GELCOAT APPLICATION GUIDE

HELPING YOU ACHIEVE REMARKABLE RESULTS.

INEOS Composites

ineos.com/composites

You should expect maximum performance with every INEOS Composites product.
This guide will help you get there.

AGITATION

One of the most neglected procedures concerning gelcoat, as well as all coatings, is proper agitation. Proper agitation is as important as maintaining the correct film thickness and catalyst level.

Gelcoat is made up of ingredients that have different densities. Shortly after packaging, these ingredients begin to separate. After a drum of gelcoat has been packaged for 30 days or more, some of the pigments and thixotropes can settle in the drum. The lighter materials such as solvents (styrene) will float to the top, leaving the resin in the middle. More separation occurs the longer the material is stored.

To insure the separated materials are redistributed evenly, proper agitation is imperative. Rolling the drum over the floor or bubbling air through the drum or stirring with a plank will not adequately agitate the material and may also have safety implications.

For 55 gallon drums, the recommended agitator should be the type that has pitched blades approximately 14" in diameter. Common suppliers of these agitators are MVP Inc. and Binks. Pails also must be agitated.

Mixing must be done prior to taking any sample from the material.

Listed below are a few of the most common problems that can occur without proper agitation:

- Sagging
- Pigment float
- Resin tearing
- Poor hide
- Poor color match in cosmetic repairs
- Yellowing
- Extended filmcure
- Prerelease
- Gelcoat film on mold after part has been demolded
- Fisheyes

Recommended Agitation

1. Mix daily 10 to 15 minutes. A higher speed might be needed for the first 3 minutes to get material moving, then a lower speed, so that there is just enough rotation and visual pumping that the material turns over, but not enough to entrain air.
2. Use caution in mixing partial drums not to over mix.
3. Pails can be agitated with a small propeller mixer or even shaken for 2 minutes on a three dimensional shaker. Care must be taken not to entrain air in the gelcoat. Allow the material to recover for 15 to 20 minutes prior to using.

GELCOAT APPLICATION PROCEDURE

INEOS Composites gelcoats are well known for providing reliable, durable, real world performance. To achieve this performance, it is important to properly apply the product. As a Responsible Care company, it is critical that we start with ensuring our materials are applied safely.

This document outlines all the key aspects of storing and applying INEOS Composites gelcoats in a manner that is safe and will provide lasting value to the end user.

PPE

Review the safety data sheet and follow all safety procedures outlined by OSHA and your manufacturing facility. Take note of all safety precautions, and use personal protective equipment recommended by the safety data sheet.

To safely work with gelcoat, the following should be worn at all times:

- Respirator
- Eye protection
- Gloves
- Protective clothing

Gelcoat Storage

Proper storage is necessary to ensure the best performance of the gelcoat.

Gelcoat should be stored between 70 °F and 85 °F. Do not store gelcoat in direct sunlight, as this can cause the material to degrade faster due to excessive heat.

Follow “first in, first out” stock rotation. This will help to counteract the limitations of storage time. Before removing a drum of gelcoat from the storage area, check the drum for damage. If you find a damaged drum, notify your supervisor.

Catalyst Storage

Catalyst should ALWAYS be stored separately from gelcoat and resin in a temperature controlled environment.

MEKP catalysts should be stored at or below 80 °F to maximize its shelf life. Catalyst should NEVER be stored in direct sunlight.

Follow first in, first out stock rotation to ensure that fresh catalyst is always used.

Contact your catalyst supplier for additional shelf life recommendations and proper storage techniques.

Pre-Spray Documentation Card

Before beginning to spray gelcoat, use an INEOS Composites Gelcoat Documentation Card to record:

- Gelcoat material code
- Batch number
- Ambient temperature and humidity
- Gelcoat and mold temperature
- Catalyst type and percent
- Tip size

Proper documentation will ensure all the important batch details are captured, as well as outline the processing conditions. This information will be very useful to determine the cause of any defects.

Use the same batch of gelcoat for the entire part to achieve the best results.

Mixing the Gelcoat

Before use, mix the gelcoat for 10 to 15 minutes with a paddle-type mixer. The ideal mixer speed will change as the volume of the drum decreases. A full drum requires a higher mixer speed to create a bottom-to-top rotation movement in the drum. As the drum level goes down over time, the mixer speed needs to be reduced to prevent splashing or overmixing.

