TPV 3 / TPV 10 – 20 % TPV 8	15 – 20 % TPV
Ink cup < 25 prints/min	10 – 20 % TPV	10 – 20 % TPV	15 – 20 % TPV
Ink cup > 25 prints/min	15 % TPV 2	15 % TPV 2	15 – 20 % TPV 2
Rotary pad printing	-	25 – 30 % TPV	15 – 25 % TPV 15 – 25 % TPV 7
Retarder	SV 1, VP, TPV 3	TPV 3 (not for sensitive applications)	SV 1, VP, TPV 3

	Tampa® *Pur* TPU	**Tampa® *Tech* TPT**	**Tampa® *Tex* TPX**
	2 component ink with excellent chemical and mechanical resistance, must be adjusted accurately (not too thin)	Fast 2 component ink with long pot life (up to 16h). Generally a full ink transfer is achieved	2 component ink, for textile printing, universal use for different applications, and good adhesion on many substrates
Hardener H 1, slow	•	-	-
Hardener H 2, fast	•	•	•
Hardener HX	•	-	•
Hardener HT 1, heat reactive	•	•	-
Mixing Ratio, ink : hardener varnish: hardener	4 : 1 3 : 1	4 : 1 4 : 1	5 : 1 5 : 1
Steel cliché, etch depth	20 – 24 µm	20 – 24 µm	> 35 µm
Ink well (open)	10 – 15 % TPV	10 – 15 % TPV	10 – 15 % TPV 2 / 7 / 9 10 – 25 % TPV 8
Ink cup < 25 prints/min	10 – 15 % TPV	10 – 15 % TPV	10 – 15 % TPV 2 / 7 / 9
Ink cup > 25 prints/min	-	10 – 15 % TPV 2	10 – 15 % TPV 2 / 7 / 9
Rotary pad printing	25 – 35 % TPV / TPV 2 15 – 25 % TPV 7	25 – 30 % TPV / TPV 2 15 – 25 % TPV 7	-
Retarder	SV 1, VP, TPV 3	SV 1, VP, TPV 3	TPV 3 (not for sensitive applications), GLV

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	Tampa® *RotaSpeed* TPHF	**Tampa® *Cure* TPC**
	Single or 2 component ink with pre-adjusted viscosity for rotary pad printing, free of halogen- and aromatic compounds	Single or 2 component UV-curable pad printing ink; must be adjusted to printing viscosity before use; prints with full ink transfer without build up on pad
Hardener H 1, slow	-	•
Hardener H 2, fast	•	•
Hardener HX	-	•
Mixing Ratio, ink : hardener varnish: hardener	10 : 1 5 : 1	20 : 1
Steel cliché, etch depth	half tone: 22 – 30 µm full etch: 20 – 22 µm	18 – 22 µm
Ink well (open)	5 – 20 % TPV 8	5 – 10 % TPV 2, ggf. TPV / TPV 7
Ink cup < 25 prints/min	5 – 20 % TPV 8	5 – 10 % TPV 2
Ink cup > 25 prints/min	-	5 – 10 % TPV 2
Continua / Big Wheel: Rotoprint / Mini Wheel:	5 – 15 % TPV 10 – 20 % TPV 2	5 – 15 % TPV 2
Retarder	TPV 3 (not for sensitive applications)	-

	Tampa® *Glass* TPGL	**Mara® *Prop* PP**
	Fast drying 2 component ink with very good printing properties and resistances, excellent printing results.	Single component ink for untreated and pre-treated polypropylene; ink requires a higher amount of thinner, than other inks; the transfer from pad is not complete, however, ink does not build up strongly
Hardener MGLH	•	-
Mixing Ratio, ink : hardener	20 : 1	-
Steel cliché, etch depth	18 – 24 µm	18 – 25 µm
Ink well (open)	15 – 25 % TPGLV 15 – 25 % PPTPV	20 – 25 % PPTPV
Ink cup < 25 prints/min	15 – 25 % GLTPV 15 – 25 % TPV	20 – 25 % PPTPV
Ink cup > 25 prints/min	max. 20 % GLTPV	
Rotary pad printing	-	30 – 35 % PPTPV + 3 % AP 15 – 35 % UKV 1
Retarder	TPV 3, SV 3 (screen)	SV 1

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3. Opacity

Almost all pad printing ink series feature 17 standard shades according to System Tampacolor. This ink system embraces a combination of opaque and transparent shades, allowing brilliant colour shades to be mixed. If a high opacity is required for printing onto dark substrates, the following options are available. Keep in mind, however, that an increase in opacity will likely lead to a slight reduction in brilliance.

High-opaque shades

Most Marabu pad printing inks have been complemented with 4 high-opaque shades:

122 Light Yellow
130 Vermilion
152 Ultramarine Blue
162 Grass Green

Opaquing Paste OP 170

The addition of OP 170 significantly increases the opacity of colour shades without substantially reducing the resistance to chemicals or dry abrasion. Max. addition amounts to 15 %. OP 170 is not suitable for use with white inks.

The Marabu-ColorManager MCM includes optimized opaque and high-opaque colour match formulas, enabling good matches with colour references such as RAL, HKS, and PANTONE®.

4. Matting

The degree of gloss of a solvent-based ink can be reduced by adding auxiliaries.

Matting Paste ABM

With an addition of 5–20 % matting paste to the ink, the degree of gloss is reduced, according to the percentage used. As a result of this, a roughening of the ink surface is created which reduces the reflection of the incident light and thus leads to a matt appearance. Depending on the quantity of ABM added, opacity and abrasion resistance will be reduced. Alternatively, especially for 2-component inks and the UV-curable TPC, the Matting Powder MP must be used.

