TRADE OF
VEHICLE BODY REPAIR

PHASE 2

Module 5

UNIT: 3

Spray – Painting Material

Produced by

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Introduction

Preparing panels before refinishing is a routine exercise in all bodyshops. However, problems can arise if the substrate is wrongly assessed and therefore wrongly prepared, despite the routine nature of the job.

A perfect refinish starts with careful prepping, given that a brilliant finish can only be achieved on a properly prepared substrate. The most important tasks include sanding, stopper and filler application as well as priming. The first step towards a perfect result is the correct assessment of the existing substrate. This allows easy planning of all the work steps which follow.

Even at this early stage, the assessment of the substrate decides the processes, tools and materials to be used. This means that any carelessness in assessing and prepping the substrate will result in expensive defects such as shrinkage, sanding marks, edge mapping, blistering, wrinkling, lifting, dulling and so on.

Unit Objective

Spray-Painting Material

By the end of this unit each apprentice will be able to:

- Select appropriate paint products for the different substrates found on motor vehicles
- Outline the hardeners and solvents that should be used in each, depending on the repair size and climatic conditions
- Find a given colour via the paint manufacturer's colour library on CD and their website
- Mix colour to paint manufacturer's

Key Learning Points:

- Substrate recognition
- Substrate compatible primer products
- Compliant and non-compliant basecoats
- Acrylic clear coats and topcoats
- Paint reducers
- Hardeners, catalysts and accelerators
- Compliant and non-compliant degreasers
- Vehicle paint code locations and information
- Computer skills and internet use
- Paint mixing techniques

1.0 Selection of Appropriate Paint Products for the Different Substrates found on Motor Vehicles

1.1 Substrate Recognition

A wide variety of different materials is used on modern vehicles.

Correct identification of substrates is essential before work begins. A superb finish is only possible once the substrate is identified and the right preparation process is used.

Car manufacturers today use a wide variety of metals and plastics. Every material requires a specific treatment. Thorough knowledge of these different substrates is indispensable otherwise panel preparation becomes a game of chance.

Metallic substrates

Most body panels consist of metallic substrates ranging from uncoated steels, galvanised or coated steels through to stainless steel. In the case of coated or untreated steels, corrosion is the biggest problem you will encounter.

In the past few years, aluminium has become more and more popular as a car body material. Galvanic corrosion may occur on aluminium due to direct connections (e.g. bolts and screws) between aluminium with steel. These areas need to be insulated.

Such areas are frequently found on modern vehicles, which is why auto manufacturers specify special repair processes to avoid corrosion.

Important: Bodyshops that carrying out aluminium repairs need a separate area for this purpose. This means that tools and sanding materials must be used exclusively for aluminium repairs. Otherwise there is a risk of the mixture of steel and aluminium dust particles ignition and causing fires.

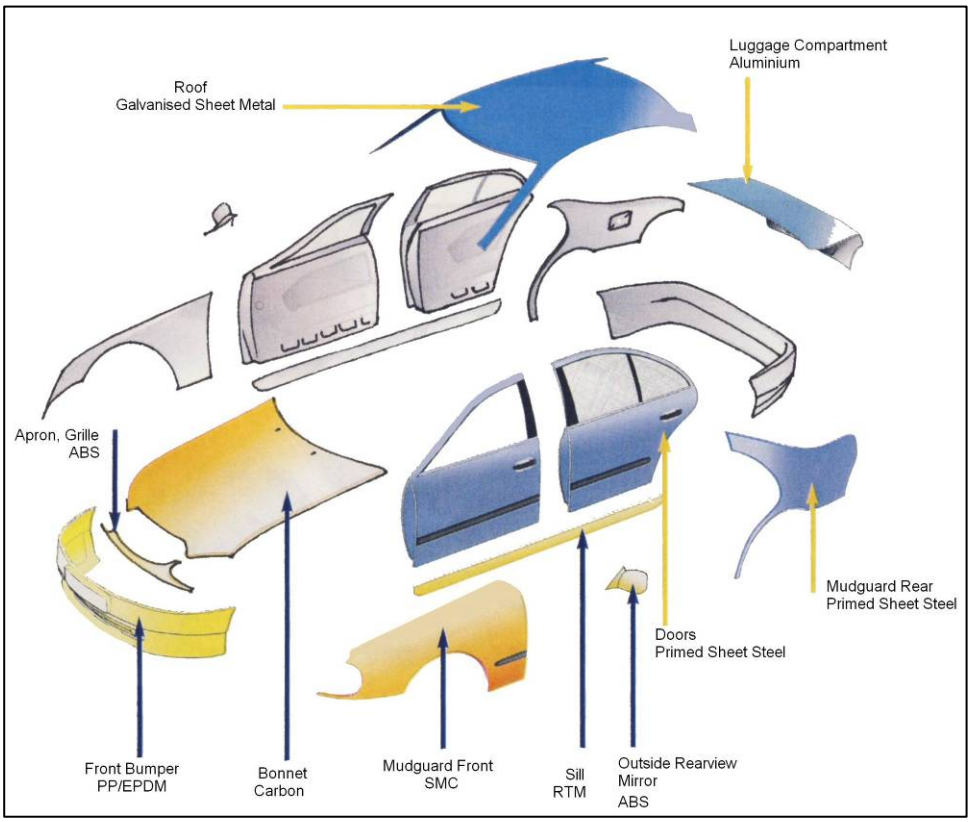


Figure 1: Substrate Recognition

Best Practice

Thorough pre-cleaning prior to commencement of work is essential

- Steam clean vehicles to remove road film, dirt, salts etc
- Solvent degrease prior to any sanding or filling is carried out

Types of O.E Substrate

- Steel
- Galvanised or zinc coated steel
- Aluminium
- G.R.P
- Plastics – many different types
- Specialist substrates (Kevlar, Carbon fibre)

2.0 Paint

2.1 What Goes into Paint?

- Pigment
- Resin/Binder
- Solvents
- Additives

2.2 Binder/Resin

- Film former
- Pigment binder
- Adhesion
- Durability

2.3 Solvent/Thinner

- Fluidity/Viscosity
- Evaporates to leave a hard film

2.4 Additives

- Flow aids
- U.V Absorbers
- Anti-settling Agents

What is paint?

It is colouring matter suspended in a liquid vehicle so as to impart colour to a surface.

By this definition 'paint' means virtually any coating – from ladies' cosmetics to greasepaint to heavy duty coatings for oil rigs.

In this book the term 'paint' is used to describe any fluid that can be applied to a surface and dries to form a continuous film.