Verify that the drum mixer is adequately turning the edges of the material in the drum. Allow the gelcoat to recover for 15 to 20 minutes prior to spraying parts.

Gelcoat Gun Filtration System Maintenance

The application performance of the gelcoat can be affected if the gelcoat gun is not properly maintained. Use a drying system to remove oil and water contamination from your air supply. Oil and water can cause defects in the gelcoat. The most common are dimples and fisheyes. Before spraying a part, verify that the water traps have been drained. Also monitor the water traps on the spray gun. Both should be drained daily.

Spray Tip Recommendations and Maintenance

Selecting the proper spray tip is vital in gelcoat application.

The size of the mold will determine the proper spray tip. The tip size and the pump pressure will affect the flow rate of the gelcoat. Larger parts, such as hulls, require a larger tip size to increase flow rate. If you need to adjust the gelcoat flow rate, make sure you are using the correct spray tip size.

You should never increase pump pressure to adjust flow rate. This will over atomize the gelcoat causing a lot of additional overspray. It can also lead to porosity in the gelcoat film. Always use the lowest possible pressure to fully develop the spray fan pattern.

Complex parts, such as decks, should be sprayed with smaller tip sizes allowing you to better control the film thickness of the gelcoat. Thick gelcoat on decks can lead to porosity and cracking issues.

The spray tip size will be indicated on the spray tip. An MVP* tip which reads “521” indicates a five degree fan angle, with a 21 thousandths of an inch orifice. The spray pattern will be 10" wide when sprayed 12” distance from the part. Typical flow rates are as follows:

- 18 thousandths: 1.75–2.25 ppm (pounds per minute)
- 21 thousandths: 2.75–3.25 ppm
- 23 thousandths: 3.75–4.25 ppm
- 26 thousandths: 4.75–5.25 ppm

To ensure the best application of the gelcoat, smaller decks and parts should be sprayed with a tip size of 521 or 518.

Larger decks or small hulls should be sprayed with tip size 521 or 523.

Use tip size 426 for large hulls.

The proper maintenance of the spray tip will increase its life span as well as allow for the best application of the gelcoat. Tips should be free from build up and overspray. If a tip does become plugged, hard objects (such as wire) should not be used to clear the orifice. This can cause chips in the carbide portion of the tip, and will cause the spray pattern to erode. It can also cause an inconsistency in the spray pattern, commonly referred to as “fingers.”

Tips will wear over time. The amount of gelcoat sprayed and the maintenance history of the spray tip will determine how often they are replaced. Check the pattern and flow rate from the spray tip. If the flow rate increases or the spray pattern declines, this indicates wear, and the tip should be replaced.

Temperature

Maintaining the proper temperature of the gelcoat is essential. If the temperature of the gelcoat is too low or too high, it will affect its viscosity and flow rate. Proper viscosity is key to successful gelcoat application. Cold gelcoat will have higher viscosity, so it will be thicker and can cause under development of the fan pattern, porosity and leveling issues.

Hot gelcoat will have a lower viscosity and will be too thin. This can lead to sagging issues and poor tape line pulls.

Temperature can be difficult to control, and the mold is a large heat sink. When gelcoat is sprayed onto a mold, it will very quickly become the same temperature as the mold. In cold conditions, this will happen in a matter of seconds. This can also cause the material to thicken and trap air.

Check the temperature of the gelcoat and the mold, as well as the ambient temperature. Temperatures should be between 70 °F and 90 °F.

Catalyst Calibration Procedure

When calibrating the catalyst, you will want to first confirm that the spray gun is accurately dispensing the correct amount of catalyst. All spray equipment manufacturers have a special cap to put on the gun to check catalyst-to-gelcoat ratio. The device will allow you to dispense catalyst and gelcoat in separate streams to be collected in a suitable container.

Place this cap on the gun and dispense material into the containers for 15 to 20 seconds. Weigh the gelcoat and catalyst separately to determine the amount of material dispensed and use the following equation.

Grams of catalyst/grams of gelcoat x 100 = % catalyst

Verify that this ratio is consistent with the value to which the machine is set. If it does not match, contact your pump manufacturer.

