TECHNICAL INFORMATION

Processing BÜFA®-Gelcoats

Just a 500-600 µm thick layer...

… but the selection of the right gelcoat is still very decisive for the final properties of fibre reinforced as well as cast moulded parts. That is why quality comes first! Weatherfastness, lightfastness, degree of gloss, resistance to chemicals, resistance to corrosion and, of course, also the mechanical properties of a gelcoat surface crucially depend on two factors: the first is which raw materials are used to formulate the gelcoat and second, how well the gelcoat is processed in practice or how well the gelcoat can be processed in practice.

Ideally Suited for All Applications

We guarantee you that only raw materials whose long-term behaviour has been tested and proved are used in our BÜFA Gelcoats. An extensive range of gelcoats and topcoats in brushing and spraying quality is available to users. All gelcoats and topcoats are distinguished by good working properties such as de-airing, flow and wetting of the mould. Optimal thixotropic properties prevent running on vertical surfaces and the reactivity of the base resins used in conjunction with specially formulated pre-acceleration ensure a fast and good cure.

Influence of Temperature

Temperature is one of the greater external factors when processing. As you can see in the graph, viscosity and reactivity are highly dependent on temperature. Optimal working conditions are achieved at 20 °C; reasonable conditions for gelcoats that are delivered ready to use range between 18 °C and 25 °C. This temperature range guarantees optimal parameters of the cured gelcoat.

a) Temperature is too low:

Temperatures that are too low increase the viscosity of the gelcoat so strongly that it can no longer be applied properly. De-airing in particular can no longer be guaranteed and when it comes to curing, sufficient thorough curing of the gelcoat can no longer be achieved with standard pre-acceleration and standard hardeners.

b) Temperature is too high:

Temperatures that are too high reduce viscosity which may lead to problems with thixotropy. The emission of styrene also increases. The pot-life of a gelcoat is drastically reduced at higher temperatures and undercuring is often found in summer, interestingly enough, because less peroxide is often added in summer. This can be remedied by using peroxides with a longer pot-life. If the normal peroxide is further used in the prescribed quantity at high temperatures, there will be a risk of shrinkage.

Humidity

Humidity also has a certain influence on working properties since it can be brought in, for example, through insufficiently dried spraying air. This causes a slight thickening which can lead to pores but it can also have a slight retarding effect through the influence of cobalt pre-acceleration. Ideal conditions range between 50 % and 75 % relative humidity. Humidity can also enter the gelcoat through moulds and tools. A prime example of this is a brush that was cleaned with acetone and then blown out with compressed air to make it dry faster. In this case, evaporation causes cooling and humidity can condense in the bristles of the brush.

Air Movement

We recommend light air movement to improve the thorough cure of the layer of gelcoat.

a) Air movement that is too strong:

Strong drafts, especially directly after application, can influence the freshly applied gelcoat and cause too much styrene to evaporate. Evaporation causes cooling which can cause undercuring.

b) No air movement

It is often observed that in deep moulds, for example, there is no air movement. The gasses given off during curing cannot flow off which results in undercuring.

Hardeners & Curing

Here as well, there is a rule of thumb: always use the specified hardener in the specified quantity. To achieve optimal curing, gelcoats are generally formulated so that there will be a gel time of approx. 20 minutes on the surface (if the rule of thumb is observed).

If too little hardener – or in some cases too much – is added, this may result in undercuring which will have a negative influence on the final properties of the moulded part. After adding the peroxide it should be homogeneously mixed with the resin. When mixing, make sure that not too much air is mixed into the gelcoat since the air must escape later.

