



GUIDE TO POSSIBLE APPLICATION PROBLEMS AND SOLUTIONS IN HIGH SOLID EPOXY PAINTS (FK-45 and FK-100 Range)

1. GOLDEN RULES IN THE APPLICATION OF HIGH SOLIDS EPOXIES

- Plan your working time well, once you have mixed A+B you have little time for application, especially at higher temperatures, in summer, or when mixing larger quantities of product.
- Component A at rest is usually a highly viscous product with thixotropic behavior, especially at colder temperatures, so it is necessary to mix component A separately with an electric agitator before adding component B. This will fluidize the product.
- Once component A is well mixed, component B can be poured over component A and stirred again until a homogeneous product is obtained.
- Mix only complete sets of A+B, to avoid mixing ratio errors.
- Depending on the type of application, to the previous A+B mixture already stirred, you can add the thinner indicated in the technical data sheet, to further lower the viscosity if necessary or convenient. An excess of solvent could cause sagging (sagging and low coverage) in vertical applications, while in horizontal applications it could increase its penetration in the base and improve its flatness.
- The cold makes the product more viscous, while the heat makes it more fluid, so that between summer and winter, viscosity can vary greatly.
- For spray application, special heated equipment is recommended.
- The ambient and base temperature, as well as the temperature of the paint should never be lower than +10°C or higher than 35°C, and the relative humidity should not be higher than 70-75%. The surface temperature of the base to be painted should always be at least 3°C above the dew point to avoid condensation. It is estimated that the ideal application temperature is around 20°C and 60% relative humidity. (Application at more than 35°C: It can be done if it is properly planned, and the paint is stored and mixed in a colder area, but the viscosity will be very low with risk of sagging).
- Consider the environmental conditions prior to application and during curing, with respect to ambient and substrate humidity, temperature, ventilation, safety in confined spaces, etc. In case these conditions are not ideal, they should be adapted by means of air extraction and ventilation, dehumidification, dehydrated air circulation, etc.
- The epoxy paint should not receive contact with water or surface condensation during the first 72 hours of curing, or the paint may not cure properly, resulting in "Amine Blush" wash spots.
- FOOD LIQUID TANKS: In general, the film will present its complete cure, from 14 days for contact with food liquids (cured at 23°C, 50% relative humidity, layer >300 microns dry). At lower temperature and/or higher humidity and coating, the ideal curing time may increase and vice versa. It is necessary to maintain ideal environmental conditions during application and curing.
- Before filling a tank that has been coated with the FK-45 and FK-100 FoodGrade food epoxy range, the complete and correct curing of the film throughout the tank must be checked, as well as an initial cleaning with water or soapy water, also possible disinfection with ozone.
- Forced drying: In general, applications with forced drying with hot dehydrated air can drastically reduce the drying, curing and commissioning time. An example of this can be the application inside pipes, where specialist companies, after application with special systems and equipment, artificially circulate a stream of dehydrated air / relative humidity 0%) and at a temperature of 40 °C / 2 h (*1)+ 12 h / at room temperature, and subsequent washing with water, before final commissioning. (*1) The contribution of heat at higher temperature shortens the programming of the curing cycle. In any case this is the responsibility of the applicator.

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- **OTHER GENERAL APPLICATIONS:** the paint offers good general performance, at least after 72 hours of curing, although we recommend not to subject the paint film to more severe chemical-physical aggressions until it has cured for at least 1 week (walls, floors, ceilings...indirect contact).
- Epoxies have good physical and also chemical resistance, especially to solvents and alkaline products, while they have low resistance to acids, especially oxidizing acids, which can cause slight damage such as yellowing, medium damage such as blistering, and total damage such as peeling. Their resistance and degradation process will depend on the thickness applied, the degree of concentration of the substance, type, time and frequency of contact. In any case, within the group of paints it is one of the most resistant types of resins. In case of doubt, please consult our technical department.
- Do not apply on wet, dirty, incompatible substrates or metals if they have not been properly primed.

NOTE: For further details, consult the technical data sheet and/or application guides, and safety data sheet of each specific product.

2. **Problems and possible solutions**

The following is a description of some of the main, most common application problems with two-component high-solids epoxy paints, as well as indications to try to prevent and solve them.

