Working with OLDOPAL®-Gelcoats

In General

Gelcoats are usually transparent or pigmented layers of pure resin that form the surface of mouldings made from unsaturated polyester resin. The requirements on gelcoats cover a broad spectrum, for example to protect mouldings from the influence of weathering and chemicals, colour fidelity to the moulded article, to protect the surface of mouldings or to protect mouldings from chemicals, to create scratch- and wear resistant surface layers or as a primer for subsequent application of varnish.

The requirements on gelcoats continue to increase and can be controlled through the selection of a suitable base resin. Additives and other admixtures such as thixotroping and reaction controlling agents optimize the gelcoat for the respective application.

To the observer, the gelcoat is the most important part of the finished glass fibre reinforced polyester resin moulded article and is decisive for the most important functional properties of the article. The properties of a gelcoat surface essentially depend on two things:

First, which raw materials have been used to formulate the gelcoat and second, how well the gelcoat has been worked in practice or, put in better words, how well the gelcoat can be worked in practice. For this reason, this Technical Information Sheet will give you some important tips on how to work with OLDOPAL®-Gelcoats properly.

External influences that affect working

Before working with gelcoats, external parameters should be examined first. Has everything been done to ensure optimal conditions for the gelcoat? Modern gelcoats have been designed to meet the requirements of many users all at once. This necessarily results in formulations that do have limitations in regard to ambient working conditions. The rule of thumb is: resin, peroxide, mould and tools should all have a temperature of 20 °C.

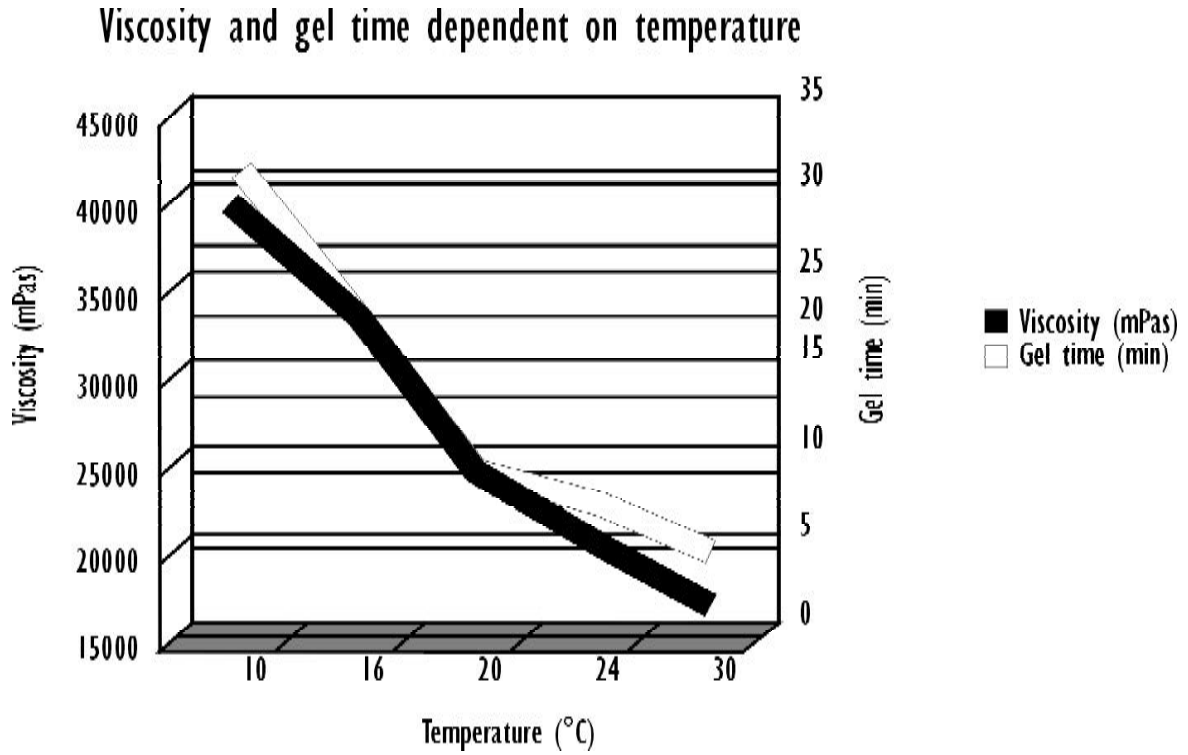
Influence of temperature

Temperature is the greatest ambient factor when working with gelcoats. As you can see in the graph below, viscosity and reactivity are highly dependent on temperature. Optimal working conditions are at 20 °C but temperatures can range between 18 °C and 25 °C for the gelcoats that are supplied ready to use.