A refinisher should know the uses and properties of all paint used in the trade - both undercoats and topcoats. That knowledge will help in choosing the best refinish system for each job.

Refinish paints are complex. Their manufacturers are continually striving to upgrade and improve them. Recent development in two-pack acrylic paints and special finishes for plastic components bear witness to this fact.

To make sure the refinisher puts the right paint into the spray-gun, this chapter sets out to describe the paints motor manufacturers used to achieve their factory finish and deals with all types of refinish paint – from primer through to colour coats – and includes a short section on thinners.

Components

Automotive paints may vary in their properties and uses, but they all have three components in common – pigment, binder (or vehicle), and solvent (or thinner).

Pigment

Pigments used in the manufacture of paint are finely ground powders. These may be derived from naturally occurring minerals or they may be synthetic dye-stuffs. Their properties are very important, because they give the paint its hiding power (opacity) and colour and help to determine its durability. Pigmentation of paint depends upon its function. In primer-fillers they are selected to give good build and easy flatting and in finishes they give a lasting decorative effect.

Binder or Vehicle

This gives the paint film-forming properties, binding the particles of pigment together, and providing adhesion to the substrate.

Solvent or Thinner

This makes the pigment/binder mixture fluid and workable during paint manufacture. It also reduces the paint to correct consistency for application by spray gun, brush or other suitable methods. The solvent mix is volatile: it evaporates both during application and after the paint has been applied, leaving the pigment and binder to form the hardened paint film.

Proprietary blends of solvents are used to reduce paint to application viscosity. They are usually known as 'Thinners'. The term 'Reducer' can be used when the blend is specifically for synthetic enamel paint.

ICI High Solid Paint

Spies Hecker Water Base Paint

Pigment

Finely ground powders: naturally occurring minerals or synthetically produced

- Colour
- Opacity
- Durability

For Primers:

- Corrosion Resistance
- Flatting Properties
- Build
- Example pigment aluminium which gives that shiny glitter effect in silver colours
- Silver colours are most likely to be affected by static because of the concentration of aluminium

2.5 What is Colour?

We are familiar with colour, we even have phrases about colour to describe people's moods (e.g. in the pink, green with envy, seeing red, feeling blue, having a yellow streak) so we are conditioned from birth to react to colour in an emotional and psychological way. Colour can convey some meanings which are difficult or impossible to convey with words.

Physically, colour is a property of light and without light colour doesn't exist. Therefore we ought firstly to define light.

Light is a form of electromagnetic radiation that moves in a wave motion similar to the ripples produced when a pebble is dropped into a lake.

Visible light is only a tiny part of the spectrum and the lengths of visible lightwages very from 4000 Å (violet) to 7000 Å (red) where 1 Å equals one hundred millionth of a cm. To give you some idea of a size, a human hair grows 100 Å each second.

Å is a Angstrom Unit.

What we see as white light is a mixture of spectral colours, each one characterised by a definite range of wavelengths. This can be proven by looking at a rainbow – the white light is split up into its component colours (Red, Orange, Yellow, Green, Blue, Indigo and Violet) by raindrops. The shortest visible wavelength is violet, the longest is red. Beyond violet are UV, X-rays and ŏ-ray, beyond red are IR, microwaves and radiowaves.

How is Colour Perceived?

For colour to be experienced, three things are necessary:-

- A source of light
- An object to reflect the light
- A receiver (The eye and brain or a photoelectric cell).

A coloured surface appears so because it reflects back certain wavelengths and absorbs all the other in the visible spectrum,

e.g. A blue surface will absorb red, yellow and green lights but reflect blue.

What about black and white? Strictly these are not colours – white surfaces reflect all or nearly all colours while black absorbs them totally. Black is thus absence of colour.

Additive and Subtractive Effects

If you project spotlights with different colours onto a screen and mix them, or spin a top paint in different coloured segments, you will get an additive colour mixture.

e.g. Red, blue and green additive colours give white light. Red and green produce yellow light.

This is the principle on which a colour TV works – all colours can be produced from additive mixtures of red, blue and green.

If you mix two or more paints however, you obtain a subtractive effect.

e.g. Red, blue and green paints made a dirty brown colour! Blue and yellow make a green.

The primary colours in paint mixing are red, blue, and yellow (i.e. most colours can be produced from mixtures of these). Note that these differ from the primary colours in additive mixing.

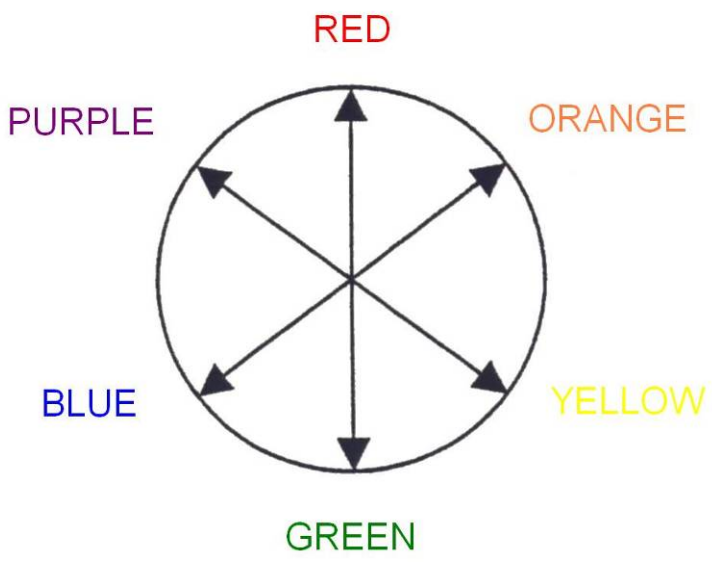


Figure 2: Colour Circle

When two colours are laced together, the effect on the eye is to change them in relation to each other, so that they appear further apart on the colour circle. This is called the juxtaposition effect.

Yellow and Blue: Yellow inclines to orange, blue to purple

Red and Yellow: Red inclines to purple, yellow to green

Blue and Red: Blue inclines to green, red to orange

This principle can be of importance when developing colour schemes for rooms, for example.

After image is produced when a person with a normal colour vision views a coloured shape for a short time then transfers their gaze to another surface. The original shape will be seen as an after image in the opposite colour in the colour circle.

Metamerism

A colour should in all cases be matched using the same combination of pigments as in the original. If another combination is used, light will be absorbed and reflected differently across the visible spectrum. Then, the two colours can change completely in relation to each other as the light source changes (e.g. from daylight lamps to tungsten lamps). This is called metamerism.

Only when the two colours are based on the same combination of pigments will a match remain good under all forms of lighting.

