

# TWO-PACK COATINGS – MIXING

## WHY THIS TECH NOTE?

Correct mixing of two-pack coatings prior to application is an essential step in the whole painting process, yet many coating failures can be traced back to the mixing stage.

### MIXING GENERALLY

Coatings comprise resins, pigments, additives and carrier (solvent or water). The heavier pigments often sink to the bottom and must be re-dispersed by good mixing prior to use. Sometimes the resin or solvent can float to the top (a phenomenon called syneresis). This clear liquid is an essential part of the paint formula and must never be poured off – it must be fully re-incorporated before use.

### MIXING OF TWO-PACKS

There is another reason for correct mixing when it comes to two-pack coatings. The standard two-pack kit comprises a Part A and a Part B; one part contains the reactive resin, whilst the other contains the curing agent or “hardener”. [Some kits in fact comprise additional packs, such as reactive colour packs and accelerators.] The Manufacturer ensures that the ratio of resin to hardener is in exact proportions to achieve complete reaction when thoroughly mixed.

Think of it at a microscopic level; each molecule must meet its reactive counterpart to react. The speed and efficiency of mixing using a power mixer ensures that, on a molecular level, almost every molecule Part A finds its Part B, so that the two-pack coating is uniform throughout the mix and achieve 100% of its properties.

If mixing is not thorough, areas will be richer in either Part A or Part B, resulting in incorrect mixing ratios in these areas. This is called “off-ratio” mixing. Off-ratio mixing may result in the following:

- Patchy, inconsistent gloss, and lower gloss than stated on the data sheet
- Inconsistent hardness – areas that are too soft or too brittle
- Significantly lower hardness overall than stated on the data sheet
- Coating failure, such as delamination
- Film defects such as blooming
- Stickiness or uncured, un-reacted paint

### WHAT IS INDUCTION TIME?

Some coatings also require an induction time to allow the curing reaction to proceed efficiently and correctly. The induction time is a period of time in which the freshly mixed material is allowed to stand before application.

The problem with using inadequate mixing tools (paddle stirrers, potato mashers or shakers) is that the theoretical length of time required to mix the materials thoroughly will exceed the induction time of the product, so the curing reaction would commence well before mixing is complete!



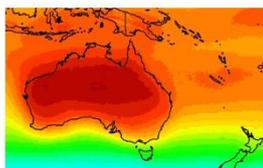
*Mixing a two pack epoxy using a high speed stirrer takes about 3 minutes*



*When attending a coating failure investigation, the Dulux rep asked to see the mixer used. This was it!*



*To mix for a minimum of 3 minutes is made easier with a high speed mixer, a comfortable stance, PPE and a timer –but impossible with a tree branch.*



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## PROCEDURE FOR MIXING TWO-PACK COATINGS

The mixing of single-pack coatings can usually be adequately achieved by the use of flat, paddle-like stirrers, potato mashers or paint shakers. The mixing of two-pack coatings (especially those with high volume solids) is somewhat more involved, and cannot be achieved with anything less than a power mixer. The amount of shear introduced by power mixing is significantly greater than hand-mixing and is critical to chemical reaction initiation.

Dulux Protective Coatings recommends the instruction sequence below for mixing two-packs:

1. Ensure the clean-up solvent is available before application.
2. Separately mix contents of each container thoroughly with a power mixer. Scrape the sides and the bottom of the can as you go. A flat-blade knife may be effective in achieving this.
3. Ensure bases have been tinted to the correct colour.
4. Box all containers before use to ensure colour consistency.
5. Add the components in the recommended sequence under constant stirring. This usually involves two people, one to pour and one to mix. Mix the contents of both packs together thoroughly using a power mixer for at least 3 minutes. Scrape the sides and the bottom of the container as you go to ensure that all of part A and B are mixed.
6. Allow mixture to stand for the recommended induction time, as stated on the data sheet.

## WHAT IS “BOXING”?

Boxing ensures consistency of colour across several containers of tinted paint. This process is unnecessary for “factory packaged” coloured paint, where all the cans carry the same batch number.