Temperatures that are too low increase viscosity enough that proper application is not possible and air release cannot be guaranteed. When it comes to curring, sufficient full curing of the gelcoats with standard preacceleration and standard catalysts cannot be achieved either.

A high temperature causes low viscosity which could cause problems with thixotropy. The emission of styrene also increases. The pot-live of gelcoats is drastically reduced at higher temperatures which, interestingly, has the consequence that you usually find undercure in summer since the dosage of peroxide is often decreased in these cases.

Peroxides with a longer pot-life solve the problem. If normal peroxide in the prescribed dosage is still used at higher temperatures, there is a risk of shrinkage. The following graph shows the influence of temperature on the reactivity and viscosity of a gelcoat.



Humidity

Humidity also has a certain influence on working properties since it can be brought in through insufficiently dry spray air. This has a slight thickening effect which not only can cause pores, but also, through its influence on the cobalt-preacceleration, has a slightly delaying effect. Ideal conditions range between 50-75 % relative humidity.

Air movement

Strong drafts, especially just after application, can influence the freshly applied gelcoat when too much styrene evaporates causing coldness which can result in undercure.

Just the opposite is the often observed effect that there is no air movement at all in deep moulds and therefore the gases released during curing cannot flow off which also results in undercure. Moisture can also enter the fine layer through moulds and tools.

The best example for this is brushes that are cleaned with acetone and then blown with compressed air to make them dry faster. The cold resulting from evaporation causes the humidity in the bristles to condondense.

So much for external influences. In the following, we will describe the parameters that should be observed directly when working, whether by machine or by hand.

Catalyst and curing

Here as well, the rule of thumb is:

Always use only the prescribed catalyst in the prescribed dosage. To achieve optimal curing, gelcoats are usually formulated so that you can count on a gel time of approx. 20 minutes on the surface (if the rule of thumb is followed).

Underdosing and in some cases overdosing may lead to undercure which has a negative influence on the final properties of the moulded article. When the peroxide is added, it should be mixed with the resin until homogeneous, mixing in as little air as possible into the gelcoat since this air must escape later.

When working from a cup, the gelcoat should be poured into a clean cup before using since the gelcoat around the edges of the cup often does not contain enough catalyst. Mixing speeds or restiance that is too high can destroy the gelcoats thixotropic properties.

Make sure that the resin and catalyst dosing devices are clean and, if necessary, have them calibrated regularly (e. g. gauge liter capacity of machines, control weights on scales.)

If, in exceptional cases, you still have to work at higher temperatures, use a low-active catalyst instead of the standard catalyst which can be used in the same dosage.

Application

Ideally, a wet film thickness of 400-600 µm is applied. This corresponds to a quantity of approx. 500-700 g/m². Thinner layers can lead to undercure. Thinner layers of gelcoat dry faster than they cure chemically which can result in the formation of so-called "elephant skin" when laminate is subsequently applied.

Layers that are too thick can lead to the build-up of internal tension in the top layer because of the concentration of pure resin which manifests itself e. g. tension cracks or they can cause premature shrinking of the gelcoat from the mould because reactivity is too high. Air release 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 sag. This often leads to enclosed pores or pigment separation. In the case of deep moulds, make sure there is sufficient ventilation. Styrene vapors have a negative effect on curing. Ventilation is necessary to remove the styrene. To promote removal, tilt deep mould so that the styrene, which is heavier than air, can escape from the mould in the direction of the floor.

Atmospheric oxygen also inhibits the reaction of the gelcoat which can cause the surface to become slightly sticky. Before laminate is applied to the gelcoat, make sure that the gelcoat has fully cured. To check this, draw your fingers over the gelcoat, make sure that the gelcoat has fully cured. If a squeaking sound is produced, the laminate can be applied. Premature lamination can lead to partial solution of the gelcoat.

Waiting times of more than 6 hours between the application of gelcoats and the laminate should be avoided if possible so that an optimal chemical bond is achieved. This applies particularly to gelcoats that contain LSE-additives. Longer waiting times must be checked in each individual application case.

