

# Avery Dennison Instructional Bulletin 1.04

## Plasticiser and Migration

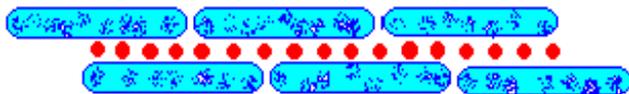
### Background

Plasticisers are a group of chemicals, which give PVC films the required flexibility. Plasticisers look like transparent 'oil' which, depending on its chemical structure, exhibits very distinct properties. Plasticisers with long molecular chains are identified as 'polymeric' plasticisers, and plasticisers with short molecular chains are identified as 'monomeric' plasticisers.

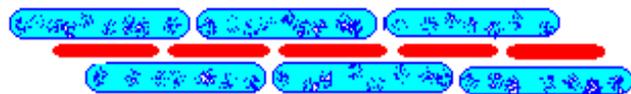
### Non-Plasticised (rigid) PVC - Rigid sheeting



### Monomeric Plasticised PVC - Lower cost, more prone to migration



### Polymeric Plasticised PVC - Premium quality, more stable and less likely to migrate



Plasticisers do not chemically 'bond' to the PVC polymer, therefore, in practice this has the consequence of potential 'migration' from the PVC film into other materials such as the pressure sensitive adhesive or inks/toners. A number of factors influence the potential and or speed of plasticiser migration.

### Plasticiser Migration Influential Factors

1. Receiving agent: The presence of a suitable plasticiser 'absorbent/receiver', (i.e. adhesive, PVC film, polyethylene substrate, etc).
2. Temperature: Elevated temperature (including solar heat) will significantly increase the rate of plasticiser migration.
3. Pressure: Increased pressure intensifies contact between vinyl and absorbent or can squeeze out the non-chemically bonded 'oily' plasticiser.
4. Solvents: The presence of solvents (in inks) act as a diluent and accelerates plasticiser migration.
5. Time: Even under ideal conditions, plasticisers naturally migrate over time.

### Consequences of Plasticiser Migration

The addition of plasticiser to PVC film is a necessary evil. Without plasticiser, films are rigid and brittle (consider an older model vehicle, with elevated temperature, cleaning solvents and time itself, dash board vinyl cracks).

As plasticiser migrates from a flexible faced vinyl 'scrim' or 'banner' material, it saturates or softens the pressure sensitive adhesive altering the adhesives physical properties (such as cohesive strength). In some cases, excess plasticiser can also migrate into a less plasticised PVC decal. The added volume in the film and reduced cohesive strength of the adhesive is likely to produce a wrinkled or tunneled decal. Plasticiser seeks equilibrium.

## Controlling Plasticiser Migration

1. As plasticiser migration cannot be halted, controlling its movement by understanding the (above mentioned) 'influential factors' is critical.
2. Physical barriers have also proven to control migration. Physical barriers include: primer coating the plasticised films or introducing an inert film between the plasticised product and its potential absorbent (producing a barrier to transport).
3. Formulating pressure sensitive adhesives to 'resist' the absorbent characteristics (these adhesives are known as 'plasticiser migration resistant').
4. Utilizing a premium grade (polymeric) plasticiser in film formulations (including PVC substrates and PVC decals).

For further information, contact your local Avery Graphics representative.