2.6 Substrate Compatible Primer Products

Refinish Undercoats

The term 'Undercoat' is used broadly to describe the coatings which provide a base for the final colour coats. It embraces primers, primer surfacers, fillers, stopper and sealers.

Primers

A primer is designed to ensure that the paint system adheres well to the substrate, both initially and in service. It is generally used over bare metal, where it may give improved corrosion resistance, but it may also be used over old finishes. Its main function is to give a secure base for the paint system as a whole and is most effective if applied as a relatively thin film. Primers are not formulated to fill scratched or to be flatted – any rubbing down should be limited to a light de-nib.

Etching primers contain an acid to give metal etch. In addition to performing the normal functions of a primer, they also act as a metal pre-treatment and prevent the spread of corrosion should the paint film become damaged in service.

Etch primers are available as one pack products, but they are most effective when the primer base and activators are mixed together just before use. Modern 'long life' etch primers have a working life of one week after the two components have been mixed.

Etching Fillers or 'Wash' Fillers

These combine the metal etching properties of etching primers with the filling and sanding properties of lacquer primer fillers.

Description

This product is designed for use on car and commercial vehicle bodies. Its chemical etching and high pigment action combine to give excellent adhesion, obliteration, build and good enamel hold-out on steel, aluminium, fibreglass, zinc-based alloys, and old paint finishes. It is dark beige in colour.

It is supplied as two separate components which are mixed before use and is an excellent base for all refinishing enamels in both air-dry and low bake systems.

Flash Point: Below 21°C.

Surface Preparation

Bare steel

- Clean with Preclean and Scotchbrite Pad.
- Treat steel with Rust Remover and Metal Pre-treatment.

Fibreglass

- Release Agent to be removed with warm soapy water.
- Then rinse, dry and clean with Preclean
- Scuff surface with P180 to provide a key
- Re-clean with Preclean

Aluminium and zinc-base alloys

- Clean with Preclean and Scotchbrite Pad

Previously painted surfaces must be in sound condition

- Clean with Preclean
- Wet flat with p400 and dry off
- Re-clean with Preclean
- Air dried synthetic finishes may lift under this primer
- Careful use of Self Etching Primer over-thinned to 14 secs. DIN 4 using thinner and applied in thin dry coats can eliminate the need for Isolator. Test a small area before application.

Self Etching Primer Filler Mixing Ratio with Activator

Thinning

Shake activator before use.

1 part Self Etching Primer Filler : 1 part Activator	18-20 secs. DIN 4 @ 20ºC
Preferably leave to stand 30 minutes before use. Do not return thinned material to original container.	

Pot life Up to 24 hours

Application Apply 2 or 3 coats as required.

Air pressure 30 p.s.i. (2 bar) or see product data sheet

Drying Touch Dry in 5-10 minutes, wet flat after 30 minutes, or de-nib after 1 hour. May also be overcoated after 10 minutes drying in a non-sand process.

Overcoating Overcoating with topcoats on the same day. If left overnight or longer, apply a further coat of the primer before top coating.

Vehicles or parts primed with this product should not be stored outside, particularly in wet weather before the topcoat is applied.

Health and Safety Refer to relevant Health and Safety Sheet.

Note: Where removal of the OEM coating for repair purposes is unavoidable, any bare metal exposed must be coated with Wash Primer.

This primer, when applied as per TDS, will replace the corrosion protection and adhesion properties normally provided by the original electrocoat.

This product forms part of a 3 stage repaint system and must be overcoated with a suitable 2K surfacer.

- Excellent adhesion to bare or galvanised steel and aluminium
- Basis of complete coating system (replacing OEm E-coat)
- Requires Activator
- Limited pot life

Surfacers and Fillers

Surfacers are designed to fill minor scratches whilst fillers are designed to fill deeper imperfections. When dry they are flatted to level out surface irregularities and provide a smooth surface ensuring uniform gloss of the colour coats that follow.

It is generally possible to apply a thicker coat of paint in one spray application of filler than surfacer. The drying time or 'flashing time' between coats should therefore be carefully controlled and the number of coats applied in one day restricted: otherwise the time required for final hardening will be considerably longer.

These restrictions do not always apply to products which harden by chemical reaction of two components mixed together just before use, e.g. polyester spraying fillers which harden with peroxide catalysts can be used to give high build very quickly.

Fillers may be formulated for application by spray, brush or knife. Knifing fillers give the best filling, but they call for considerable skill in application. Spray fillers are easy but they will follow the contour of the surface being painted, and still require flatting to give a level surface. The brushing filler will fill better than the spray filler, but considerable flatting will be necessary to eliminate the brush marks.

Primer Surfacer and Primer Filler

Primer surfacers and primer fillers have two functions – to provide a degree of filling and to give adhesion.

For better filling and easy flatting, primer surfacers and primer fillers contain much more pigment fillers contain much more pigment than pure primers. This high pigment content leads to poor water resistance should a thin coat be applied to bare metal as with pure primers. It is important, therefore, to apply a minimum of two full coats to give a film thickness – measured after flatting – of at least 0.002" (50 microns).

Stoppers and Putties

A stopper or putty is heavily pigmented undercoat applied by knife and used to fill deep scratches or indentations in the surface. It is intended for application to small areas only - for knife spread over large areas knifing filler should be used.

Stoppers should be applied in thin coats allowing adequate drying time between coats. Two-pack polyester stoppers are free of this restriction.

Spraying Putties

Nitrocellulose based spray putties, which give the build of spray fillers coupled with fast drying may be applied by suction feed or pressure feed spray gun. The latter is preferable for speed and ease of application. They may be applied over large areas with less danger of imperfections than with knifing putties.

Non-Sand Undercoats

Non-sand undercoats are designed to minimise flatting. They are normally used as sealer coats immediately beneath the colour coats, permitting the substrate to be flatted with a coarser grade of paper, but still offering good scratch filling and good gloss of the finishing coats.

Non-sand undercoats may be in the form of non-sand primers giving both good adhesion to bare metal and good corrosion resistance. Alternatively, primer fillers can be formulated for use either as normal or non-sand undercoats.

Chip Resistant Primer

Chip resistant primers are specially formulated for application to areas subject to stone damage, e.g. sills, apron, etc. They give improved resistance against corrosion and help to reduce drumming noise.