Next, visually confirm that the catalyst is being properly atomized. Typically, the catalyst atomizing air pressure should be set between 20–25 psi. Note that catalyst pressure can vary between 20–40 psi, depending on hose length. Use a catalyst percentage of 1.5–2.5% for best results. Catalyst levels below 1.5% and above 2.5% can cause poor cure and lead to a variety of gelcoat issues, such as porosity. Recommended catalyst percentage will vary based on temperature and shop conditions. Contact your INEOS Composites technical service representative for suggestions on the type and percentage of catalyst to use.

As you continue calibrating the catalyst, adjust the fan pattern and pump pressure of the gun. You will want to spray the fan pattern on a vertical wall to verify pattern development. Using a vertical wall allows the catalyst to fall to the ground if not properly atomized Pay special attention to any signs of catalyst fallout. It is crucial to verify that the catalyst is distributed correctly.

If the catalyst pressure is too high, the raw catalyst can be blown through the spray pattern, which can cause porosity issues and large pits. If the catalyst pressure is too low, it will not allow the proper break up of the catalyst and can lead to dimples and large porosity.

It is poor practice to use catalyst to adjust gel time. This practice can compromise the gelcoat's performance. Instead, use a material with an appropriate gel time for the climate, season or size of the part you are making. To adjust the gel time, contact your INEOS Composites technical service representative.

Record the final catalyst pressure on the Gelcoat Documentation Card.

Pressure Calibration Procedure

Setting the ideal spray pattern is critical to optimum gelcoat performance.

Wider spray patterns will be required for large, flat parts, such as hulls. More complex parts, such as decks, will require a narrower spray pattern. This should ideally be controlled by the proper tip size, not by the pump pressure.

Set up a piece of paper or other disposable surface to develop your spray pattern.

Set the gelcoat gun pressure to 20 psi.

Aim the spray gun at a piece of paper or other easily disposable surface. The tip of the gun should be anywhere from 12"–18" away from the paper, at a 90 degree angle.

Pull the trigger to spray the gun, and quickly release. Observe the spray pattern on the paper.

Increase the pressure to 30 psi. Spray the gelcoat onto the piece of paper, and quickly release.

Continue to increase the pump pressure in 5 psi increments until the spray pattern is fully developed. Adjust the air-assist pressure to continue to develop the spray pattern.

As the pump pressure increases, the spray pattern will become more developed. Your spray pattern should become more elliptical in shape as the spray pressure increases during the pressure calibration procedure.

It is best practice to spray at the lowest possible pressure which still yields a properly developed spray pattern.

Too low of a pressure will prevent the gelcoat from being broken up properly. This typically causes porosity issues.

Too high of a pressure can cause more overspray. It can also cause the blowing of the gelcoat and make it difficult to control the film thickness. This can lead to porosity as well.

Record the final pump pressure on the Gelcoat Documentation Card.

Basic Gelcoat Spray Techniques – Spraying a Hull

Before you begin to spray, inspect the mold for damage and cleanliness. Make sure there is no polystyrene build up or dust in the mold. Check the prepared mold for the appropriate mold release properties for the part configuration.

Gelcoat should be sprayed 18"–36" away from the mold using parallel strokes that overlap approximately 20%. You should never start or stop spraying on the mold. This should always be done off the part.

Spraying the first pass of gelcoat is the most critical. The goal is to completely cover the mold with gelcoat, creating a coating thickness of approximately 8 mils on the first pass. You should never exceed 12 mils wet on this first pass, or air can become trapped in the coating, causing porosity.

Gelcoat should be applied in three passes, targeting 60 seconds between a pass using a crosshatch technique. Verify this thickness with a mil gauge after spraying each pass. You want to ensure that 6–10 mils have been applied with each pass. The total wet gelcoat target should be 18–24 mils. Record the mils applied after each pass on the Gelcoat Documentation Card.

For large parts, spray smaller sections at a time to prevent air drying between passes.

For small parts, it is best to spray several at one time. This will allow the proper 60 second flash time, without requiring the gelcoater to stand around idle.

Advanced Gelcoat Spray Techniques – Spraying a Hull

Spraying molds with corners and deep grooves can be a challenge. You need to be careful not to double gelcoat thickness in corner areas. This will lead to the potential of porosity and cracking problems. To avoid thickness in the corners, spray down the corner in a single pass. Then, spray away from the corner area.

For parts with deep channels, make sure the sides are sprayed an adequate thickness without spraying too much gelcoat on the bottom of the channel. Test the spray thickness with a mil gauge frequently. To better manage the thickness, spray more slowly, using five or six passes instead of two or three.

