Resene

Resene Paints Limited

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ALKYD V. ACRYLIC

The pressure on the market of two distinctly different classes of paint each vying for the same surfaces must of necessity cause some confusion in the mind of the specifier. The purpose of this memo is to lay before you the inherent differences in the two species so that the choice can be made more logically.

In order to do this, we are going to have to stick our toes into the deep water of polymer chemistry, but before we take that plunge it is absolutely vital to clarify our thoughts in the area of history and development. Alkyd resins have been on the scene for about fifty years. Their's is a mature technology with no significant developments having occurred in decorative alkyds for the last twenty years. Acrylics on the other hand are still developing and at a very rapid rate. The result of this tends to make past experiences meaningless as an assumption based on the use of any acrylic 10 years ago would have little relevance today.

Any polymer having useful film properties must have a high molecular weight; within one polymer type higher molecular weight will give tougher, more abrasion resistant, and more durable films. Alkyds and acrylics achieve their high molecular weights in very different ways. Acrylic polymers are grown to massive molecular weights in a reaction kettle by growth of long chain-like molecules. When they are discharged from the kettle, all the reaction is spent and the polymers can correctly be called non-reactive. Such massive molecular weight polymers can only be handled in the form of an emulsion, a solution would be unusably sticky and viscous.

Alkyd resins on the other hand are cooked only to medium molecular weights but contain, in their ingredients, reactive sites (polyunsaturated oils) which will further react to bring the molecular weight up to the necessarily high level. This further reaction is induced in the paint film by the addition of catalysts (driers) and the presence of oxygen in the air. The reaction proceeds by the linkage of adjacent molecules into a 3 dimensional lattice.

The difference described is important for two reasons:-

1) The 3 dimensional nature of the alkyd is much more rigid, when fully cured, than the chain like acrylic. This results in the alkyd becoming more brittle than the acrylic, and
2) Not all of the reactive sites are used up during the curing of an alkyd — these later become sites for future breakdown.

These two reasons provide the theory behind the observed fact that acrylics **are** more durable than alkyds. Life, of course, is never quite as simple as a yes/no alternative and there are often other factors to consider apart from just durability. The list of factors in this case is quite long but we will confine ourselves to three major areas:-

a) **Film build (or volume solids)** Because the alkyd starts off at a lower molecular weight you can 'get more of it in the can'. A good gloss alkyd will have a volume solids of about 55% whilst the equivalent gloss acrylic will be about 40%. This means that at equal spreading rate, the alkyd gives a film 37.5% thicker than the acrylic. Conversely at equal film build the alkyd will have a 37.5% greater spreading rate.

b) **Inclement weather.** Alkyds and acrylics form films by entirely different mechanisms. Alkyds initially lose solvents by evaporation during the "tack-off" period then cure by the catalytic/oxidation reactive mentioned earlier. The rate of this reaction is temperature dependent, slowing down in the cold. The reaction rate will pick up however, when the temperature rises. Damage which can occur to the film during cold temperature drying is usually confined to some gloss loss.

   Acrylics however, form a film by the physical fusion of plastic particles after loss of water by absorption or evaporation. Temperatures below a certain critical level will cause the particles to become too hard to deform and coalesce into a film. This is particularly true when high humidities delay the evaporation process possibly into the cooler part of the evening. Lack of film coalescence in acrylics is an irreversible phenomenon.

c) **Surface Preparations** Acrylics are a particulate material carried in a water medium. If these are applied to a porous surface water will be absorbed preferentially leaving the vehicle sitting on the surface. If the surface is sound, this is a very desirable state of affairs as it leaves all of the protective or decorative film exactly where it should be.

   Alkyds on the other hand, due to their lower molecular weight, are more penetrative of porous surfaces which can lead to loss of film from the surface but can also help in binding and conditioning less than perfect surfaces. This does not preclude the need for proper surface preparation but does give the edge to alkyds over doubtful surfaces.

To sum up, where an external surface requires coating, if the surface is sound and the weather conditions favourable, an acrylic will generally give the better performance: if the surface is doubtful an alkyd will probably be preferred.

On the other hand an alkyd undercoat followed by an acrylic is a very good system!!

GOUGH STREET, LOWER HUTT, NEW ZEALAND. P.O. BOX 36-006.
TELEPHONE (04) 684-319.
TELEGRAMS "RESENE",
TELEX: WELLINGTON NZ 3353 SEEK (RPL).
FAX: (04) 686-987.
BRANCHES: WHANGAREI, AUCKLAND, HAMILTON, TAURANGA, ROTORUA, NAPIER, HASTINGS, NEW PLYMOUTH, PALMERSTON NORTH, LEVIN, PARAPARAUMU, NELSON, CHRISTCHURCH, TIMARU, DUNEDIN, QUEENSTOWN, INVERCARGILL, FIJI.