AUTEX Research Journal, Vol. 10, No2, June 2010 © AUTEX

NOVEL DECORATIVE MATERIALS FOR TEXTILES

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Abstract:

Thermal transfer foils like Flex and Flock are novel decorative materials for textiles. They are very attractive due to ease of use, simplicity of application, and the possibility of achieving unusual effects. This technology requires preparation of a digital image for digital cutting and/or printing plotters. This paper describes these materials, their structures, advantages, and techniques of application.

Key words:

Thermal transfer materials, decorative materials flex foil, flock foil, hot melt adhesives.

Introduction

Thermal transfer materials for a heat seal press appeared on the market beginning about 1970 [1]. These materials allow the reproduction of writing and images of every kind on cloth. This can be done directly with the employment of cutting plotters or punch cutters on cad-cut materials, or with materials that are printed through digital printing techniques in a thermal resin or with sublimatic inks for inkjet printers. These products assure the best covering of cloths, resistance to consumption and ease of use and at the same time they match the trends of fashion and the sectors for which they are designed. Such products are meant to be employed in important sectors such as sportswear, casual wear, professional clothing, and for a number of other personalizations such as for clubs, societies, etc. These foils are available in several colours and with unique characteristics of softness, patented due to the possibility of imitations [1-4].

There is a wide range of products for heat transfer with different structural, physical, and chemical properties. For this reason, different techniques of application can be used to achieve unusual effects.

The basic types of thermal transfer foils are Flex and Flock. Both of them are designed for cutting in Cad-Cut system and for printing. The specific structure of these foils for printing, their raw material base, and their manufactured properties, allow their use in pigment, sublimation, solvent, or eco-solvent printing. A screenprinting technique may be applied and first of all, digital printing with an inkjet printer (using piezo-heads). This requires the preparation of a digital vector image.

Flex and Flock foils can be designed for cutting (monocoloured-in about 30 colours-or with a prepared pattern) or for printing in a different technology (white foils).

Description of foils

Foil of Flex type (Flex-film)

Most of them offer a pleasantly soft, textile touch. The material can be cut with customary plotters and can be easily weeded afterwards. Typical Flex foil consist of layers as in Figure 1.

Structure of Flex foil:

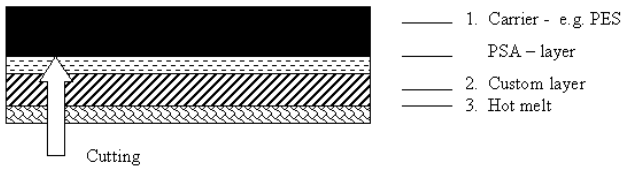

Figure 1. Typical Flex foil.

1. So-called carrier backing is a PES film with or without a self-adhesive layer (PSA). The self adhesive layer is a liner which enables an easy re-positioning of pattern accidentally loosened when weeding the material. This is why it is particularly suitable for smaller lettering and motifs. The non-adhesive polyester liner enables the stacking of the weeded decals without sticking together. After heat pressing, the carrier is removed.
2. The effect of a coloured film (custom layer) is produced on the basis of PCV or polyurethane. In the case of PCV, the ECO-TEX Standard is class 3 [1]. When PU film is used-ECO-TEX Standard class 1 [2]. The thickness of the layer is about 0,10-0,30 mm.
3. Hot-melt adhesives are used for heat sealing on the basis of polyester, copolyamide, or polyurethane. These are activated by means of temperature. Thanks to specifically formulated adhesives, perfect bonding to[b2] the textile is possible, so the fastness and wash resistance of the finished product can be very good.

Flex foils have a smooth, matte, or shiny surface. More of them have a soft handle and are ecologically proven, in accordance with the ECO-TEX Standard. White or colour standard Flex material is characterized by a high opacity and wash resistance.

The other groups are:

- extra thin perforated foil material, fit for Cad-Cut applications,
- The circular perforation allows transpiration, giving at the same time a decorative, special effect. e.g., PS PERFOR [1,3].
- extremely stretchable flex film for transfers onto very elastic textiles like Lycra or Spandex, e.g., FLEX ELASTICUT [1,3]. In this case there is extra support due to a transparent layer for stabilization. The support layer and polyester backing must be removed immediately after heat transfer.