Options for working

Gelcoats can be applied by various methods. Spray-, brush- and roller-applications are described here.

Application by hand

Applying gelcoats with a brush is the easiest method. The advantage of this method is the low emission of styrene and very good air release. The pigmentation of the gelcoat should be adjusted so that brush strokes are not visible. Ideally, two layers, 300 µm each, are applied. The second layer is applied after the first has initially cured and does not open when the second is brushed on. However, it is not easy to maintain an even layer thickness over the whole piece with this application method.

A special hand application method is rolling the gelcoat. Rolling is mainly used for the production of large moulded articles with large surfaces to achieve a relatively short coating time. However, not every gelcoat in brush consistency is suitable for rolling and special formulations must often be selected for large surfaxe objects.

Spray application

Spray application can be carried out by various methods. What they all have in common is that spraying is much faster than brushing. Gelcoats that are especially optimized in regard to viscosity and air release are available for spraying. A lot more air is brought into the gelcoat by spraying and the emission of styrene is increased at the same time.

Ideally, two layers of gelcoat are applied, the first layer approx. 200 µm thick. This ensures good air release. After approx. 2 minutes, the second layer is applied to the not yet gelled first layer and the thickness brought up to approx. 600 µm.

The gun should be led perpendicular to the surface of the mould, spraying lenght-wise and cross-wise at a distance of approx. 0,5 m, depending on the material used and size of the spray nozzle. To minimize the emission of styrene and optimize air release, the droplets that form when spraying should be as large as possible and spraying pressure should be as low as possible. This can be achieved through modern medium pressure- or HVLP (high volume, low pressure) equipment or, in the case of cup guns, through larger spray nozzles.

The easiest spraying method is by using cup guns (Polycon). Peroxide is added to a maximum of 2,5 kg of gelcoat in the cup and sprayed onto the mould with compressed air. Cup guns are used for smaller moulded articles when colours are changed often. An advantage with this method is the possiblity of spraying gelcoat with tinsel or granulate.

Mechanical equipment is needed for the other spraying method. There are two procedures: airless with externally mixed peroxide (the disadvantage is peroxide overspray if the formulation is not optimal) and spray application where the peroxide is mixed internally (the disadvantage is the expenditure for flushing).

Both methods are suitable for continous series production and for large articles. Peroxide is dosed automatically and you have the advantage that the catalyst is always freshly added which makes working relatively independent of gel time. And there are no "smoking" pots as in the case of cup guns.

Release agents

The release agents used have an external influence on working with gelcoats. Since the user usually releases the moulds himself, release agents are only mentioned now. It is especially important that the combination gelcoat-mould surface-application method-release agent is coordinated. Our Technical Information sheets contain information on the release agents to be used for most applications.

Release agents that are improperly used or uncoordinated can have disastrous results on the surface quality of moulded articles. Examples are an increased number of micro-pores because the release

agent has not been polished thoroughly enough or release agents have been used that prevent good wetting (visible by heavy droplet formation on freshly applied gelcoats, "mercury effect").

Further important notes

+ OLDOPAL®-Gelcoats are thoroughly tested by colorimetric measurement. Normal deviation in colour is extremely slight and deviates only from batch to batch. In spite of this, only one batch should be used for the same moulding.

+ OLDOPAL®-Gelcoats are delivered ready to use. The addition of any additives changes the characteristics of the gelcoat and the working quality described in the Technical Information sheet.

+ OLDOPAL®-Gelcoats are preaccelerated as a rule. Desired differences in gel time are controlled by the peroxide that is used. Please get in touch with our technical service department concerning the selection of a suitable curing system.

+ OLDOPAL®-Gelcoats are guaranteed for a shelf-life of 3 month at room temperature. Protect containers from frost and high temperatures. Before using, stir the contents of each container carefully. Gelcoats should be visually examined upon delivery or at the latest before they are used, also checking pot-life, viscosity and color if necessary to make sure they meet specifications. The characteristics of the gelcoat are described in the respective Technical Information sheet.

+ OLDOPAL®-Gelcoats used for mould making have special working instructions which are found in the respective Technical Information sheet.

+ If you need any help selecting the right OLDOPAL®-Gelcoat in regard to its requirement profile, e. g. lightfastness and weather resistance, mechanical or thermal properties or chemical resistance, do not hesitate to get in touch with us.

Your BÜFA Team wishes you lots of sucess!