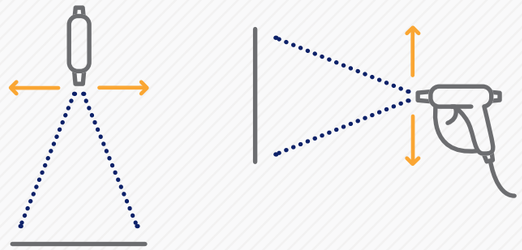
To properly apply gelcoat in corners and deep grooves and channels, you may need to pre- or post-brush the gelcoat. These areas should be brushed slowly in one direction. Brushing quickly or back and forth will cause air to be trapped in the film.

After you have completed spraying the part, use the Gelcoat Documentation Card to document anything unusual that happened during the process, such as: a plugged tip or catalyst burst. This may help determine the cause if a defect is found.

The part now needs to cure prior to lamination. Most gelcoats require 1.5 to 2 hours of cure time for best results. Ensure there is adequate air flow across the mold, so styrene vapors cannot lay in deep areas. Styrene vapor is heavier than air and will inhibit the cure. Always check the part prior to lamination to ensure all areas are well cured and dry to the touch.

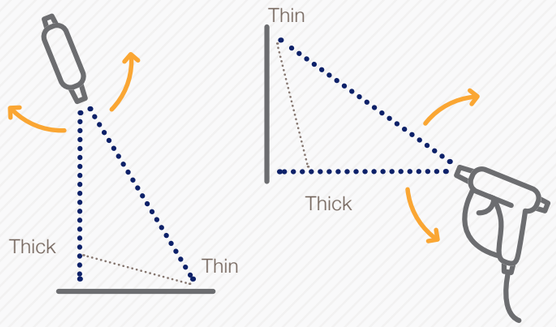
SPRAY APPLICATION

Correct



Keep the spray gun perpendicular to the mold surface at a distance of 50–80 cm (20–32 in).

Incorrect



Spray using continuous and parallel strokes overlapping 20% at a constant speed so that an even layer is formed over a section of a large mold or over the whole mold of a smaller size.

APPENDIX I

Check List for Gelcoat Supervisors

At the start of the shift:

- ☐ Start mixing the gelcoat
- ☐ Open and drain moisture traps
- ☐ Check and record gelcoat, ambient, and mold temp
- ☐ Inspect spray tips for damage
- ☐ Check spray pattern to ensure proper development and dial in if necessary
- ☐ Check and record pump pressures
- ☐ Check and record catalyst amount

Each mold should have a card that accompanies it. At a minimum, the card should contain the following information:

- ☐ Date
- ☐ Gelcoat code
- ☐ Gelcoat batch number
- ☐ Gelcoater who sprayed the part
- ☐ Verification of mils applied
- ☐ A place for comments (for example: gun was spitting, lost catalyst, etc.)
- ☐ Could also have lamination-related info on same card
- ☐ Defects found in final inspection should be addressed with the individuals involved in the application

APPENDIX II

Best Practices

For best results:

As with all gelcoat and coating technology, it is imperative that INEOS Composites gelcoats are mixed well prior to use.

Prior to spraying on a production part, a test panel should be made to verify color accuracy and confirm that the material meets the intended fitness for use by evaluating properties, including but not limited to application, porosity resistance, ease of repair, weathering, blistering, blushing and scratch resistance.

If multiple pails or drums of the same color are needed to make a part, INEOS Composites recommends mixing all the pails or drums together in a suitable container to ensure a homogeneous mixture.

Optimum application temperatures of the gelcoat, mold and environment are 70–90 °F.

Select a suitable size and angle of the spray gun tip, depending on the size and complexity of the mold.

Use the lowest possible pump pressure that achieves a uniform spray pattern.

Set the recommended catalyst between 1.5–2.5%.

Ensure the catalyst is dispersing properly within the spray pattern.

Spray the part using continuous parallel strokes to a thickness of 18–24 mils. This thickness should be built up in 3 passes of 6–8 mils, with each pass perpendicular to the prior pass and a 60 second flash time between passes.

For best repair results, the part should be patched with the same batch of gelcoat from which it was sprayed.

For further instructions on best practices, please contact your local INEOS Composites sales or technical service representative.

