

Understanding Color Matching

COLOR TERMINOLOGY

Face Tone	The color when viewed straight on
Flip Tone	The color when viewed from an angle
Base Tinter/mass tone	The color of a single pigment or tinter
Under Tone	The color produced by mixing a self color with either white or aluminum
Hue	The quality of color which is described by the words red, yellow, green, blue. Pure black, grey and white are neutral.
Metamerism	The phenomenon of two colored samples that appear to be identical under one or more light sources but are a mismatch under other light sources

SOLID/METALLIC COLORS

Solid Colors are pigments finely dispersed in a resin medium at a sufficient concentration to give opacity at a film thickness of 2 thou. Light is reflected from the paint film in the same way that it is reflected from a glass surface or mirror. The light penetrates about half-way into the film and is reflected away at the same angle at which it enters. This gives the effect of opacity and all-over color which looks the same from any angle of direction.

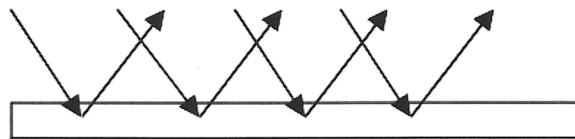


Figure 2. Light falling on pigmented film, reflected away at the same angle

Metallic Colors can cause many more problems for the refinisher than is the case with solid colors, and therefore need much more care in application to produce good color matches. An understanding of why metallic finishes present these problems will go a long way towards helping the refinisher to deal with them. Metallic colors are characteristically different from solid (fully pigmented) ones. The paint is a translucent material which gets its opacity from the aluminum flakes which are layered in it. Because of this translucency a ray of light can easily penetrate the paint surface and is reflected back only when it strikes one of these aluminum flakes. As the aluminum flakes lie at all depths, the total light is reflected and scattered in all directions, giving the finish a metallic sparkle.

This gives the metallic paints their characteristic apparent color difference when viewed from the face and flip tone. As the layering of the aluminum particles affect the appearance of the paint film, it allows that different effects can be obtained by different spraying methods.

If the material is sprayed dry, the aluminum flakes are trapped in the surface of the paint film. This lightens the color and enhances the metallic appearance of the finish. If the material is sprayed wet, the flakes have time to sink in, bringing up the color of the tinting pigments and producing a darker effect.

When repairing a metallic finish, an accurate reproduction of the original finish can only be obtained by matching both the color and the metallic appearance.

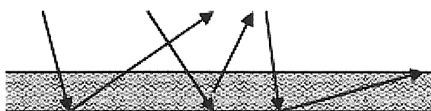


Figure 3. Light penetration and reflection from aluminum particles in a wet and heavy spray condition

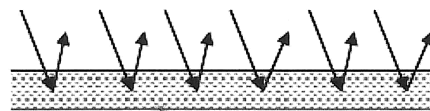


Figure 4. Light penetration and reflection from aluminum particles after a dry and light spray condition



An Alco Industries Company
600 Nova Drive SE • Massillon, Ohio 44646
ProSprayFinishes.com • ProSprayH2O.com

Technical Support: 1-800-776-0933

REFERENCE

Understanding Color Matching

IDENTIFYING THE COLOR

Use the Pro-Spray Intermix program to identify the color required by reference to the Manufacturer's color name or code. Where the code is missing use the Pro-Spray Minolta Color Reader by matching the car color to a color swatch.

MIXING THE COLOR

1. Use the Pro-Spray Intermix program to obtain the mixing formula for the required color.
2. Check that all bases are thoroughly stirred. New tinters should be stirred for at least 20 minutes. It is advised that your mixing schemes are switched on twice a day for at least 10 minutes at a time, and further suggested that a short stir be carried out prior to mixing. During cold spells stirring periods should be extended.
3. It is recommended that aluminum and pearl bases are hand stirred with a wide blade prior to being machine stirred. This ensures that all aluminum and pearl paste is thoroughly mixed, and any slight settlement is stirred in.
4. Do not leave the mixing machines running continuously. This will have a detrimental effect on the contents.
5. Ensure that all lugs on the top of cans are properly engaged, that the stirrer is rotating freely, and the pourer is clean and seats properly when closed. Failure to clean the pourer will lead to bits of dried paint in the mix and will cause problems if the sprayers does not strain before use.

IMPORTANT: Always hand stir every mix immediately after mixing and before putting on a shaker or delivering to your customer. Failure to stir mixed paint will result in little or no shelf life of mixed paint.

