

Subject: Ghosting of 100% Cotton

Low bleed plastisols designed for printing onto polyester and polyester blend fabrics in conjunction with some reactive cotton dyes can lead to the ghosting problem.

Since the ghosting phenomena is well defined, warnings regarding the use of low bleed plastisols are given in the technical data literature.

The ghosting phenomena results from a combination of:

Certain cotton dyes are more sensitive to oxidation/reduction reactions than other dyes, and will more easily lose color value. The degree of "fixing" of dyes on the fabrics is part of the equation. For instance, dyed fabrics that are to be printed later using discharge must have the dyes not "fixed" so the color can be removed after the discharge printing. They dyers typically do not totally react/fix the dyestuff to leave it vulnerable to further reaction. Also, they select dyes so they have the discharge potential.

In the case of reactions with low bleed plastisols, dyes in the yellow, blue/violet families are more sensitive, and fabric colors using these groups of colors need pre-testing. Dyers can select more colorfast dyes, but these typically have a higher cost. Also if a dyer does not know the end use of a given fabric, then they typically use the most economical dye package, and generally, the less costly dyes will be subject to easier color removal.

Low bleed plastisol contains chemistries that are activated with temperature to offer some oxidation/reduction characteristics, and this is why they work on polyester fabrics dyed with dispersed dyes. The recommendation is not to use the low bleed plastisols on 100% cotton fabrics.

If one chooses to use a low bleed ink on 100% cotton, the combination of low bleed ink/fabric should be pre-tested to assure there is no adverse effect. There is a test procedure defined in Rutland's literature.

In fact, with the influx of more imported fabrics, it is advised that all fabrics be pre-tested to assure that the quality is suitable for printing.

- Process conditions – experience shows that the following must occur for ghosting to occur on 100% cotton:
 - Certain dyes must be present on the 100% cotton
 - Low bleed ink be used
 - Humidity be present in the garment after printing
 - Lack of full fusion of the plastisol (make the ghosting more severe)
 - Heat present after the fusion step

100% cotton has high moisture content – the commercial moisture content of cotton is 8.5%.

Some of the softeners/finishes on the fabrics can act as humectants and increase the moisture content of the fabrics, especially in areas with high humidity.

Many fusion operations do not fully fuse the plastisol, nor remove all of the moisture from the fabric during fusion, and this results in two problems:

Because there is moisture in the fabric, the heat of evaporation cools the fabric thus reducing the degree of fusion of the print. Until all the water in the fabric is evaporated, the fabric and the print will not go above 212°F. Because the plastisol has not been fully fused, the chemistry used for low bleed purposes has not been completely reacted, thus residual reactive chemistry that can interact with dyestuff is available.

Residual moisture left in the fabric contributes to the reaction between the low bleed chemistry and the dyestuff, especially in the presence of elevated temperature.

When garments are removed from the oven belt and they are still hot, they should not be stacked until they have been cooled. The stacking acts as insulation to hold the heat and if moisture is present and the plastisol is not fully fused, then conditions are prime for a problem if the poor resist, reactive dyes are present on the garment.