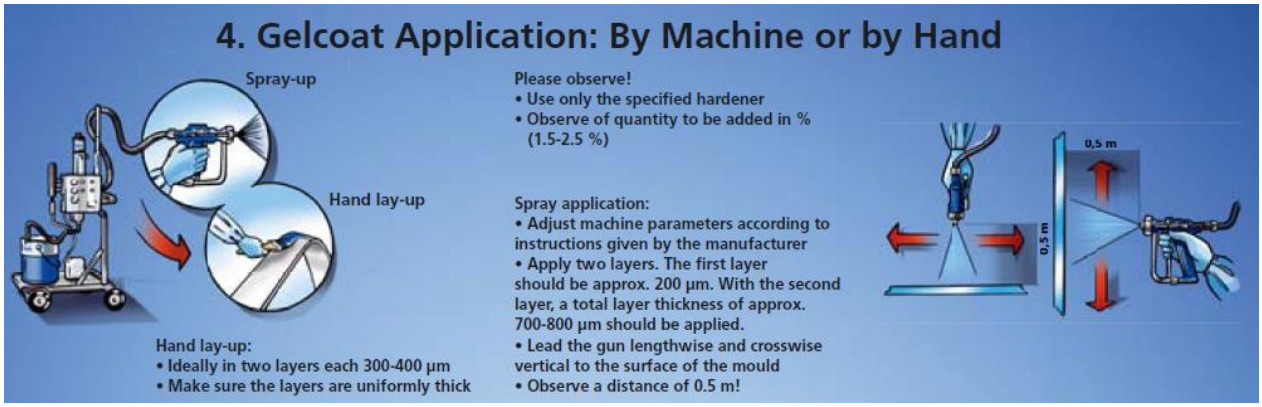
When processing from a cup, the material should be poured into a second container after mixing since there is often too little hardener in the edge zone of the gelcoat. Mixing speeds that are too high or too much resistance can destroy thixotropy. Make sure that the resin and hardener metering equipment is clean and, if applicable, regularly calibrated (e.g. volumetric measurement in the case of equipment, control weight for scales). If you have to work in spite of higher temperatures, please use a low-active hardener instead of the standard hardener which can be added in the same quantity.

Application

Ideally, a wet film 400-600 µm thick should be applied. This corresponds to a quantity of approx. 500-700 g/m². The gelcoat should be applied in a hand lay-up process in two layers each 300-400 µm with intermediate curing. If applied by spraying, the first layer should be around 200 µm. After 1-3 minutes, the desired layer thickness is ideally produced by spraying lengthwise and crosswise.

Thinner layers may lead to undercuring. In this case, the gelcoat dries faster than it can chemically cure which may cause so-called “elephant skin” to form later when the laminate is applied.

Layers that are too thick can cause increased stress in the topcoat due to the concentration of pure resin. This can lead to stress cracks in the topcoat, for example, or premature shrinking of the gelcoat from the mould through too high reactivity. De-airing is also more difficult when layers are too thick.



The application of too much gelcoat in one working operation can also cause the gelcoat to run off. This often leads to enclosed pores or pigment separation. Make sure there is sufficient ventilation when working with deep component moulds. Ventilation is necessary to lead off styrene vapours which can have a negative effect on curing. Vapours can be more easily led off, e.g. by tipping deep moulds so that the styrene, which is heavier than air, can escape from the mould in the direction of the floor.

Before the laminate is applied to the gelcoat you must make sure that the gelcoat has cured properly. This is best done by running your fingers over the surface of the gelcoat; if a squeaking sound results, lamination work can proceed. If laminating is carried out too early, the gelcoat may partially dissolve ("elephant skin").

The gelcoat should be covered with the laminate construction at the latest 6 hours after application to guarantee an optimal chemical bond. This especially applies to gelcoats that contain a skin forming agent.

Options for application

Gelcoats can be applied by different methods –spraying, by hand or with a roller. See also the technical information "BÜFA Tec Machine Parameters for ES 1 and BETA3.

Application by hand

Applying the gelcoat with a brush is the simplest way to apply a gelcoat. This had the advantage of low styrene emission and very good de-airing. The pigmentation of the gelcoat should be formulated so that brush strokes are not visible. The gelcoat is best applied in two layers each 300 µm thick.

The second layer should only be applied after the first layer is initially cured to prevent tearing the first layer. However, with this application method it is not easy to apply a uniform layer thickness over the entire component.