ICI 2K Roll Primer

- Apply with roller
- No masking
- No overspray

Standox 2K Wet on Wet

- Apply to new panels and paint over immediately
- Non sand
- Time saving

2.7 Compliant and Non-Compliant Basecoats and Acrylic Clear Coats and Topcoats

Three types of topcoat are used by the main motor manufacturing companies:

Acrylic Lacquer – 'Thermoplastic Acrylic' ('TPA')

Used for both straight colour and metallic finishes. It will air-dry, but is in fact stoved at 150-160°C (300-320°F) to give high gloss which results from a re-flowing of the thermoplastic paint.

High Bake Synthetic Enamel

Used for straight colour, it has excellent filling properties, high gloss and toughness, it is unsuitable for metallic finishes, metallic control being difficult and gloss retention inferior to that of acrylic based paint. It needs a temperature of 130°C (260°F) over a period of 30 minutes for the full hardening process to take place.

High Bake Acrylic Enamel 'Thermosetting Acrylic' (TSA')

Used for both for straight colour and metallic. It's also requires a stoving schedule of thirty minutes at 130°C (260°F) for the hardening process.

These three different paints cover and the two basic types of paint used in both the motor manufacturing and refinish industries:

Lacquers

Acrylic lacquer dries and hardens by means of solvent evaporation only. It does not change chemically in any way and remains soluble in lacquer solvent. When recoated with itself, it is softened by solvents of the repair paint. The two paints fuse into one and are irretrievably bonded together. Such paints may be spot repaired and are known as 'lacquer paint'.

Enamels

High Bake Synthetics and High Bake Thermosetting Acrylics dry first by solvent evaporation, and then harden by chemical reactions which take place at the baking schedule of 30 minutes at 130°C (260°F). The paints not only harden, but become resistant to solvents. Any repair paint applied just lies on the surface, does not fuse or 'marry in', and may be wiped off whist still wet without harming the under underlying finish. To enable High Bake enamel finishes to be repaired after the car has been assembled and trimmed, and with the same original finish, a catalyst is added to the paint. This reduces the minimum stoving temperature to 90-100°C (194-212°F). **Paints which harden by chemical reaction are known as enamel paints**

2.8 Refinish Paints

Refinish paints may be classified into four groups according to drying process:

Lacquer Paints

Drying occurs purely as a result of solvent evaporation and no chemical change is involved. Lacquer paints have a high solvent content and rapid initial dry.

The group includes: Cellulose and acrylic based car repair paints, cellulose and acrylic based quick drying primers, primer fillers, sealers and cellulose based stoppers.

Oil and Synthetic Resin Based Paint

Initial drying occurs by evaporation of the solvent, but final hardening is due to chemical changes in the paint vehicle caused by the uptake of oxygen. Whilst these changes are taking place the vehicles gradually becomes less soluble in its own solvent and there is critical period during which lifting or shrivelling will occur on recoating. These paints are characterised by high solids content and a slow surface dry time than lacquer.

Low Bake Enamels

These paints will not air dry; to fully harden they need a baking temperature of 80°C (176°F) upwards. Initial drying is by solvent evaporation but final through-hardening is dependent upon a chemical reaction between two components of the paint vehicle. This reaction can only take place in a time period of 30 minutes after the stoving temperature has reached 80°C (176°F).

Low Bake Enamels have a high solids content. They also require the use of stoving equipment.

Once popular in continental Europe, low bake enamel have been overtaken by other paints which have shorter stoving schedules at lower temperatures.

Two Pack Paints

When the two component parts are mixed together a chemical reaction takes place causing the paint vehicle to harden. A drawback is the limited 'pot life' or working time once the two component parts have been mixed.

Characteristic of the group is high solids content, with low solvent content or even solvent free.

Typical materials are:

- Two pack polyurethane finishes
- Two pack urethane acrylic finishes
- Two pack spray primers and fillers
- Polyester stoppers and spraying fillers with peroxide catalysts

Note:

Small motor vehicle assembly plants and small specialist car manufacturers may use any of these refinish topcoats:

- High solid acrylic lacquer
- Air dry acrylic lacquer
- Air dry synthetic enamel
- Low bake (80°C) enamel
- Two pack acrylic enamel
- High solid enamel

If you sand solid colour it will colour the sanding disc, if you sand lacquer it will appear clear on the sanding disc.

3.0 Hardeners and Solvents that should be used Depending on the Repair Size and Climatic Conditions

3.1 Paint Reducers

Thinners

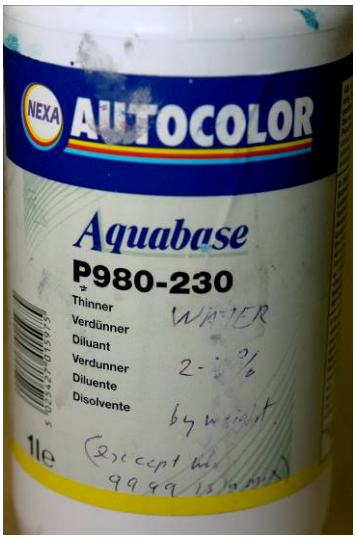
A great number of thinners are available for thinning paint to the correct viscosity at which it can be properly applied. The main difference lie in the evaporation rates, the ability to dissolve the paint vehicle and 'thin' the paint. Every thinner recommended for a particular type of paint should be a blend of solvents carefully formulated to have the correct dissolving power for the paint vehicle, and to have an overall evaporation rate which will allow the quickest drying time consistent with good flow.

The solvents already used in the manufacture of the paint must be taken into account when the thinner used to reduce it to application viscosity is formulated. It should be noted that 'cheap' thinners are usually not as cheap as they may first appear. They are often based on solvents with no real technical merit. They merely reduce the paint to some sort of spraying viscosity and, if they are used, the work may well have to be re-done.

'Fade-Out Thinners' are special blends of solvents designed to assist in the blending on of dry spray at the edge of a spot or fade-out repair area.

Function of co-solvents:

- Dissolving the binding agent
- Controlling the viscosity during paint production and application
- Formation of the film, coat by coat, without sagging and with good edge covering



- Flow and levelling

- Controlling the drying process
- Wetting the pigment and paint substrates
- Orientating the bronze particles in metallics

Co-solvents are indispensable and cannot be eliminated for the formulation of a waterborne basecoat.