APPENDIX III

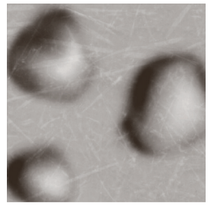
Troubleshooting Guide

Alligatoring

Cause	Solution
Too thin or uneven gelcoat	Apply 18–24 mils in 3 passes at 6–8 mils per pass.
Poor cure	Ensure catalyst is calibrated and between 1.5–2.5%. Increase ambient temperature (70–90 °F). Check for moisture in air lines and molds. Completely disperse catalyst.
No wet line/overspray	Change spray pattern to ensure a constant wet line.
Too low mold or shop temperature	Increase ambient and mold temperature to 70 °F minimum.
Cold gelcoat	Increase gelcoat temperature to 70 °F minimum.
Too high or too low catalyst level	Ensure catalyst is calibrated and between 1.5–2.5%.
Too early lamination/gelcoat not cured	Allow gelcoat to cure, dry to the touch. Typically 1.5–2 hours.

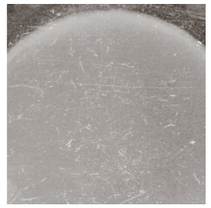
Blisters

Cause	Solution
Unreacted/Undispersed catalyst	Adjust catalyst pressure to completely disperse catalyst with no fallout.
Too much catalyst	Ensure catalyst is calibrated and between 1.5–2.5%.
Air between gelcoat and laminate/dry glass fibers	Thoroughly roll air out of laminate.
Contamination	Ensure gelcoat, molds, equipment and airlines are free of foreign matter such as dirt, oil, silicone or water.
Improper product selection	Review gelcoat selection with INEOS Composites representative.
Contaminated glass fiber (water, oil, dust)	Examine glass for signs of contamination and replace.



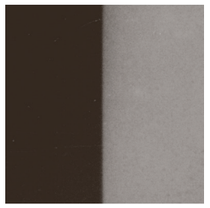
Blushing

Cause	Solution
Improper product selection	Review gelcoat selection with INEOS Composites representative.
Improper cure	Apply 18–24 mils in 3 passes at 6–8 mils per pass with 1.5–2.5% of the recommended catalyst.



Chalking

Cause	Solution
Too high or too low catalyst level	Ensure catalyst is calibrated and between 1.5–2.5%.
Unreacted/undispersed catalyst	Adjust catalyst pressure to completely disperse catalyst with no fallout.
Poor cure because of low temperature	Increase ambient, mold, and gelcoat temperature to 70 °F minimum
Poor cure due to low film thickness	Apply 18–24 mils in 3 passes at 6–8 mils per pass.
Improper product selection	Review gelcoat selection with INEOS Composites representative.



Color Separation

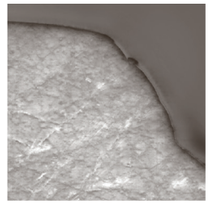
Cause	Solution
Flooding of gelcoat	Apply 18–24 mils in 3 passes at 6–8 mils per pass. Keep gun 18"–36" from mold.
Cured overspray	Change spray pattern to ensure constant wet line.
Contamination	Ensure gelcoat, molds, equipment and airlines are free of foreign matter such as dirt, oil, silicone or water.
Settled gelcoat	Make sure gelcoat is thoroughly agitated at least once per day for 15 minutes.
Worn tips	Replace tips and recalibrate.
Too short spraying distance	Maintain 18" minimum distance.
Too high spraying pressure	Calibrate pump pressure to ensure lowest possible pressure which still yields a properly developed spray pattern.
Improper spray tip	Review tip recommendations with INEOS Composites technical service representative.
Too thick gelcoat (sagging)	Apply 18–24 mils in 3 passes at 6–8 mils per pass. Keep gun 18”–36” from mold.

Cracking

Cause	Solution
Gelcoat too thick	Apply 18–24 mils in 3 passes at 6–8 mils per pass.
Poor adhesion between gelcoat and laminate	Start lamination as soon as you can, usually 2–4 hours. Do not let it set over a weekend. Check resin selection for compatibility.
Weak laminate	Make laminate thicker. Increase glass-to-resin ratio. Speed up resin cure.
Rough demolding	Ensure proper demolding procedures are followed.