– for application on nylon and coated fabrics with a special sealing adhesive, e.g., POLI-FLEX NYLON [2].
– those with an efficient 'migration blocking barrier', e.g., POLI-FLEX BLOCKOUT [2], which is a multilayer polyurethane film that will not allow any sublimation ink to bleed through the garment: a similar effect is achieved with SUBLISTOP [1].
– those with a holographic film effect, e.g., POLI-FLEX STARFLEX [2].
– silver transfer films with retroreflective properties. These films consist of metalized microscopic glass beads laminated to dry heat-reactivating adhesive backing, e.g.,POLI-FLEX REFLEX SILVER, POLI-FLEX NYLON REFLEX ECO [2], TRANSREFLEX, EXTRA REFLEX [3], and THERMOREFLEX [1]. Recommended for applications on work wear and for applications which require more than 100 lumen luminescence, e.g., on the clothes of a fire brigade.
– those with the special effect of a silvery shining glitter and glossy lacquer, e.g., FLEX MODA GLITTER+ LACQUER [3],
– those with fashionable Jeans, Meta, Carbonium (bicolour effect) surfaces, e.g., POLI FLEX FASHION [2,3].

The wash resistance of this foil is 40 Co-80 Co (inside out wash). The best resistance can be obtained on those fabrics not treated with silicone. Some of flex materials are suitable for dry-cleaning.

For the application of flex foils in cutting system:

1. cut the foil material with the Cad-Cut system in inverse-laterally reversed through the coat of hot melt adhesive on the back,
2. weed the excessive material,
3. place the foil material on the garment with its carrier,
4. heat apply by press,
5. remove the carrier after the textile has cooled down or warm, following the instructions of the producer.

Cutting can be realized using the systems: die-cut, heat-cut, or laser cut. For die-cut are used, e.g., the Roland GX-24 Vinyl Cutter (Figure 2).

Figure 2. Roland GX-24 Vinyl Cutter [4] and a way of cutting to the depth of the carrier layer.

Heat presses are used for heat sealing, e.g., LTS 238 (Figure 3).

Figure 3. Hand operated Non Stop Press of Lotustransfer [3].

The most popular press settings are 150 Co-165 Co , 10-17 sec, pressure minimum-medium is about 2-4 bar. There are also flex foils designed for digital applications, and a few for screen printing applications. Digital printing enables a photographic image quality, doesn't limit the number of colours used, and most of all doesn't require preparing an expensive stencil for screen printing. This transfer foil has a hot melt adhesive on its back and is applied on a polyester backing (Figure 4a). Its surface is matte with a white colour and can be easily processed, e.g., COLOPRINT [1] is particularly suitable for systems using solvent or eco-solvent inks. After printing, the material can be cut out using an optical registration system, which detects each design and cuts it according to selected outlines. The printing and cutting of these materials is laterally correct. The material is dried at least 12 hours before rolling, overlaying, or heat transferring. Then any excessive material must be weeded. The image is carried from the backing (liner), which is removed, to the garment using adhesive, transparent polyester resistant to high temperatures. This carrier is used for positioning the image printed on the textile. A print with a special carrier film or silicone sheet is applied using a heat transfer press. After heating, the covering sheet is removed hot or after the fabric has cooled down.

For the same inkjet (solvent and eco-solvent) there are materials with special effects GLITTERPRINT [2]. Others enable professional stretchable colour brilliant transfers for textile printing, e.g., COLORPRINT EVOLUTION [3] or EVOLUTION PRINT [1] POLI-FLEX, serial nos. 4015, 4016, 4600, and 4020 [2].

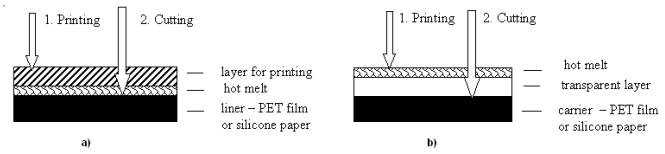

Figure 4. Flex-foil for printing a) typical, b) transparent - for print in reverse.

There is also transparent foil with a heat seal material specifically formulated for inkjet solvent and eco-solvent based inks-both printing and cutting systems. These materials are very thin, which is suitable for light coloured fabrics. They enable the production of professional, high quality and colour brilliant transfers for textile printing that are characterized by their extraordinary durability, e.g., COLORPRINT TRANSPARENT [3], COLORPRINT CRYSTAL MATT/GLOSSY [1], and POLI-FLEX, serial nos. 4655, 4625, and 4626 [2].

In this case the material is printed on its back (Figure 4b), that is, on the hot melt adhesive side. Printing and cutting must be laterally reversed. This technique excellently protects the ink from wear because of the transparent film lying above.

These foils are not suitable for dyed garments with disperse dyes due to sublimation effects. In this case, a special product with a blockout interlayer can be used, e.g., POLI-FLEX 4010 BLOCKOUT [2].

Dry-cleaning is not possible. Washing is possible at 40 Co, twenty-four hours after the heat transfer. Foils that are prepared especially for sublimation printing are POLI-FLEX 4675 [2] and SUBLIONE [5]. In this case, the effect layer is polyester, so the printouts have better wash resistance, e.g, -90 Co. Flex material is also offered as a transfer material for screen printing using vinyl inks, e.g., FLEXPRINT [1], with good wash resistance to 80 Co.