When several cans of paint are tinted to the one specified colour, minor colour variations may occur between the cans, or even just one can might be slightly out. To ensure perfect colour consistency, all the cans of tinted paint (or the tinted part of a two-pack kit) should be poured into a separate container, or “boxed”, prior to mixing and application. After boxing, the tinted component should be poured back into the original cans so that the kits can then be mixed in their correct proportions as required.

The procedure for boxing 3 containers of tinted components is:

1. Obtain a clean container of the same volume (or larger) as the cans to be boxed
2. Mix the contents of each can thoroughly to ensure tinter is well incorporated
3. Pour ⅓ of the contents of each can into the container and mix well
4. Pour the boxed material back into the original containers
5. Repeat step

In some cases, the tinted component is very viscous (thick, like treacle) and is difficult to mix. If the induction time stated on the data sheet is reasonably long, then it may be easier to do the boxing after having mixed the part A with the Part B as the resulting viscosity may much lower and hence easier to handle. Seek advice from your Protective Coatings Consultant if unsure.



*Ensure that the mixing and induction times are strictly observed*



*No need to box if the colour is factory packaged or the product is to be used untinted*



*Smooth, consistent colour and gloss, and maximum hardness – all achievable by proper mixing!*

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## QUESTIONS AND ANSWERS

**Q:** *I don't have a high-speed mixer. Can I use a flat paddle to mix two-packs?*

**A.** No! The energy necessary to completely mix two-packs simply cannot be achieved with a flat paddle stirrer. The amount of energy a power mixer delivers in three minutes would equate to around **thirty minutes** of energetic stirring with a paddle, even if you had the strength and stamina to do so. This period of time lapsed may also exceed the induction time and/or reaction time, during which the paddle-mixed material would begin to react randomly in localised areas within the can. If you have a powerful drill motor, a drill bit attachment similar to the one shown may suffice. This would ensure thorough mixing within a reasonable period of time, and before the induction time has finished.

**Q:** *The colour in the can is changing as it being mixed. Why?*

**A.** When paint is tinted, the coloured pigments in the tinter slowly become dispersed into the paint. The colour of the paint therefore can change from its original colour to that of the formulated colour. The longer the paint is mixed, the more thorough the pigment is dispersed, and the closer the final colour of the paint will match that of the colour card or sample for which the formulation was created.

**Q:** *Can I mix two-pack coatings from different suppliers?*

**A.** No! Each product varies with regard to amount of resin in the base, and amount of curing agent in the hardener.

Even if two-packs from different suppliers have the same mixing ratio (for example, a 4:1 ratio) the level of hardener to resin can be completely different. The “Part A” in each two-pack kit specifically requires the exact amount of hardener present in its own “Part B” in order to properly cure. In fact, the same principle applies to different products with the same mixing ratio from the same supplier!

Therefore, if you attempt to mix apparently similar products from different suppliers, you run the very high risk of application or coating failure due to incorrect resin/curing agent ratios. **And if it fails, neither supplier will have reason to help you.** Manufacturers ensure that for a given two-pack kit, when the entire contents of Part A is mixed with the entire contents of the B, you have the exact ratio of resin to curing agent.

**Q:** *Can I mix single-pack coatings from different suppliers?*

**A.** No! Even when it comes to single-pack coatings, there are many types of resin or acrylic latex and widely different methods of stabilization. An additive present in one paint can readily de-stabilize another, so if they are mixed, the result could be immediate flocculation of the latex particles. Flocculated paint resembles cottage cheese or very lumpy custard, and once this happens, even vigorous mixing cannot reverse it.

It is false economy to attempt to mix left-over paint, unless it is the same paint product.

*For more information, please contact the Dulux Protective Coatings Technical Consultant in your state.*



*Some epoxies are very thick and heavy – nothing other than a heavy duty electric mixer can mix these products successfully. Don't try this with a paddle.*



*A measuring stick can be used to measure part kits in the correct proportions –but don't use one as a mixer*



*A green floor? At least it is uniformly glossy, thanks to good mixing of whole kits from the one supplier*