The Use Of SMA® Resins As Dispersing Resins For Leather Finishing

It is well known that SMA® low molecular weight Resins have polymeric surfactant properties. They have a good balance of hydrophobic and hydrophilic functionalities which makes them effective agents for the wetting, grinding, dispersing, and stabilization of pigments in waterborne systems.

The use of these resins has been limited primarily as additives to provide certain desired properties (e.g. heat-resistance, gloss, resolubility, levelling, etc.) in applications such as ink and paint formulations, the surface treatment of leather, and textile printing. For example, SMA® Resins are well known in leather finishing as ingredients in polish formulations which are applied as a spray to provide gloss and water resistance. SMA® 2625 H, which is the key component to give gloss, water resistance, and levelling properties, is formulated with pigment dispersions, waxes, and some binders.

Less well known is the utility of SMA® as a Grinding/Dispersing Resin to make pigment dispersions. This application takes advantage of the SMA® Resin’s strong surfactant properties to gain other benefits such as high dispersion stability, and high pigment/dispersing resin ratio. This bulletin summarizes the use of SMA® Resins as a dispersing resin in the leather finishing market.

SMA Resin for Anionic Pigment Dispersions

SMA Resins are a family of low molecular weight copolymers of Styrene and Maleic Anhydride. SMA® 1000, 2000, 3000 and 4000 are copolymers with a styrene/maleic anhydride ratio equal to 1, 2, 3 and 4, respectively. SMA® 1440, 17352 and 2625 are partially esterified derivatives of SMA® copolymers which contain ester, carboxylic acid and anhydride functional groups.

In addition to supplying SMA® resins in solid form, Cray Valley Company produces aqueous solutions of the ammonium salts of SMA® grades to facilitate their use in water-based formulations. During the hydrolysis process, the SMA® Resin anhydride groups open to give anionic carboxylate groups. These ammonium salt solutions (SMA® H grades) are soluble in all proportions with water. However, they are sensitive to strong acid conditions and will precipitate at a pH below 6.

Due to their outstanding wetting, dispersing and stabilizing properties, SMA® H can be used to make dispersions of both inorganic and organic pigments. Those pigment dispersions have good stability, good gloss and excellent color development. In many cases, it is possible to use less pigment to achieve the same color strength. Thus, SMA® 1440 H and SMA® 17352 H are the right dispersing resins to give stable dispersions with outstanding color intensity. For example, one main use of SMA® Resins in the leather finishing application is to disperse black pigment.

SMA® Imide Resins for Cationic Pigment Dispersions

SMA® Resins can react with primary amines to form fully imidized styrene-maleimide copolymer products, called SMA® Imides.

When a SMA® Resin is reacted with a primary, tertiary diamine, the resulting SMA® Imide product contains tertiary amine functional groups. These allow the SMA® Imide to be converted into a cationic copolymer by protonation with an organic acid to form trialkyl ammonium carboxylate salt groups.
Cray Valley Company offers a series of SMA® Imide copolymers based upon dimethylaminopropylamine (DMAPA): SMA® 1000I, 2000I, 3000I, and 4000I. These grades have styrene/maleimide ratios of 1/1, 2/1, 3/1, and 4/1, respectively. As derivatives of standard SMA® Resins, SMA® Imides are all low molecular weight copolymers (Mn < 5000) and exhibit outstanding thermal stability to 350 °C (decomposition temperature) and a Tg of 80 to 90 °C.

SMA® Imide Resins are soluble in acidic aqueous solutions due to the presence of the tertiary amine functional groups. Cationic salt formation is obtained, so converting an SMA® Imide to its catonic form gives a material which has dispersing properties.

Thus, the SMA® Imide / Cationic Form can be used to disperse pigments and particles in acidic and cationic formulations. It is possible to obtain very stable cationic pigment dispersions. Those cationic pigment dispersions have the property of staying at the surface of leather to cover the defects of the leather. This cationic pigment dispersion is bound at the surface by the anionic character of the leather.

Summary
Due to their unique chemical structures, SMA® Resins/Anionic Form and SMA® Imide/Cationic Form can efficiently form stable pigment dispersions. These pigment dispersions are currently used in the leather finishing for either anionic or cationic processes.