- **Problem: Formation of air bubbles.**
 - **Cause:** Inclusion and retention of air during the mixing process of both components by aggressive agitation (at high speeds). Its stabilization makes it difficult to remove it during application, with the consequent appearance of bubbles on the surface after curing. This phenomenon can be aggravated at lower application temperatures, since the product has a higher viscosity, and this makes it difficult for the air to escape to the surface before complete curing.
 - **How to prevent it:** Use moderate agitation speeds (300-500 rpm), stirring the mixture properly, with the paddles always immersed to avoid the inclusion of air in the paint. Also, to ensure the removal of air from the paint, just after its application and before it dries, you can pass a specific spiked roller to remove the air. If appropriate, the viscosity of the product can be lowered by adding its thinner.
 - **Subsequent solution:** Sand the areas of the surface where air has been retained, until its total elimination and regularization of the planimetry, clean and/or vacuum completely the dust generated and apply again a coat of paint.
- **Problem: Formation of blisters or craters ("pinholes").**
 - **Cause:** The phenomenon that causes blistering or cratering is known as outgassing and occurs when epoxy is applied to porous concrete surfaces. Air is trapped in the pores of the concrete and tends to escape to the surface through the applied paint layer, generating craters or blisters if the paint has completed its curing process and the air is retained.
 - **How to prevent it:** It is recommended in absorbent bases to apply a first coat of epoxy paint diluted at 5-10% with solvent that facilitates its penetration and allows to replace the air in the pores and to cover them. Although, in the case that the surface is damaged, it is recommended to carry out a previous suitable repair (putty Kit FK-45 Plaster).
 - **Subsequent solution:** Sand the areas of the surface where blisters and/or craters have appeared, until their total elimination, clean the surface and/or vacuum completely the dust generated, repair the base with putty Kit FK-45 Plaster and apply again a coat of paint.

- **Problem: Total or partial lack of adhesion ("peeling").**

- **Cause:** The causes of poor adherence can be multiple:
 - Bad or deficient preparation of the base (greasy or dirty surfaces, with humidity, unconsolidated bases, etc.).
 - Incorrect mixing ratio between the two components.
 - Application of paint on non-recommended surfaces, where adhesion is not guaranteed, etc.
- **How to prevent it:** Check if the surface is suitable and make a correct previous preparation of the same: Cleaning, repairing if necessary and/or priming, consolidation, in case it is necessary. Application of the epoxy paint on the correctly prepared surface, without humidity and in normal conditions of application, ideal temperature between 15-25°C and relative humidity not superior to 60-65%, in case of not being these conditions apply systems of extraction and ventilation of air, dehumidification, etc. until obtaining that the conditions are the suitable and stable ones. Respect the mixing ratio of both components and mix correctly before application.

On surfaces where adhesion is not assured, perform preliminary tests to check if the paint adheres or to determine if some type of primer and/or preparation (sanding) is necessary.

- **A posteriori solution:** remove the paint from all those areas where it is not properly adhered, either mechanically or with macs strippers. Determine the cause or causes of the adhesion problem and act according to these as indicated in the previous point (consolidation, cleaning, priming, repair... adaptation of the environmental conditions, etc.).

- **Problem: Sticky or soft surface ("tacking"). Incorrect curing.**

- **Cause:** The main cause when the paint does not cure completely (no catalysis) is the incomplete or incorrect mixing of both components. It manifests itself if after allowing the necessary curing time, it is observed that the paint has not hardened properly and shows "tacking", is soft or even completely fresh, without having reacted (in case component B, which is the catalyst/hardener, has not been added). Another possible cause is that the environmental conditions or the surface to be painted are not suitable.
- **How to prevent:** Ensure that the quantities of both components correspond to the correct mixing ratio between them (indicated on the product label). Mix both components thoroughly, for about 2-3 minutes, with gentle mechanical agitation and ensuring a correct homogenization of the whole product. In the case that thinner and/or Slip Stop are added, also ensure the homogenization and correct mixing of the whole product, before being applied. Apply the paint whenever possible in environmental conditions between 15-25°C and 30-60% relative humidity. Make sure that the surface to be painted does not have a temperature lower than 10°C since it would not allow the curing of the paint (unless it is an epoxy paint for applications at lower temperatures). In higher temperature conditions (30°C-35°C), plan well the work previously since the pot life and curing time of the mixture can be reduced notably. Do not work in conditions of high humidity or with risk of condensation that can give rise to other problems such as "surface amine blushing".
- **After-sales solution:** If it is detected that the paint has not cured correctly, once it has been applied and the curing time has elapsed, it will be necessary to remove it completely, either mechanically or with a paint stripper such as Oxystrip, then clean and prepare the base coat well, and apply it again correctly.