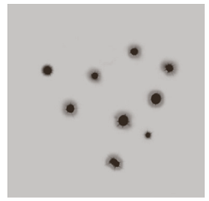
Delamination

Cause	Solution
Poor adhesion between gelcoat and laminate	Start lamination as soon as you can, usually 2–4 hours. Do not let it set over a weekend. Check resin selection for compatibility.
Contamination	Ensure gelcoat, molds, equipment and airlines are free of foreign matter such as dirt, oil, silicone or water.
Mold release agent contamination	Ensure only clean and dry rags are used to wipe the backside of the gelcoat prior to lamination.



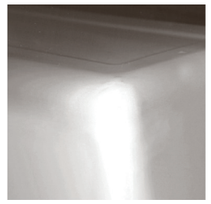
Dimples/Fisheyes

Cause	Solution
Contamination	Ensure gelcoat, molds, equipment and airlines are free of foreign matter such as dirt, oil, silicone or water.
Unreacted/undispersed catalyst	Adjust catalyst pressure to completely disperse catalyst with no fallout.
Low gelcoat viscosity	Ensure gelcoat is within specified shelf life.
Mold release	Check compatibility with gelcoat.
Static electricity on mold surface	Ensure the mold is properly grounded.
Dust and dirt on mold	Wipe out mold prior to application with a clean dry rag.
Gelcoat film is too thin	Apply 18–24 mils in 3 passes at 6–8 mils per pass.



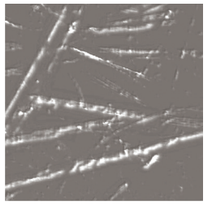
Discoloration

Cause	Solution
Gelcoat too thick	Apply 18–24 mils in 3 passes at 6–8 mils per pass.
Poor adhesion between gelcoat and laminate	Start lamination as soon as you can, usually 2–4 hours. Do not let it set over a weekend. Check resin selection for compatibility.
Undercured gelcoat Incorrect catalyzation Contamination of gelcoat Styrene inhibition Cold temperature	Ensure catalyst is calibrated and between 1.5–2.5%. Ensure gelcoat, molds, equipment and airlines are free of foreign matter such as dirt, oil, silicone or water. Provide adequate air circulation across the part to remove styrene fumes. Increase ambient, mold and gelcoat temperature to 70 °F minimum.
Prereleased gelcoat	Check gelcoat thickness. Apply 18–24 mils in 3 passes at 6–8 mils per pass.
High resin exotherm	Review laminate recommendations with INEOS Composites technical service representative.



Fiber Print

Cause	Solution
Pattern in mold	Refinish mold to remove print.
Improper skin coat thickness or undercured skin coat	Apply a 60–90 mils skin coat and allow it to Barcol to 20 prior to applying the bulk laminate.
Gelcoat too thin	Apply 18–24 mils in 3 passes at 6–8 mils per pass.
Undercured gelcoat	Allow gelcoat to cure, dry to the touch. Typically 1.5–2 hours.
High resin exotherm	Review laminate recommendations with INEOS Composites technical service representative.
Too early demolding	Allow the bulk laminate to reach a Barcol of 40 prior to demold. Best practice is to demold after a minimum of 12 hours.
Too early lamination/gelcoat not cured	Allow gelcoat to cure, dry to the touch. Typically 1.5–2 hours.



Heat Lines

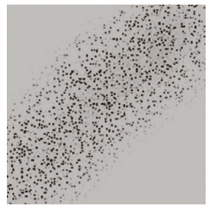
Cause	Solution
High resin exotherm Too much or incorrect catalyst Unreacted/undispersed catalyst Laminate too thick Resin-to-glass ratio too high/ resin draining	Ensure catalyst is calibrated and between 1.5–2.5%. Review catalyst recommendations with INEOS Composites technical service representative. Adjust catalyst pressure to completely disperse catalyst with no fallout. Review laminate recommendations with INEOS Composites technical service representative. Calibrate resin-to-glass ratio and review laminate recommendations with INEOS Composites technical service representative.
Improper skin coat thickness or undercured skin coat	Apply a 60–90 mils skin coat and allow it to Barcol to 20 prior to applying the bulk laminate.

Low Gloss

Cause	Solution
Inadequate mold maintenance/ polystyrene or wax build up	Clean, polish and reapply wax to molds within a regular maintenance program.
Unreacted/undispersed catalyst	Adjust catalyst pressure to completely disperse catalyst with no fallout.
Prereleased gelcoat	Refer to prerelease section of this troubleshooting guide.
Undercured gelcoat Incorrect catalyzation Contamination Styrene inhibition Cold temperature	Ensure catalyst is calibrated and between 1.5–2.5%. Ensure gelcoat, molds, equipment and airlines are free of foreign matter such as dirt, oil, silicone or water. Provide adequate air circulation across the part to remove styrene fumes. Increase ambient, mold and gelcoat temperature to 70 °F minimum.

