Printing on Polyester Sheets

Screen
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Polyester is increasingly used as an alternative to PMMA and PC. Owing to the growing popularity, a detailed presentation about this material and its possibilities within screen printing is provided below.

Content

1.0 The Substrate „Polyester"

PET is a thermoplastic synthetic material which is produced in a polycondensation process. Terephtalic acid and ethylene glycol are the original media for condensation. The linear and saturated compound arising from them is called polyethylene terephthalate (PET) = polyester.

1.1 Polyester Types

There are four different structures of polyester:

- amorphous, glycol-modified copolymers with an increased impact resistance (PET-G)
- HT (High Temperature) co-polyester
- amorphous PET (PET-A)
- crystallizing PET (C-PET)

By modifying the PET-A variant with glycol, the crystallite melting point of polyester is strongly increased and a non-crystallizing PET-G material is originated. Compared to PET-A, PET-G displays an excellent vacuum formability (no white colouring) as well as an enhanced impact resistance.

With HT (High Temperature) co-polyester, a modified and improved PET-G material is the basis, but with an increased temperature and thermoforming resistance, as well as a reduced risk of cracking.

Polyester materials are mainly transparent, but coloured variations are also available.

1.2 Fields of Application

As with acrylic (PMMA) and polycarbonate (PC), polyester sheets are commonly used for advertisement signage or other industrial applications, and also for construction sites. Typical products which are printed and subsequently vacuum-formed include backlit signage, sales displays, bicycle helmets, vending machines, and many more.

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1.3 Reasons for PET acc. to manufacturers

- High impact resistance (higher than PMMA but lower than PC)
- HT-PET-G has a higher temperature resistance (up to 90°C) than PMMA, PET-G, PET-A
- Best fire protection classification (B1 and/or B2), better than PMMA and PC
- Lower forming temperatures compared to PMMA and PC, therefore reduced energy needs
- High chemical resistance

1.4 Common substrates/manufacturers

Sheets are available with thicknesses ranging from 1 to 10 mm. Coloured variations are also available. The following list of materials is sorted in alphabetical order is not claimed to be complete.

PET-G (transparent)	Manufacturer
COPOL	Quinn-Plastics
Quinn PETG	Quinn-Plastics
Quinn PETG UV	Quinn-Plastics
Simolux	Simona
Simolux UV	Simona
Veralite 200	I.P.B.
Veralite 202	I.P.B.
VIVAK,	Bayer Polymer
VIVAK UV	Bayer Polymer

HT (high temperature)-PET-G	
Spectar HT	Quinn-Plastics
Spectar HT-UV	Quinn-Plastics
VIVAK HT	Bayer Polymer
VIVAK HT UV	Bayer Polymer

PET-A (transparent)	
AXPET	Bayer Polymer
Hostaglas	Bay Plastics Ltd.
Veralite 100	I.P.B.

2.0 The Screen Printing Ink

Generally, solvent-based as well as UV-curable ink systems can be used for printing onto all types of polyester.

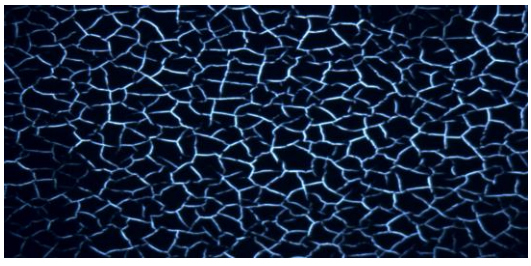
2.1 Requirements on the Screen Ink

- no cracking of the printed ink film
- good forming and vacuum forming properties
- highly fade-resistant colour shades suited for long-term outdoor use
- high opacity
- lowest possible effect of the ink on the substrate regarding impact resistance
- high mechanical and chemical resistances
- excellent mesh opening, important for slow printing sequences in the case of large format printing

2.2 Tips for Printing onto PET

Printing onto polyester materials is generally not easy, in particular onto PET-G and PET-A, since cracking of the ink may occur even after several days, and/or the adhesion may be insufficient if the ink selection was not correct. It is therefore advisable to choose the ink system carefully, as well as to pay attention to the following criteria:

- White shades and mixtures with white are most critical (high pigmentation reduces flexibility)
- thick ink films (coarse fabrics < 77 or multi-layered prints) will likely lead to problems such as cracking
- if drying is carried out in a tunnel dryer immediately after printing, the risk of cracking will be reduced to a minimum and impact resistance will be best
- Selection of a suitable thinner/ retarder such as PSV, SV 1, or SV 5 for example



Cracked ink film

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2.3 Marabu Ink Recommendations

The customer's job requirements are decisive in defining the correct ink type. At present, we can recommend the following ink types for different requirements. On the right hand side, you will find the recommended backing white:

PET-G:

1-component solvent-based/ basic shades

Tunnel drying or rack drying

- → Mara® *Flex* FX — White: FX 970
- → Mara® *Gloss* GO — White: FX 970
- → Mara® *Mold* MPC — White: MPC 970

1-component solvent-based/ basic shades

Only suited for direct tunnel drying

- → Libra *Print* LIP — White: LIP 971*
- → Mara® *Switch* MSW — White: MSW 970**

* LIP 971 will achieve its best tape adhesion after the vacuum-forming process

** We recommend to add 2% WM 1

If LIP is used, we recommend LIP 971 for mixtures with white. In the case of black or mixtures with black, please use LIP 489 instead of LIP 980.

2-component solvent-based/ basic shades

- → Mara® *Star* SR : H 1= 8 : 1
- → Mara® *Poly* P : H 1= 8 : 1

UV-curable/ basic/ 4-clr. process shades

- → Ultra *Form* UVFM (vacuum-formable)
- → Ultra *Graph* UVAR

PET-A:

1-component solvent-based/ basic shades

- → Mara® *Flex* FX — White: FX 970
- → Mara® *Gloss* GO — White: FX 970
- → Mara® *Mold* MPC — White: MPC 970

2-component solvent-based/ basic shades

- → Mara® *Star* SR : H 1= 10 : 1
- → Mara® *Poly* P : H 1= 8 : 1

UV-curable/ basic and 4-clr. process sh.

- → Ultra *Plus* UVP + 2% UV HV 4
- → Ultra *Star*-M UVSM + 2% UV HV 4

HT PET-G:

1-component solvent-based/ basic shades

- → Mara® *Gloss* GO — White: FX 970
- → Mara® *Mold* MPC — White: MPC 970
- → Libra *Print* LIP — White: LIP 970, 971
- → Libra *Gloss* LIG — White: LIG 070
- → Libra *Speed* LIS — White: LIS 070, 971
- → Mara® *Star* SR — White: SR 070, 270
- → Mara® *Switch* MSW — White: MSW 970

1-component solvent-based/ 4-clr. process shades

- → Libra *Print* LIP 4x9* — White: LIP 970/971
- → Libra *Gloss* LIG — White: LIG 070

*not vacuum-formable

2-component solvent-based/ basic shades

- → Mara® *Star* SR : H 1= 8 : 1
- → Mara® *Poly* P : H 1= 8 : 1

UV-curable/ basic and 4-clr. process sh.

- → Ultra *Form* UVFM (vacuum-formable)
- → Ultra *Graph* UVAR

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3.0 Fade Resistance

Printed display panels are often made for a medium-term or long-term outdoor use. Please note, therefore, that not all colour shades of the recommended ink series are highly fade-resistant.
Especially for the critical colour ranges of yellow, orange, and red, Libra *Speed* LIS and the ink series Mara® *Star* SR have a clear advantage thanks to their highly fade-resistant basic shades. In special cases, it is to align the customer's requirements with the characteristics of the ink used.
For more information, please refer to the technical data sheets of the corresponding ink series.

4.0 Remark

The information given in this TechINFO has been compiled as to the best of our knowledge and proven successful in practice for many years. Nevertheless, prior to the start of the actual print run, it is an obligation to verify and document all details and recommendations relating to the printing conditions (printing features, drying, vacuum-forming, post-processing) as well as to the substrate in use.
Please pay particular attention to the risk of cracking which can also arise (especially on PET-G) a couple of days after printing.

Contact

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