3.2 Hardeners, Catalysts and Accelerators

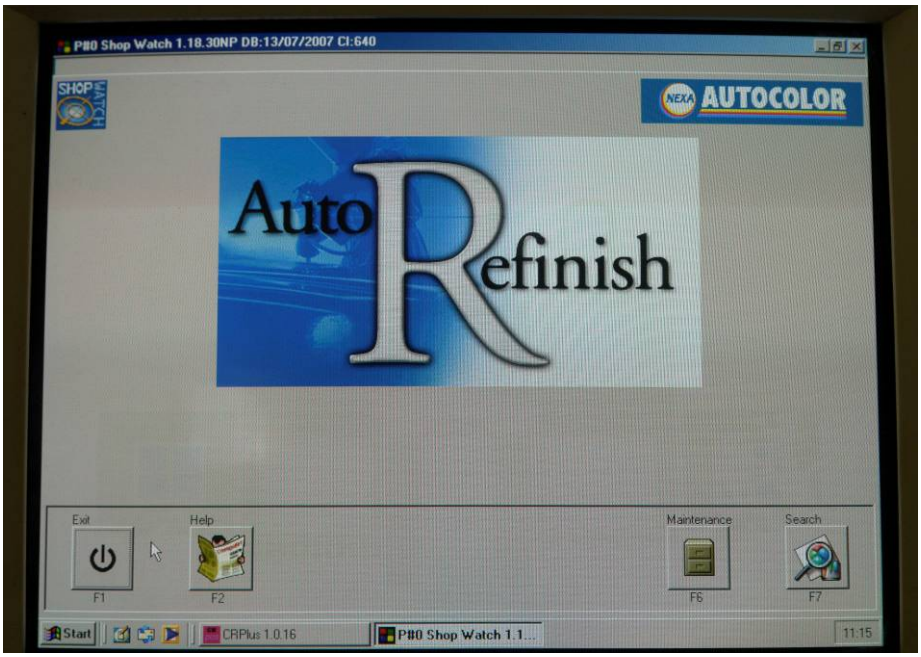
A chemical action takes place to harden paint when hardener/catalysts/accelerators are added to paint/lacquer. This also produces isocyanides.

Hardener is essential to dry paint speedily.

Compliant and Non-Compliant Degreasers

Used to remove road film, dirt, salts, tar etc.

4.0 To find a given Colour via the Manufacturers Colour Library



Computer skills and internet use to find paint formulation.

Vehicle Paint Code Locations and Vehicle Identification Plate

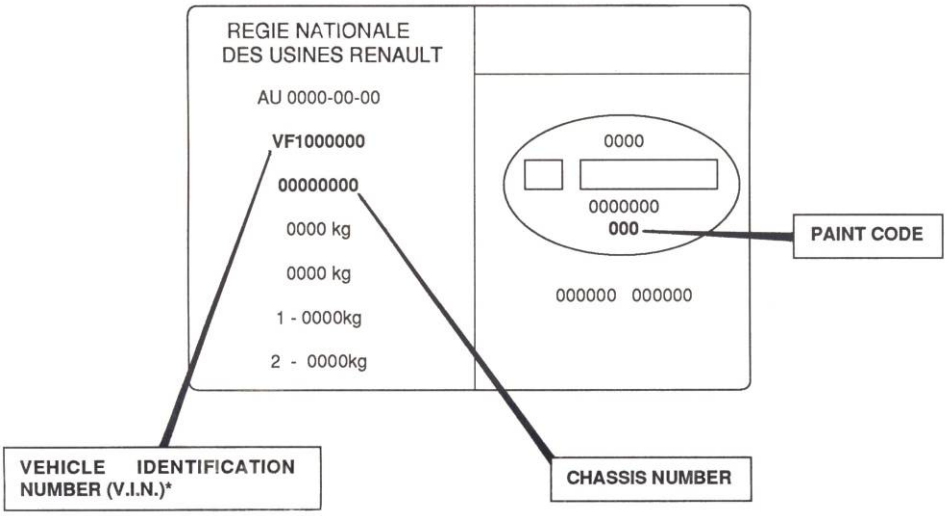


Figure 3: Identification Plate

4.1 Vehicle Paint Code Locations and Information

Vehicle Identification Model Renault Megane

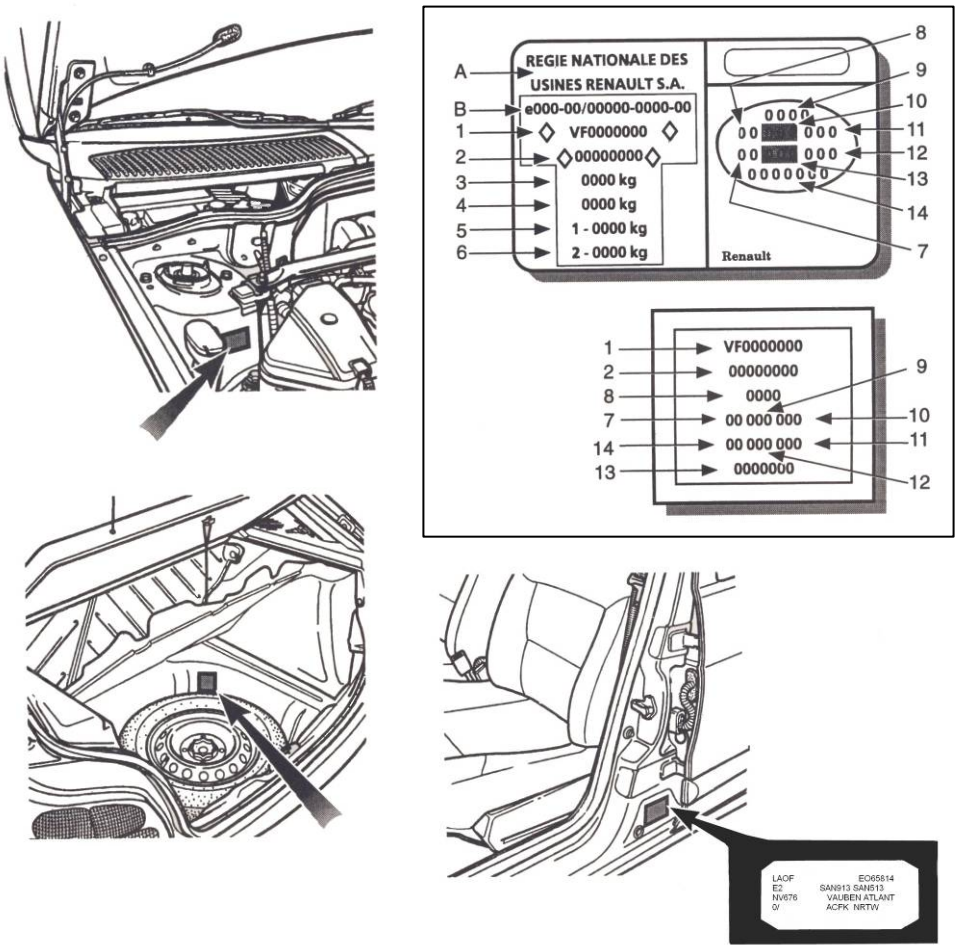


Figure 4: Vehicle Identification

Code	Description
A	Name of Manufacturer
B	E.E.C Approval Number
1	Type mines of the vehicle preceded by the world manufacturer's identification code (VFI corresponds to RENAULT FRANCE)
2	Chassis Number
3	Maximum Permissible Weight
4	Maximum permitted total train weight
5	Maximum permitted total weight on the front axle
6	Maximum permitted total weight on the rear axle
7	The first figure indicates the gearbox or factory options, the second figure indicates the equipment level
8	Vehicle type

9	Technical Equipment
10	Additional Factory Optional equipment
11	Equipment Level
12	Paint Code
13	A letter describing the factory of manufacture followed by the fabrication number
14	Trim Code
Note: depending on the country of export, certain details might not be given. The plate described above shows all possible information.	