Matting Powder MP

If a printing ink should have a matt surface, without reducing the opacity, this can be achieved by adding the universal Matting Powder MP. An addition of 1-4 % MP, for White/Opaque White max. 2 %, is recommended. The powder must be stirred mechanically into the ink.

5. Ink flow

All ink systems contain flow agents to minimize the risk of air being entrapped in the printing ink by the continuous motion of the doctor blade or intensive stirring. If flow problems arise, in most of the cases this will be the result of ink-repelling residues on the surface of the print substrate. The cleaning of the substrate may be recommended (see chapter 9).

This may also be due to the viscosity of the ink being too high which can be avoided by adding further thinner. If this does not improve the situation, Printing Modifier ES can be added. This auxiliary contains silicone which reduces the surface tension of the ink with an additional defoaming function. The quantity added must not exceed 1 % as, otherwise, adhesion problems may occur, especially when over-printing.

6. Static charge

When printing onto non-polar plastics and plastics sensitive to static charge, we recommend to add 10-15 % of the Antistatic Paste AP to the ink. This paste decreases the viscosity of the ink and reduces at the same time the static charge through polar solvents.

7. Adhesion promoter

Polyethylene (PE) and polypropylene (PP) must be pre-treated before printing to achieve proper adhesion of the ink. An exception to this is polypropylene if Mara® *Prop* PP is used. In addition to the traditional pre-treatments such as Corona or flame, a special product is available – Primer P 2.

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Primer P 2
This special "solvent" is manually applied to the entire surface with a cloth or a spray gun before printing. It is then possible to print onto polypropylene with a single or 2 component ink. The effect of this pre-treatment is limited in time, so it should be applied max. 1-2 days before printing.

8. Abrasion resistance

Surface Additive SA-1
The addition of this auxiliary can increase the resistance against abrasion and other mechanical stress in all pad printing inks (with the exception of Maraprop PP). At the same time, it is possible to improve the ink transfer from pad to substrate.
Recommended addition: 3 – 5 % (max. 10 %).

9. Pre-cleaning

Many materials such as plasticized PVC or powder coated or wet painted substrates are invisibly contaminated by additives or plasticizers. This contamination may act as a separation layer and, therefore, may lead to adhesion problems due to a lack of contact between substrate and print.

Tarpaulin Cleaner PLR
Using this mild alcohol-based cleaner, residues can be removed with a cloth soaked in PLR, often resulting in better ink adhesion. Please change the cloth from time to time.

10. Hardeners

There are ink systems which can be optionally used as single or 2 component ink systems. In these cases the addition of hardener can increase adhesion to difficult substrates as well as increasing the chemical and mechanical resistance.
It should be noted, however, that the addition of hardener will reduce pot life to 8-16 hours (except with Hardener HT 1), depending on the ink type. For 2-component inks, hardener must be added.
The following hardeners are available for the Marabu ink systems:

Hardener H 1
Hardener H 1 is non-yellowing and is, therefore, suitable for outdoor applications. Other characteristics: relatively flexible ink film, long pot-life, slow drying.

Hardener H 2
Hardener H 2 is not suitable for outdoor applications because it yellows when exposed to UV-radiation which will be visible especially with varnishes or whites, and light-coloured shades mixed with white. Other characteristics: rigid ink film, shorter pot-life, quick drying.

Hardener HX
Hardener HX is non-yellowing and is therefore suitable for outdoor applications. Other characteristics: relatively flexible ink film, long pot-life, slow drying. HX is made without the use of aromatic hydrocarbons.

Hardener HT 1
HT 1 is a heat-reactive hardener which only reacts with the ink if force-dried at 150°C for 30 min. HT 1 can be used instead of H1 or H2, provided the same quantity of hardener is added, and has the big advantage of a prolonged pot-life of up to 6 months!
Caution: HT 1 can only be used on heat-resistant substrates.

Hardener MGLH
This hardener is specifically for the use with Tampa® *Glass* TPGL and is not recommended for any other ink type.

General information on hardeners
All hardeners are sensitive to humidity. Therefore, the drying process must take place at the lowest possible ambient humidity in the first 24 hours, otherwise parts of the hardener will react with the water instead of the ink. During storage of the hardener any contact with humidity must also be strictly avoided (containers must always be completely closed after use!).

Furthermore, the degree of cross-linking of hardener and ink, subsequently the chemical and mechanical

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resistance of the printed 2 component ink, is highly dependent on the temperature. By a forced drying of the ink at 140°C-150°C for 20-30 min. directly after printing, best possible cross-linking and thus the highest resistances will be achieved. 2 component ink systems can also be dried at room temperature; the complete cross-linking will, however, take up to 7 days and may have a reduced resistance. On difficult substrates such as glass, some metals, thermosetting plastics, and for high requirements, (e.g. dishwasher-resistance), forced drying of the ink in the oven may be essential.

11. Remark

Besides the regular addition of thinner or hardener, further modification of the ink with auxiliaries should be well-considered.
Auxiliaries show their positive effect only if added in the adequate quantity. Please refer to the Technical Data Sheets for quantity indications. The quantities are based on percentage by weight and not by volume. Overdosing will in most cases adversely affect the printing results and will lead to difficulties such as levelling problems or loss of adhesion, especially for multicolour prints. For these reasons, a scale and accurate working are a necessity.
Any addition of an auxiliary will change the characteristics of the respective ink system. Preliminary trials are always essential.

Contact
In the event of any queries, please contact:

Technical Hotline
Phone: +49 7141 691140
technical.hotline@marabu.de