- **Problem: Surface with greasy spots, loss of gloss and color changes ("Amine blush").**
 - **Cause:** High humidity conditions, condensation, or even contact with water during the drying/curing of the paint in the first 72 hours. Water reacts with carbon dioxide to produce carbonic acid, which in turn reacts with the amine groups of the curing agent to produce carbamic acid (-NHCOOH) and carbamate (-NH3CONH-), resulting in a sticky, greasy and waxy surface. Whitish, grayish and/or dull (loss of gloss) stains may also appear.
 - **How to prevent it:** Avoid applying the paint in an environment with high humidity or condensation, if necessary, use methods to reduce it, such as dehumidification, air extraction, ventilation, etc. Even after application, ensure that there is no condensation on the paint for at least 48-72 hours. Always ensure that the ambient temperature is at least 3°C above the dew point, to avoid vapor condensation during curing. Do not apply on damp or wet surfaces. Ensure a correct curing before carrying out a first cleaning with water and before putting into service.
 - **After-sales solution:** If possible, it is recommended to completely remove the paint, either by mechanical or chemical methods, and apply again. If it is not possible, clean the areas where the problem has appeared with a cleaner with FK-12, and after its total drying, apply again another coat of paint on top.

- **Problem: Lumps or sticking on the applied surface.**
 - **Cause:** Incorrect preparation and cleaning of the base, incomplete mixing of both components, external contamination of the product, use of an inadequate roller or application equipment and/or crystallization of component A due to storage at low temperature (below 20-25°C).
 - **How to prevent it:** Correctly prepare the base before applying the paint. Carry out a correct homogenization of the mixture. Use suitable and clean application equipment (rollers, airless, etc.), store component A at temperatures above 20°C.
In case the latter has crystallized, or its viscosity has increased (reversible process), heat it up to a temperature of 25-30°C and stir until homogenizing component A to make it fluid again, before mixing it with component B.
 - **Remedy after application:** If after the application the appearance of lumps or sticks is detected, sand those points where they appear, clean the surface after sanding and apply another coat.

- **Problem: Sagging (vertical applications).**
 - **Cause:** Excess of solvent added to the product with the consequent strong decrease in viscosity or application of excess product on the vertical surface causing the product to sag. Also too high temperatures cause sagging.
 - **How to prevent it:** Add, if necessary, the thinner to the mixture in small quantities to avoid that the viscosity of the thinner decreases too much. Carry out tests before painting large surfaces to check that the viscosity of the product is adequate and that no sagging occurs. Do not load the vertical surfaces with an excess of paint, spread the product properly. In the case that a greater layer is desired, it is advisable to apply several coats and not to try to leave more layer in only one.
 - **Subsequent solution:** if after the application and once cured the paint sagging is detected and you want to eliminate it, it will be necessary to sand those areas where there is excess product until the entire surface is homogenized. After sanding, clean the surface and/or vacuum completely the dust generated, and apply again another coat of product.

- **Problem: Paint damaged or disintegrated after use.**
 - **Cause:** exposure to very aggressive cleaners or solvents that are unsuitable for it.
 - **How to prevent:** Epoxy paints in general are not resistant to cleaning or exposure to strong or highly oxidizing acids such as acetic, nitric, hydrochloric acid, etc. They can also be damaged by some solvents such as acetone, MEK, benzyl alcohol, etc. If you do not know how a cleaner, disinfectant or solvent can affect the surface, carry out a preliminary test in an inconspicuous area (see document on chemical resistance on our website).
 - **Subsequent solution:** if the surface has been damaged by a chemical agent, it will be necessary either to remove all the damaged paint with a macs paint stripper or by mechanical means and repaint, or, if the affected area is not very large, to remove the non-adhered paint from the damaged areas and repaint.
- **Problem: Reaction of components A+B before application.**
 - **Cause:** the pot-life of the mixture has elapsed. You will notice that the mixture has hardened in the container, or its viscosity has increased so much that it is almost impossible to apply it correctly.
 - **How to prevent it:** it is very important to plan the work well before mixing the two components. Always consult the technical data sheet and application guides before the application in order to estimate the time available to paint once both components have been mixed, bearing in mind that this time may be reduced in high temperature conditions and/or in summer, and that the greater the quantity of product mixed, the shorter the application time available.
 - **After-sales solution:** if it is detected that the product has reacted in the container, increasing its viscosity too much or even hardening, it is recommended to discard it and start again with another set, to avoid that the product being applied does not adhere well to the surface or does not properly reach the final properties that correspond to it.

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