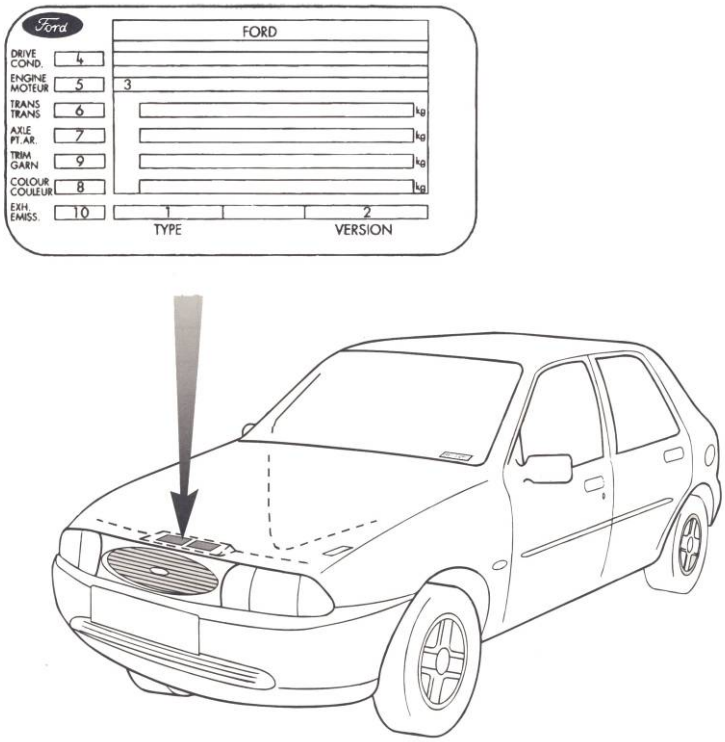


Figure 5: Vehicle Identification

Code	Description
1	Vehicle Type
2	Version
3	Vehicle Serial Number
4	Drive
5	Engine
6	Transmission
7	Axle
8	Colour Code
9	Trim Code
10	Exhaust Emission Control (EEC)

Tack Rags

Tack between coats to keep clean

Available for both waterbase/solvent

Spray Suit

Protects operator

Keeps work clean

Special pre-wipes

5.0 Pictograms and their Meanings

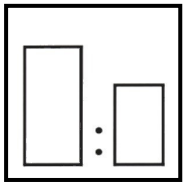
Leading European refinish paint manufacturers have agreed upon a standard language of symbols which are internationally understandable. The use of pictograms to convey the information necessary to guarantee optimal application quickly, exactly and understandably has proved to be the most suitable method.

Since technical data sheets and packages are now found in many territories (including outside Europe) bearing the pictograms, the following list shows each pictogram and its meaning:

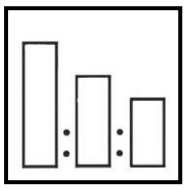
Preparation

Cleaning

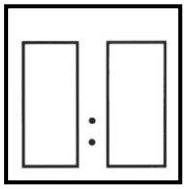
Mixing



Mixing Ratio 2 Components

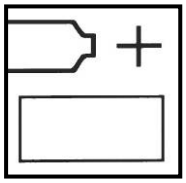


Mixing Ratio 3 Components



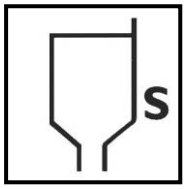
Mixing Ratio 1:1, 2 Components

Use of Measuring Stick



Addition of Hardener

Reduction of Viscosit



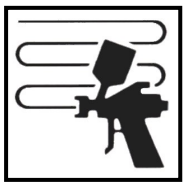
Thin to Viscosity

Application

Gravity Feed Spray Gun

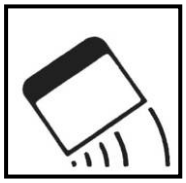
Suction Feed Spray Gun

Underseal Spray Gun



Coats

Coats



Application of Stopper

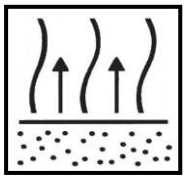
Application with Brush

Application with Roller

Aerosol

Airless Spray

Drying



Flash-Off

Drying Time

Infra-red Drying Time

Further Steps

Sanding by Hand (wet)

Sanding by Hand (dry)

Denibbing

Orbital Sander (wet) (compressed air)

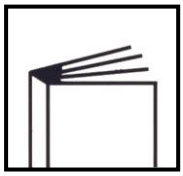
Orbital Sander (dry)

Flat Bed Sander (wet)

Flat Bed Sander (dry)

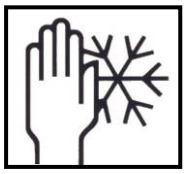
Polishing

Technical Information



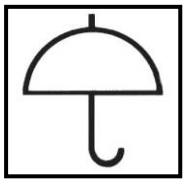
See Technical Data Sheet

Storage



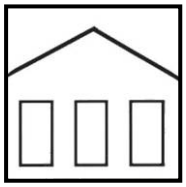
Store Free from Frost

Store in a Cool Place



Protect from Humidity

Close Tin



Shelf Life

Miscellaneous

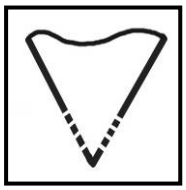
Stirring

Stirring in the Mixing Machine

Check Colour

Poor Opacity

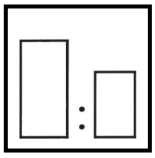
Three Coat Process



Strainer

6.0 Example of Data Sheet

6.1 Standox 2K HS Filler - Product use Instructions

Working Process	**2K Sanding Filler**
Substrate: **Pre-prime aluminium and galvanized substrates with etch primer**	-PE Products, sanded -Through-Hardened sanded paintwork -Steel panel, cleaned and sanded -Standox Primers, Primer Surfaces, sanded -Shop Primer and KTL, sanded
Pretreatment/Cleaning:	 For substrate preparation information see Standox Painting System S1
Application:  Use Air Fed Respirator. Refer to relevant Health and Safety data sheets	 4:1 with Standox 2K hardener potlife 60-90 min/20ºC  Ready to spray, if necessary add Standox 2K Thinners 25-30 s/DIN 4 mm/20ºC Mixing stick No.3  1.5 – 1.8 mm 3 - 4 bar 2 – 4 = up to 250 micron  1.7 – 2.0mm 3 – 4 bar 2 – 4 = up to 250 micron
Flash off time 5-10 min/20ºC before infrared drying	 20 - 40 min/60ºC Panel temperature depending on film thickness  Short wave 8 – 10 min Medium wave 10 – 12 min

