



CONTENTS:

DOI Distinctness Of Image

Build-up of 3-coat systems for automotive colours

WaterBase 900 Series MM 977 to simplify fade out application

TDS of hardeners and thinners

How does a spray booth work and why do we need a good booth?

DOI Distinctness Of Image

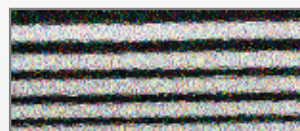
Many of us in the paint industry are very familiar with gloss but some surfaces can have a high gloss value yet will not have the required finish. This could be because of the ability of the system to reflect the light falling over it. That's what we call distinctness of image, or DOI. If the reflection on the surface appears sharp and clear then the surface is said to have a high DOI, conversely if the image appears to be blurry and disturbed then it's said to have a low DOI.

Let us see a simple example to understand DOI. In the next 2 images we see the reflection of a bird in water. In the first image the water is still and silent, the reflection of the bird is perfectly seen in the water with all its details. In the next image the water has some structure (ripples) in it, there is a reflection of the bird but not as sharp and clear as in the previous image. In technical terms we can tell that the DOI of the first image is very good while the other is not very good.



When we have a perfect finish the reflection of the image is perfect, an imperfect finish gives an imperfect reflection. The ripples in the water can be compared to the structured surface of the finish. The more structure, the more blurry the image is. The structured surface appears to the human eye as a wavy pattern of light and dark areas.

The detection of the different wavy texture size depends on the distance of observation. At a distance of 40cm, we can see structures size between 0.3-10mm while at a distance of 3m we can see only structures of 3-30mm. The waviness seen at a distance of 3m is termed as long waves, while that ones visible at 40cm are the short waves.



At 3 m - Long waves



At 40 cm - Short waves

There are many factors that could effect the DOI. A few of them are mentioned below.

- Substrate
- Layer thickness
- Flash off time /curing time
- Over spray

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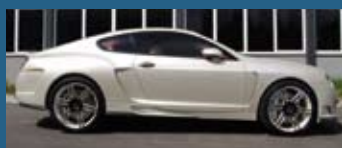
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Build-up of 3-coat systems for automotive colours

Where it is commonly seen in Japan for more than 2 decades, nowadays more and more 3-coat colours are found in the global car colour population. Basically those colours are not more difficult to repair than usual colours but certainly the car refinish colour developer should apply some extra parameters in building up a 3-coat. Before we touch upon the smart rules for colour development some 3-coat systems are listed beneath:

3-Coat pearl

Gives a pearlescent appearance. The OEM build-up of the layers is a whitish first coat and a transparent topcoat with one or more pearls.



Poor hiding coloured topcoats

For clean and saturated solids or effect colours forced by the hiding properties and price of some pigments a coloured primer is applied for coverage and a semi opaque clean topcoat for the colour.



Candy colours

For clean and saturated effect colours. The OEM build-up of the layers is a coarse metallic colour first coat and a transparent tinted clearcoat. Car refinish systems are using a tinted transparent intermediate basecoat instead of the tinted clearcoat.



Special effect colours

For colour shift colours like Chromaflair and Spectraflair. Although those effects have hiding properties, they are very expensive and therefore very little pigment is used in the topcoat. The first coat is mostly solid black, or aluminium for Spectraflair.



Smart colour development for 3-coat systems

There is more than one way to reach the right colour in 3-coat systems. The matcher can play around with the pigments in the first coat and the topcoat and reach the colour by trial and error combining all parameters until a reasonable match is achieved. However this is not the preferred approach to develop 3-coats. Great effort has to be put in building up the layers to make the

individual coloured layers colouristic compatible with each other. The basic-one and only-rule for all 3-coat systems is:

The colour of the first coat should be as close as possible towards the colour of the top coats flop colour. Failing to do so the matcher could cause a major problem for the end user: Mottling or cloudiness. The computer image beneath illustrates what happens when a transparent white layer is applied over a white⁽²⁾ and a grey⁽¹⁾ underground.



Mottling when a white layer is sprayed over a grey panel

To develop a 3-coat with limited risk of mottling here is an example on how the experienced colour developer develops a 3-coat pearl in 4 steps:

1. Determine the formula of the first coat by measuring the colour as a solid or removing the topcoat by sanding until the next layer appears
2. Determine the effect in the topcoat by using the microscope
3. Estimate of the disorientation of the effect and determine the amount of flop controller (999)
4. Add around 1% of the first coat formula to the topcoat

The 4th step will make the bridge between the first and the topcoat and reduces the risk of mottling. The first coat and the topcoat should be applied as they are normal individual basecoats. Most Japanese OEM car manufacturers are applying the same rule to reduce mottling on the paint line.

End users who experience mottling with a certain 3-coat pearl could fix this by applying the 4th step. For the other mentioned 3-coats the same rule applies that the first coat should be as close as possible to the flop of the topcoat.

WaterBase 900 Series MM 977 to simplify fade out application

WaterBase Base Additive MM 977 can be used to simplify blending and spot repair applications with 900 Series. With the aid of MM 977 a better lay-down and orientation of metallic/pearl colours will be attained. Also a dark "halo-effect" at the end of the fade out will be prevented this way.

To get the most out of this method, the next steps must be followed:

The blending area/panel should be cleaned with both a solvent silicone remover and a waterborne degreaser. And prepared further with the appropriate sanding/scuffing materials.