Foil of Flock type (Flock-film)

Textile flocking is a relatively economical way of imparting an attractive finish and pleasant touch [6,7]. The variety of effects that can be produced by flocking extends from fine velour, e.g., for clothing, to velvet or suede-like decorative fabrics and simulated fur and floor coverings.

Short pieces of monofilament fibre, i.e., a short fibre material made of viscose, polyamide, polyester, polyacryl nitrile, acetate, or natural fibres (wool, cotton), prepared for flocking are used in the process of flocking. Depending on the pile height, the flock material looks like suede or velvet.

The most frequently-used fibre titres are in the range of 0.9-22 dtex, and the usual fibre lengths are between 0.5 and 8 mm. Flock material is manufactured by grinding in the ball mill, cotton and wool or by cutting with precision of 0.1 mm. In the textile sector, flock prepared by a special process is almost always applied by an electrostatic or an electrostatic/ mechanical means.

The main tasks of the flock adhesive are to retain the flock fibres during flocking in order to achieve a high flock density and provide the required anchorage once the adhesive has been applied. The chemical base of the flock adhesive could be: polyvinyl acetate, polyarylic acid ester, polyvinylchloride, polyuerethane, etc. Curing is carried out by solvent evaporation, condensation or polyaddition.

The main processes in flocking are as follows:

1. Application of adhesive: e.g., by squeegees, rollers, screens or spray methods. The adhesive (binder) must make good contact with the textile surface without penetrating too far into the material (to maintain flexibility).
2. Flock application: this is the application of short pieces of monofilament fibers to the adhesive coated surfaces. This is usually done by application of a high voltage electric field.
2. Drying: the drying conditions are dependent on the requirements of the particular bonding agent used. Drying is generally carried out for 3-8 min at approx. 70 Co for solvent-based adhesives.
3. Final treatment: removal of excess flock by brushing with brush rollers together with a mechanical suction unit.

A very beautiful velvet finish can be obtained by the use of flock-foil for heat transfer. Heat transfer pre-flocked materials are on the market (Figure 5).

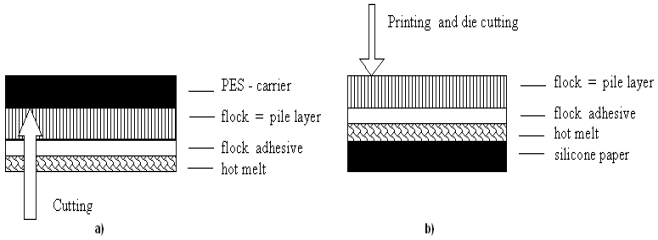

Figure 5. Typical structure of Flock: a) foil for cutting, b) foil for printing and cutting.

Flock foils for cutting are monocoloured or patterned. The companies Siser, Politape, and SEF produce a wide range of these foils, e.g., STRIPFLOCK [1], POLI-FLOCK [2], VELCUT, and FASHION VELCUT [5]. The pile-layer in these materials is rayon viscose flock. These heat transfer rayon flock materials have brilliance and texture due to a high fibre density and excellent cutting and weeding properties. Cutting is in reverse. Flock foil consists of layers, as shown in Figure 5a: PES film as a carrier, rayon flock, PCV resin as a flock adhesive, hot-melt film on the polyester base. This composition in the product STRIPFLOCK [1] allows it to achieve certificate ECO-TEX Standard of class 3.

Flock foil material for printing is shown in Figure 5b. Most foils of this type are prepared for eco-solvent and solvent printing, e.g., JETFLOCK SOLVENT [1], ECOPRIN-FLOCK [3], and ECOPRINT [5]. Flock is made of velvety rayon viscose with special fibre impregnation. Silicone paper or transparent polyester backing is used as a liner.

For application on textiles the so-called carrier-a tape of transparent polyester resistant to high temperature-is used. Heat transfer materials for sublimation printing such as FIBERPLUS [5] and SUBLI-FLOCK 5901 [2] need two steps of transfer after a digital printing mirror inverted on the transfer paper with sublimation inks. The first heat press must be performed at 190 Co for 40-50 sec and then the cutting of the image heat transfer onto the textile.

There are also available flock materials as transfer materials for screen printing using water colour inks for cotton, e.g., FLOCKPRINT [2]. After printing, the motifs can be cut using a plotter cutting system.

Conclusion

Heat transfer technology offers manifold creative possibilities in the decoration of textiles. It is designed for fashion designers, for sports and leisure garments, corporate clothes, and promotions. This technique is easy to use, quick, and clean. It can be used in small or large numbers and always in an impressively brilliant quality. This system of textile decoration is possible due to a dynamic development of polymer materials with film properties, pigments, hot-melt adhesives for thermal transfer, and pressure sensitive adhesives for aiding the application of the foils onto the textiles.

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