P800

P320 – P400
Orbital Sander

Standocryl 2K Autolack or
Standox Basecoat with
Standocryl 2K clears

7.0 Mix Colours to Paint Manufacturers Specification

7.1 Paint Mixing Techniques

There are many advantages in mixing your own colours. The main ones are instant availability of the exact quantity of colour required, and the facility for accurate tinting where this may be necessary. Reduction of paint-wastage can also mean cost saving in the paint shop.

The Principles of Mixing

A mixing scheme should be used not just as a convenient source of paint in a wide range of colours, but also with the same care, skill and judgement as any other equipment in the workshop.

The growing numbers of colour variations that have appeared in recent years – particularly with the growing popularity of metallic finishes – make the mixing scheme an invaluable means of overcoming the resultant colour matching difficulties.

However, it is essential to keep high standards of housekeeping and follow the right procedures to gain maximum benefit from a mixing scheme.

These are some basic guidelines:

- Keep up-to-date and fully utilize all available colour information.
- Remember that the mixing scheme can only be expected to operate accurately if:

  The basics are hand stirred before being placed on the stirring machine.

  The scales are regularly serviced.

  The microfiches are up-to-date.

  All equipment is kept clean.

- The mixing area should not be subjected to extremes of temperatures. Highs and lows cannot only affect the performance of the equipment, but may have a temporary effect on the can viscosity of the paint.

As a guideline, the mixing room should be sited within the outer walls of the building, where wide fluctuations of air temperature are less likely.

7.2 Mixing Procedure

Where more than one topcoat type is available, it is important to select the correct microfiche formula. This done, check that it is the latest fiche available.

Before mixing, the stirring machine should be run for the correct period both morning and afternoon (15 mins in the morning, 10 mins in the afternoon).

Zeroing or Tareing of gravimetric or volumetric measuring equipment should be carried out with care.

Virtually all mixing formulae indicate accumulated values, eliminating the need for any calculations while mixing. This allows for careful concentration on the quantity to be poured. In case of overshooting the required amount of paint with any but the first ingredient in the formula, do not attempt to adjust the amount poured. A fresh mix must be started.

When all ingredients indicated on the microfiche had been added, stir the mix thoroughly before use.

Digital Mixing Scales

There are two main types of mixing system – gravimetric and volumetric. The most popular type in European markets is the gravimetric scheme.

Characteristics of Gravimetric and Volumetric Systems

	Gravimetric	Volumetric
Reading the Formula and Selecting Ingredients	Formula displayed on Microfilm (Microfiche)	As Gravimetric
Selecting the Container	Paint poured into container on a balance. No special container required	Paint poured into container until level reaches preset marker. Another system uses a pneumatic warning device instead of marker. Both need containers with flat bottoms and uniform cross sections along their usable length. Dented containers must never be used.
Tareing or Zeroing	Simple mechanical operation (although not required on most electronic balances)	As Gravimetric
Stirring	Employs separate machines with mixing heads to fit on standard 2½ litre and 1 litre cans. These heads are easily removed for hand stirring.	As Gravimetric
Reaching the end point for each ingredient	Operator watches balance needles as he pours. Needs care but skill in judging when to stop comes with experience. Modern electronic balances are designed to make this operation easier.	Operator watches paint level, stop pouring when this reaches the marker. Can be difficult when the marker is down inside the can. System incorporating pneumatic gauge instead of marker gives the operator audible warning to stop pouring, but some margin for error depending on his speed of reaction.

8.0 Plastics Painting System

These products are for the professional painting of vehicles only

The ICI Autocolor Plastic Painting System offers a complete range of products for the painting of new and repaired plastic surfaces. The system bas been specially designed to be used with ICI Autocolor 2K product. The products offer the range of finishes, flexibility and adhesion required over the wide range of plastics used by car manufacturers.

Intended Use

These products are for the professional painting of automotive vehicles only after reference to the manufacturer's material Safety Data Sheets MSDS.

Products

P273-1333	Cleaner for Plastics
P273-1050	Anti-Static Cleaner for Plastics
P551-1700	Porefiller for Plastics
P572-173	Primer A for Plastics
P572-212	Primer B for Plastics
P100-2020	Flexible Additive for Plastics
P565-660	Texturing Base - Fine for Plastics
P565-768	Texturing Base - Coarse for Plastics
P565-631	2K Matting Agent
P850-1275	2K Medium Thinner
P850-1276	2K Slow Thinner

Process and Preparation

Cleaner for Plastic (P273-1333)

Thorough preparation and cleaning are key to the successful refinishing of plastic parts. The first step is to remover silicone mould-release agents and other contaminants, such as traffic film, with Cleaner for Plastics mixed 1:1 with water. Apply with Scotchbrite Ultrafine and lightly scuff the surface at the same time. Rinse thoroughly in clean water and allow to dry.

Anti-Static Cleaner (P273-1050)

Is formulated uniquely for plastic parts, providing the ideal clean surface for subsequent painting. The anti-static properties prevent the build-up of static and ensure a dust-free finish. Apply Anti-Static Cleaner to the whole of the plastic part being painted, using one lint-free cloth for application and one for wiping off contamination.

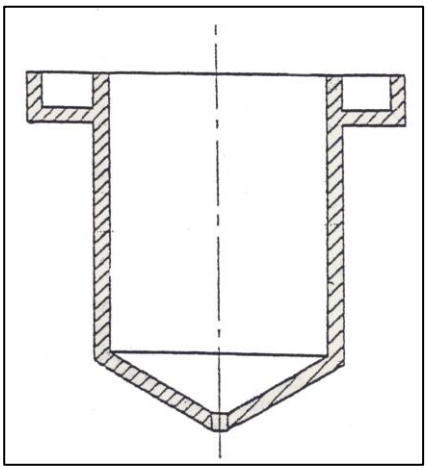
Filling and Priming Porefiller (P551-1700)

Is a stopper designed to fill the pinholes found in porous plastic components left by the moulding process. Apply by ragging onto the substrate with a lint-free cloth.

