Pressure-Sensitive Tape Process (and the environment)

Environmental regulations affect pressure-sensitive tape technology in two key areas: manufacturing processes and product design. Such tapes usually consist of two major components: a backing and a pressure-sensitive adhesive. The backing may be paper, cloth, plastic, film, foil, laminate or other relatively flexible sheet material. One or both of the sides of the backing may be specially treated to provide controlled release or adhesion. The adhesive is coated on the backing and bonds to the target object as a result of the application of pressure.

Pressure-sensitive adhesives include a variety of natural and synthetic materials, including natural rubber, synthetic rubber, block copolymers, acrylics, silicones, etc., modified in various ways.

The majority of today's **pressure-sensitive adhesive tapes** consist of plastic film backing coated with natural rubber (solvent), synthetic rubber (hotmelt) or acrylic pressure-sensitive adhesive. Polypropylene, polyester and polyvinyl chloride constitute most of the films currently used. These films are normally formed by extrusion and do not require the use of solvents in forming the film.

The major environmental considerations result from the formation of the adhesive layer on the backing. The earliest pressure-sensitive adhesives such as low-viscosity natural rubbers were coated from solvent. Without containment devices, these were simply exhausted into the atmosphere. Likewise, the production of energy to evaporate these solvents usually requires other emissions into the atmosphere, primarily carbon dioxide.

Over the past three decades regulations in industrialized nations have increasingly restricted the quantity and types of emissions from such processes, particularly airborne emissions of photo chemically active solvents. The regulations attempt to accommodate obsolete manufacturing processes through the use of improved control technologies.

A consequence of the increasingly restrictive emission regulations has been the parallel development of "pollution prevention" strategies and policies. Central to these strategies is the adoption of low- or non-polluting processes. Hence the growth of hot-melt pressure-sensitive adhesives (HM PSAs) based on block copolymers such as styrene/isoprene/styrene over the past two decades. Requiring no solvent and using minimal energy, these processes comply with tighter restrictions. Likewise, water-borne acrylate adhesive technologies have increased.

However, shortcomings in low-emission adhesive technologies, such as application temperature restriction in the case of Hotmelt PSAs and relatively low holding power (shear adhesion) in the case of water-borne acrylics, have led to new families of additives and processes designed to overcome such weaknesses.