Clean the whole repair area once more thoroughly with WaterBase Degreaser 9-851.

Blending into the adjoining panel:

Mix MM 977 with 10% 9-151/ 9-161 WaterBase Thinner. Apply one wet coat of the mixed MM 977 over the entire blending area; do not apply MM 977 beyond the blending area. Blow-dry the MM 977 until completely dry.

Apply the basecoat colour on the repair area or replaced panel until covered according the recommended method as described in the technical information (ICRIS)

When coverage is obtained blow-dry the surface thoroughly. Before applying the drop coat, tack off the blending area with a non-sticky tack rag. Reduce the spraying pressure to 1 bar at the gun pressure gauge. Apply the drop coat over the entire repair and fade into the blending area (MM 977)

If necessary apply additional drop coat(s) into the blending area to achieve an invisible blend.

Blow-dry the entire surface, before applying the clear coat.

Note:

Keep the blending area free from overspray by using a tack rag between coats. Preferably, move the spray gun diagonally across the blending area to sustain an imperceptible blend.

During blow drying increase the spray booth temperature to 35-40 °C or at least 15 degrees above ambient temperature.



TDS of hardeners and thinners

Technical Data Sheets are no longer available for hardeners and thinners. All the necessary information can be found in the TDS of the A component, which is used in combination with the hardener or thinner. We have also included a matrix in ICRIS in which the most important information from the TDS is shown. In the matrix you can see at which temperature and for which type of repair job you can use a certain hardener or thinner. It also shows an overview of the shelf life for every hardener and thinner.

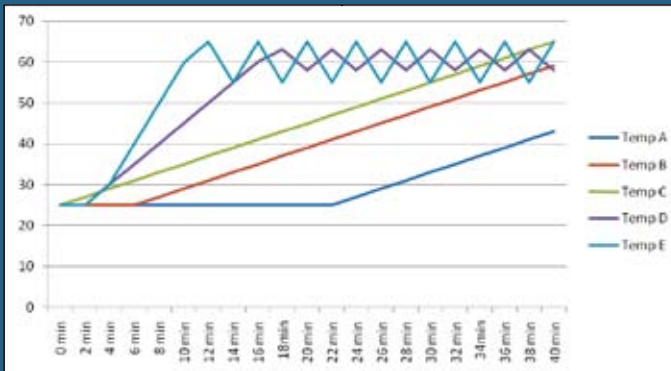
How does a spray booth work and why do we need a good booth?

Part two: Burners

Another thing we do in the spray booth is drying or baking, to cure the paint. Now the story becomes a little bit more complicated as there are a few modes the spray booth goes through before it starts baking. After you have finished painting you go through a few things to be done:

1. Does the paint manufacturer recommend a flash-off before baking, if so 5-10 min. You will see this often in Technical Data Sheets.
2. Every spray booth has a delay, so if you switch from spraying to bake, it will remain in the spraying mode for a while to ensure that all overspray and solvent is gone out of the booth. Generally set at 5-10 min. again.
3. Sometimes on the front panel the painter can also select his own "EXTRA" flash off, which can be selected according to what he wants.
4. How fast does the burner heat up the spray booth air? As there are different burners it can go very slowly or very fast.

In the next graph you will see what happens:



Temp A: Here the booth temperature remains for 22 min. at 25°C before it starts slowly warming up. Even after 40 minutes it has not reached the requested 60°C. Most likely a delay setting by the spray booth manufacturer of 10 minutes when switching from the spray mode to bake and the painter read the TDS well and also waited 10 min. before he switched the booth on bake.

Temp B: Here we see clearly that the spray booth slowly ramps up after 6 min. After 40 min. it finally reaches 60°C.

Temp C: No flash off and it starts heating directly, but slowly.

Temp D: This one flashes off for 2 min. and the temperature raises gradually. This is an **in-direct fired burner**.

Temp E: A short flash off to get rid of the overspray in the booth and a fast increase of temperature a typical **direct fired burner system**.

Let's now have a look at **in-direct and direct fired burners:**

Indirect fired burner. Here as you can see is a kind of chamber (cattle) which is positioned in the ducting. The flame is in the chamber, heating the stainless steel cattle, which is heating the air passing the system. So the air is heated in-directly and nice and slowly with out too many fluctuations. A disadvantage is that it takes longer to transfer the heat, so less energy efficient and it takes longer to cool down after the baking is finished.



Direct fired burners have the open flame in the ducting, so the air is heated instantly. When you check the air temperature in the booth you will see that the temperature instantly increases, see temp E. Take care with those, if you leave the paint to flash off too long you will get skinning of the paint and as the temperature increases so quickly it can give you solvent popping. With those kind of systems one could rather not flash off after completing the paint job and switch the booth directly on bake. Advantages of this system are big: fast curing, hardly no flash off needed, energy efficient but you need to know how to work with them.



In the TechFlash from July 2009 you could read about airflow and fans in spray booths. This time we have limited it to tell you about burners. In upcoming TechFlashes we will elaborate a little bit more on spray booths and how they work. We hope that this helps you for now. If you have questions or comments, please don't hesitate to contact our colleague Martin Ruigrok, Technical Manager, De Beer Australasia, email: martin@debeer.com.au