Allow to air-dry for 10 mins at 20°C, denib with P800 paper if necessary and apply Anti-Static Cleaner (P273-1050) again, as above. The priming system consists of **Primer A**, a pigmented, flexible primer and **Primer B**, a transparent, low build primer. They can be used separately, if the nature of the plastic is known, or mixed together in a 3:1 mixing ratio by volume to prime all types of coatable plastic substrates.

Viscosity Cup

All surface coatings are thinned and the measuring device is standard. Thinness is known as viscosity level.



Paint is thinned and poured into the viscosity cup. The paint is released to run through the cup and the elapsed time is measured. All paint manufacturer's give a viscosity reading.

All surface coatings are thinned to some degree or other. To measure accurately the exact viscosity of paint, primers and fillers, a specially made cup must be used.

Figure 6: Section Through a Viscosity Cup

This is known as a flow cup and must be used in conjunction with a 60 second stop clock. Time spent thinning and checking paint viscosity can save hours of rectification work later. It is important to thin materials with the correct thinner and to the viscosity that the paint manufacturers suggest to get the best performance from the material and it cannot be over emphasised that thinning ratios affect colour in metallics. The standard BSB4 is the most widely used cup. Ford 4 and DIN4 are also used and the following table shows the equivalent readings:

BSB4	FORD 4	DIN 4
17	15	14
19	16	15
20	17	16
22	19	17
24	21	19
26	22	20
28	24	22
30	26	23
33	28	25
36	31	27
38	33	28
39	34	29

These readings represent elapsed seconds through the respective cups.

The equipment consists of the cup, a stand and a 60 second stop clock.

The paint after thoroughly stirring is thinned in the case of cellulose to approximately half and half. The thinners and paint are then well stirred and a sample is poured into the viscosity cup. The cup is filled to the very top and the usual practice is to place a finger under the orifice. The paint is released to flow and at the same time the 60 second time clock is started. The point where the stream from the cup breaks is the moment that the clock is stopped. The reading should be about 24 seconds BSB4 if the manufacturer calls for a time of 21 to 23 seconds then more thinner is added and if the call is for 26 to 28 seconds then more unthinned paint must be added. General usage soon makes it apparent what is required to get very close to the required reading.

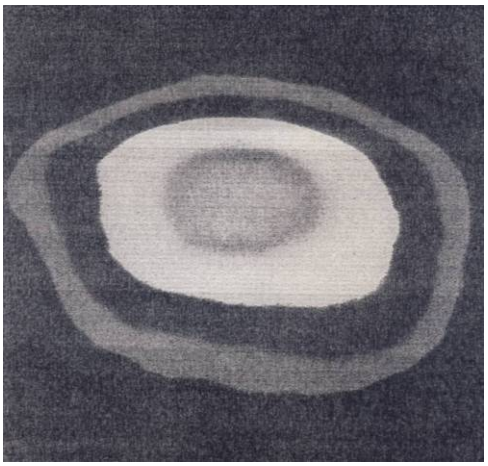
Always use the viscosity cup as it will ensure that one of the unknowns is taken out of the paint equation. The more professional and accurate the operator is the less chance of errors and paint faults creeping in.

All paint manufacturers give viscosity cup reading for every product currently on offer.

Viscosity Cup in Use

9.0 Feather Edging

The flatting operation usually exposes some bare metal – either because the paint film is thin, or in removing localised rust spots or imperfections such as scratches and stone chips. All such bare metal areas must be feather edged. This means that the paint surrounding them is flatted back to give an edge with good adhesion to the metal, but which tapers so gradually from the metal to the sound paint surface that the taper cannot be felt with the fingertips.



Feather Edging

10.0 Guide Coats

A guide coat should always be used when flatting primer-surfacer and fillers. A convenient guide coat consists of a 9 to 1 thinner/lacquer mixture, choosing a contrasting colour but avoiding reds, maroons or yellow as these may bleed into subsequent lacquer coats. Guide coating ensures that the minimum amount of surface is removed, thus giving a high standard of work in the shortest time. In addition, any guide coat remaining in any imperfections and hollows makes inspection easier and highlights areas which need stopping up.

3m Guide Coat

Summary

Sound, correct preparation of the substrate is indispensable in order to obtain a perfect and brilliant result and also a very important way of avoiding defects and customer complaints from the outset.

The need to prepare the vehicle and that includes the substrate is still considered a necessary evil in many bodyshops. Practical experience has shown, however, that proper preparation is half the job.

However, if such important skilled work is carried out by unqualified workers or with low-qualified products to save costs, the potential 'savings' are counter productive. The problems which will invariably arise are merely shifted downstream - and that is when things become really expensive.

At the end of the day, your work will be judged on your results - good preparation will help you get the job right first time.

Self Assessment

Questions – Module 5. Unit 3

1. When hardener and paint are mixed, the vapours released into the air contain what?

2. What generally goes into paint mixing ratio?

3. What residue will lacquer leave on a sanding disc?

4. What does hardener do for the drying process?

5. Why is hardener put into paint?

6. Why is silver affected by static more than black?

7. What is a guide coat used for?

8. What does a viscosity cup measure?

9. Why is plastic primer applied to plastic parts?

10. How can you tell what colour a vehicle is?

Answers to Questions 1-10. Module 5. Unit 3

1.

Isocyanides

2.

Paint hardener, thinner/reducer in this order

3.

Clear

4.

Speeds up the drying process

5.

To harden/cure it

6.

Because of the concentration of aluminium

7.

Shows scratches and controls to a minimum the amount of surface removed.

8.

The viscosity of the paint

9.

For proper adhesion

10.

By its paint code found on the vehicle

Suggested Exercise

1. Locate the paint code on a vehicle.
2. Evaluate if the finish is clear over basecoat or a solid colour.
3. Employ the colour chips identify the colour alteration/shade.
4. Using the CD and then the website locate the colour formulation.
5. Weigh out paint to manufacturer's specification.
6. Explain the difference between cumulative and absolute paint weights as well as volumetric and gravimetric paint mixing.

Training Resources

- Classroom/workshop with internet access
- Visual aids
- Mixing room scheme
- PPEs
- Motor vehicle
- Paint manufacturer's colour library on CD
- Access to their website and colour chips
- Measuring/mixing sticks

SOLAS

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