Grade					
	Vinyl Chloride	Vinyl Acetate	Acid	Acrylic Ester	Inherent Viscosity
E 15/45	85	15			0.5
H 15/45	85	15	•••	•••	0.5
H 15/50	85	15			0.6
H 40/43	60	40			0.46
H 40/50	60	40			0.6
H 40/55	60	40			0.7
H 40/60	60	40			0.88
E 15/45M	84	15	1		0.5
H 15/45M	82	17	1		0.56
E 15/40A	85			15	0.4
E 20/55A	80		•••	20	0.68
E 22/48A	78	7		15	0.56

TABLE 4—Suspension vinyls for solution coatings—Wacker Chemie.

FABLE 5 —Suspension vi	inyls for	solution	coatings—Nissan.
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	Composition, wt%					
Grade	Vinyl Chloride	Vinyl Acetate	Vinyl Alcohol	Acid		
MPR-TA	91	3	6			
MPR-TS	87	13	•••			
MPR-TM	86	13		1		

Vinyl solution resins are dissolved by ketones, esters, cer tain chlorinated solvents, and some nitroparaffins. As a cass ketones are the best solvents in terms of the ability a dissolve higher solids at lower solution viscoury. Lydrocarbons are chiefly used as diluents printation of over cost. Aromatic and aliphatic hydrochroits can be used as diluented aromatic and drocarbons, chiefly toluene and xylene and higher boiling fractions such as Aromatic 100 or 150, are preferred as they can be used at high levels, in the range of 50 to 65% of the solvent blend depending on the resin composition, molecular weight, and desired solids. The Aromatic 100 and 150 are usually used only in baking finishes.

Aliphatic hydrocarbons can be used in limited amounts, up to about 30% of the solvent blend. Higher levels can lead to viscosity instability, and only low boiling aliphatic hydrocarbons, those with boiling points up to 117°C, are suitable. The use of higher boiling aliphatic hydrocarbons can cause precipitation of the resin during drying.

Alcohols are strong precipitants for vinyls and are not generally used in unmodified vinyl lacquers. However, in some cases vinyls, usually hydroxyl-modified vinyls, are readily formulated with other resins that are carried in alcohol. With these, up to 15 to 20% alcohol may be used in the solvent blend. Careful attention must be paid in vinyl coating formulations that contain alcohols to be sure that problems do not develop during application and drying of the coatings. Glycol ethers and glycol ether esters are sometimes used in vinyl coatings to improve flowout of baked coatings.

In response to regulations restricting the type and amount of solvents used in coatings, such as Los Angeles Rule 66 and later versions, vinyl coatings were reformulated as compliant systems by reducing the amount of branched ketones and aromatic hydrocarbons and making up the difference with esters and aliphatic hydrocarbons [13]. Though it was necessary to use more oxygenated solvents, the performance of compliant coatings stayed the same. Typical solvent blends used for spray application and the referentiated compliant systems are shown in Table 7

Solution Characteristics

From the time a vinyl resin is dissolved, the viscosity of solutions includes with time until an equilibrium is reached fiter with the viscosity remains constant. This behavior is blieved due to the formation of regions of microcrystallinity between polymer molecules in solution. The extent of the viscosity increase is dependent on: (a) resin molecular weight; (b) solids content of the solution; (c) and the strength of the solvent blend. The viscosity increase may be small or so large that the solution sets to a gel. Properly formulated vinyl resin solutions usually reach an equilibrium viscosity in about 3 to 5 weeks. Guidelines for the preparation of viscosity stable solutions for resins of varying molecular weight are shown in Table 8.

Vinyl chloride copolymer solutions also exhibit what is known as the memory effect. When a vinyl resin solution is heated to about 60°C, the effect of microcrystallinity is eliminated. If the solution is then cooled to its original temperature, the viscosity will not immediately return to its original value because of the time lag needed for the effect of the microcrystallinity to redevelop. With time, the viscosity of the solution will return to the same value as that of a solution that was not heated. The converse relationship hold when vinyl solutions are cooled. A graphical presentation of the memory effect is presented in Fig. 1.

Plasticizers

Plasticizers are often used with vinyl resin coatings to improve flexibility, formability, and impact resistance of the coating. Monomeric as well as polymeric plasticizers or compatible polymers with low glass transition temperature (T_g) may be used to plasticize a vinyl coating.