A special form of application by hand is rolling the gelcoat. Rolling is mostly used for the production of large-surface moulded parts to achieve a relatively short coating time. Not every brushing quality is suitable for rolling and in many cases a special formulation must be selected for large-surface components.

Spray application

Application by spraying can be achieved by different methods. What they all have in common is that spraying is much faster than brushing the gelcoat. There are especially optimised gelcoats with the right viscosity and de-airing properties for spraying. During the spraying process, a lot of additional air is brought into the gelcoat and the emission of styrene in increased at the same time.

In an ideal case the gelcoat is applied in two layers. The first layer should be approx. 200 µm thick since this ensures good de-airing. After approx. 2 min. the second layer is sprayed onto the not yet gelled first layer, increasing the thickness to approx. 600 µm.

While spraying, the gun should be led vertical to the surface of the mould lengthwise and crosswise at a distance of approx. 0.5 m, depending on the material used and the size of the nozzle. If possible, the droplets created while spraying should be large to achieve minimal emission of styrene and optimal de-airing. This can be achieved with modern medium pressure HVLP (High Volume, Low Pressure) units or with larger nozzles for cup guns.

The easiest way to apply by spraying is to use a cup gun (Polycon). In this case, up to max. 2.5 kg gelcoat are mixed with peroxide and sprayed with compressed air on the mould. Cup guns are mainly used for smaller components when colours are often changed. An advantage of this method is the possibility of spraying the gelcoat with tinsel or a granulate.

Equipment is needed for the other method of spraying gelcoat. With this method, either an airless procedure is used in which the peroxide is mixed externally (the disadvantage of this is peroxide overspray when the equipment is not optimally adjusted) or spray application with internal mixing of the peroxide (the disadvantage here is the time needed for cleaning). Both methods are suitable for continuous series production and for large components. The peroxide is automatically metred and you have the advantage that the hardener is always freshly added which makes processing independent from the gel time. In addition, there are no "smoking" pots as is the case with a cup gun.

Release agents

The release agents used have an external influence on the processing of the gelcoat. But since the user usually also releases the moulds himself, this subject is only mentioned now. It is especially important that the combination gelcoat / mould surface / application method / release agent are coordinated to each other. Our Technical Information Sheets give notes on the release agent to be used for most applications.

Incorrectly applied or improper release agents can have disastrous consequences on the quality of the surface of the component. For example, there may be an increased number of micro-pores if the release agent is poorly polished or release agents have been used that prevent good wetting (visible on stronger droplet formation on freshly applied gelcoat, a so-called “mercury effect”.

Further important notes:

+ The colour of BÜFA®-gelcoats are intensively tested at our facility using colorimetric measurements. The usual deviations in the shade of colour lie in a very narrow range, depending on batch. In spite of this, gelcoats with the same batch number should be used for one and the same GRP component, if possible.

+ BÜFA®-gelcoats are supplied ready to use; the addition of any sort of additive changes the character of the gelcoat and its processing quality described in the Technical Information Sheets.

+ BÜFA®-gelcoats are pre-accelerated as a rule. Desired differences in gel time are to be controlled by the peroxide selected. Please get in touch with our Technical Service Department concerning the selection of a suitable curing system.

+ BÜFA®-gelcoats usually have a guaranteed shelf-life of 3 months at room temperature. Protect the containers from frost and high heat. Before using, gently stir the contents of each container. The state of the goods according to specifications should be visually inspected upon delivery but at the latest before processing begins and, if necessary, the pot-life, viscosity and colour verified by testing. The characteristics of the gelcoat are found in the respective Technical Information Sheet.

+ BÜFA®-Tooling gelcoats are processed differently; notes on this are found in the respective Technical Information Sheet.

+ We will be glad to help you select the right BÜFA®-gelcoat in regard to its requirement profile such as lightfastness and weather resistance, mechanical and thermal properties or resistance to chemicals.

Your BÜFA team wishes you lots of success!

You´ll find technical data sheets and further information at www.buefacompositesystems.com

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