

Mixing of Two-Pack Coatings

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Why This Tech Note?

Correct mixing of two-pack coatings prior to application is an **essential step** in the whole painting process. Many **coating failures** can be traced back to **inadequate mixing**.



Mixing Generally

All coatings are made of resins, pigments, additives and solvent (which may be organic or water). The heavier pigments often **sink** to the bottom of the container 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 an additional 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 **multiple packs**; reactive colour packs and accelerators are sometimes supplied in addition to the resin and hardener packs.] The Manufacturer ensures that the **ratio** of resin to hardener is in the **correct proportion** to achieve **complete reaction** between the two when properly mixed.

Think of it at a microscopic level; **each molecule** requires **intimate mixing** with its reactive counterpart to react. The speed and **efficiency** of mixing using a **power mixer** ensures that, on a molecular level, the Part A and the Part B are intimately mixed, and that the reaction can occur **correctly** and **uniformly** throughout the mix.

If mixing is not thorough enough, there may be areas that are richer in either Part A or Part B, resulting in incorrect mixing ratios in these areas. This is sometimes called “off-ratio” mixing. Off-ratio mixing may result in any or all of the following:

- Patchy, **inconsistent gloss**, and generally lower than specified on the data sheet
- **Inconsistent hardness**, areas that are too soft or too brittle (depending on the type of product)
- Significantly **lower hardness** than specified on 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.

And herein lies an additional problem with using inadequate mixing tools (such as paddle stirrers, potato mashers or shakers); the theoretical length of time required to mix the materials thoroughly would certainly **exceed the induction time of the product**, which means that the curing reaction would commence well before mixing is complete! This is particularly true of solvent-free coatings.



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Procedure for Mixing of 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 commencing 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. Perfectionists usually transfer to a separate, clean container to avoid contamination of un-reacted material. While this is to be admired, if the sides and base of both containers are scraped and effectively mixed, then this is usually unnecessary.
7. Allow mixture to stand for the **recommended induction time**, as stated on the data sheet.

What is "Boxing"?

Boxing refers to the process of ensuring consistency of colour across several containers of tinted paint. This process is not required for "factory packaged" coloured paint, especially if the paint containers all carry the same batch number.

When several containers of paint are tinted to the one specified colour, **minor variations** in colour may occasionally occur between the containers, or perhaps just one container might be a little different from the others. To ensure absolutely perfect colour consistency, all the containers of tinted paint (or the tinted component 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 containers so that the kits can then be mixed in their correct proportions as required.

The procedure for **boxing** 3 containers of tinted components is as follows:

- *Obtain a clean container of the same size (or larger) as the containers to be boxed.*
- *Mix the contents of each container thoroughly to ensure tinter is well incorporated.*
- *Pour 1/3 of the contents of each container into the empty container and mix well.*
- *Pour the boxed material back into the original containers.*
- *Repeat step 2.*

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 be much lower and hence easier to handle. Seek advice from your Protective Coatings Consultant if unsure.



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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 container. 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 seems to change as it being stirred. 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. 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 correct 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.