SPRAYING THE COLOR

1. Always spray out test panels ensuring that full opacity is obtained; allow to dry and check against the vehicle before applying the color.
2. When using the color always ensure that it is well stirred and thinned with the correct thinner to the recommended viscosity (checked with a viscosity cup) and activated where necessary.
3. When using a basecoat/clearcoat system it is essential to apply the clearcoat (correctly thinned, and activated) which should be allowed to dry before comparing the test panel with the car.
4. Always clean and compound the section(s) next to the one being painted. In this way if the color needs fading out (particularly with metallics) the necessary preparation has been done. This also ensures that when the match is being checked, the proper color is showing and not a faded or dirty one.
5. The following points should be noted as the variations in technique listed will affect the final color, particularly on metallics.
 - Air pressure
 - Speed of pass
 - Film thickness
 - Flash off time (Air temperature or thinners)
 - Viscosity of paint

Understanding Color Matching

Before tinting a metallic color, decide if one of the following techniques will solve the problems:

PAINT SHOP CONDITIONS	TO LIGHTEN	TO DARKEN
Temperature	Warm up	Cool down
Humidity	Low	High
Air movement	Increase	Decrease
SPRAY GUN	TO LIGHTEN	TO DARKEN
Fluid nozzle	Small	Large
Needle control	Close up	Open out
Air cap	High air consumption (fine atomization)	Low air consumption (poor atomization)
Fan width	Wide	Narrow
Air pressure	High	Low
THINNING	TO LIGHTEN	TO DARKEN
Type of thinner	Fast	Slow
Amount of thinner	Over thin (lower viscosity)	Under thin (raise viscosity)
SPRAY TECHNIQUE	TO LIGHTEN	TO DARKEN
Gun distance	Distant	Close
Gun speed	Fast	Slow
Flash off time between coats	Long	Short

- It is advisable to build up a collection of spray test panels into a color library which will prove invaluable with future color matching. Ensure that the formulae used are written on the reverse, together with any additional quantities of tinter and other information to facilitate the remixing of the color at a later date.

TINTING THE COLOR

Always use daylight for color matching as artificial light gives a false impression. For example:

DAYLIGHT	TUNGSTEN FILAMENT LAMP	SODIUM DISCHARGE LAMP	MERCURY DISCHARGE LAMP
WHITE	Slightly Yellow	Light Yellow	Bluish Yellow
YELLOW	Orange Yellow	Yellow	Greenish Yellow
GREEN	Greyish Green	Brownish Yellow	Deeper Green
BLUE	Greyish Blue	Dark Brown or Black	Deep Violet Blue
RED	Slightly Orange	Brown	Dark Brown

- Whenever possible spray out the color, as paint dabbed on a panel will give a wrong impression.
- Always allow the paint to fully dry before any comparison is made, as the shade will often change during the drying process.
- Where the adjustment of a color is necessary please refer to the "General Guide to Tinting Colors" ensuring whenever possible that the tinters already appearing in the formula are used.
- Further advice and assistance can be obtained by contacting your Pro-Spray Distributor or Representative.

MIXING EQUIPMENT MAINTENANCE

To ensure the accurate mixing of color formulae, it is essential that all the paint mixing equipment—scales and mixing machines—are kept in good condition and treated with the respect due to any accurate piece of equipment. The following notes will help you achieve this aim.

Scales

- Scales should be kept clean, ensuring that everything moves freely.
- Check that the scales are level and on a firm stable base.
- Regular servicing by the manufacturers is recommended.
- Pro-Spray will not reimburse any cost incurred for servicing or repair.

Understanding Color Matching

VARIANT DESCRIPTIONS

No 1	Original Color	L/DB	Lighter face; darker bluer flop
D	Darker than original color	DF/L	Darker finer face; lighter flop
C	Cleaner than original color	DF	Darker; finer
B	Bluer than original color	G/R	Greyer face; darker flop
V	Greener than original color	L/R	Lighter; redder
R	Redder than original color	D/L	Darker face; lighter flop
Y	Yellower than original color	BK/D	Bluer coarse face; darker flop
K	Coarser than original color	A/KL	Coarser lighter flop
U	Duller than original color	Y/D	Yellower/Darker
F	Finer than original color	A/DY	Darker yellower flop
L1	Lighter than light shade	LK/D	Lighter coarse face; darker flop
D1	Darker than dark shade	DK	Darker, coarser
B1	Bluer than blue shade	LV	Lighter, greener
L2	Lighter than L1	LB	Lighter, bluer
D2	Darker than D1	KD	Coarser, darker
B2	Bluer than B1	Y/D	Yellower, darker
A/L	Lighter when viewed from the angle	A/LY	Lighter/yellower flop
A/D	Darker on angle	A/LR	Lighter/redder flop
A/C	Cleaner on angle	D/LR	Darker face; lighter redder flop
A/B	Bluer on angle	D/C	Darker face; cleaner flop
A/V	Greener on angle	DR/V	Darker, redder face; greener flop
A/G	Greyer on angle	D/R	Darker face; redder flop
A/R	Redder on angle	D/LB	Darker face; lighter bluer flop
A/Y	Yellower on angle	FG/L	Finer greyer face; lighter flop
A/U	Duller on angle	LK	Lighter; coarser
A/K	Coarser on angle	A/LG	Lighter; greyer flop
V/R	Greener face; redder flop	DB	Darker bluer
F/L	Finer face; lighter flop	RR	Redder face; redder flop
L/D	Lighter face; darker flop	D/LV	Darker face; lighter greener flop
K/Y	Coarser face; yellower face	DV	Darker greener
DG/L	Darker greyer face; lighter flop	D/Y	Darker face; yellower flop
G/D	Greyer face; darker flop	LY	Lighter yellower
L/G	Lighter; greyer	C/B	Cleaner face; bluer flop
R/L	Redder face; lighter flop	Y/R	Yellower; redder
A/LB	Lighter bluer flop	D/D	Darker face; darker flop