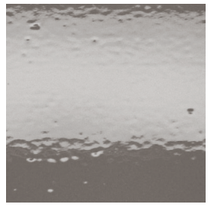
Pin Holes/Porosity

Cause	Solution
Trapped solvent	Do not reduce gelcoat with solvents.
Unreacted/undispersed catalyst	Adjust catalyst pressure to completely disperse catalyst with no fallout.
Contamination	Ensure gelcoat, molds, equipment and airlines are free of foreign matter such as dirt, oil, silicone or water.
Improper spray pressure	Calibrate pump pressure to ensure lowest possible pressure which still yields a proper spray pattern. High pressure will produce fine porosity; low pressure will produce large porosity.
Improper catalyst type/level	Ensure catalyst is calibrated and between 1.5–2.5% Review catalyst selection with INEOS Composites technical service representative.
Gelcoat too thick	Apply 18–24 mils in 3 passes at 6–8 mils per pass.
Improperly working spray unit/ pump leaks	Check for leaks in pump and replace seals. Consult equipment manufacturer for further recommendations.
Gel time too fast	Request slower gel time from INEOS Composites technical service representative.
Cold temperature	Increase ambient, mold and gelcoat temperature to 70 °F minimum.
Inadequate mold maintenance/ polystyrene or wax build up	Clean, polish and reapply wax to molds within a regular maintenance program.



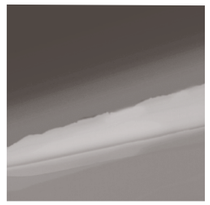
Poor Flow and Leveling

Cause	Solution
Improper spray technique	Apply 18–24 mils in 3 passes at 6–8 mils per pass. Spray in a crosshatch pattern to ensure uniform thickness.
High gelcoat viscosity	Request lower viscosity from INEOS Composites technical service representative.
Cold temperature	Increase ambient, mold and gelcoat temperature to 70 °F minimum.
Improper spray tip	Review tip recommendations with INEOS Composites technical service representative.



Prerelease

Cause	Solution
Hot temperatures	Ensure ambient, mold, and gelcoat temperatures are between 70–90 °F. Request slower gel time from INEOS Composites technical service representative.
High catalyst level	Ensure catalyst is calibrated and between 1.5–2.5%.
Uneven or thick film	Apply 18–24 mils in 3 passes at 6–8 mils per pass. Spray in a crosshatch pattern to ensure uniform thickness.
Gelcoat allowed to cure too long	Start lamination as soon as you can, usually 2–4 hours. Do not let it set over a weekend.
Contamination	Ensure gelcoat, molds, equipment and airlines are free of foreign matter such as dirt, oil, silicone or water.
Styrene inhibition	Provide adequate air circulation across the part to remove styrene fumes.



Sagging

Cause	Solution
Improper spray technique/thick gelcoat	Apply 18–24 mils in 3 passes at 6–8 mils per pass. Spray in a crosshatch pattern to ensure uniform thickness.
Flooding of gelcoat	Apply 18–24 mils in 3 passes at 6–8 mils per pass. Keep gun 18"–36" from mold.
Vibration	Do not jar or vibrate mold before gelation.
Low gelcoat viscosity	Ensure gelcoat is within specified shelf life.
Improper spray tip	Review tip recommendations with INEOS Composites technical service representative.
Improper spray pressure (high)	Calibrate pump pressure to ensure lowest possible pressure which still yields a properly developed spray pattern.
Mold release	Check compatibility with gelcoat.
Slow gelcoat cure	Can be affected by cold temperatures. Increase ambient, mold and gelcoat temperature to 70 °F minimum. Request faster gel time from INEOS Composites technical service representative.

Wrong Gel Time

Cause	Solution
Too slow	Ensure ambient, mold and gelcoat temperatures are between 70–90 °F. Ensure catalyst is calibrated and increase the amount, staying within in the 1.5–2.5% recommended range. Request faster gel time from INEOS Composites technical service representative.
Too fast	Ensure ambient, mold and gelcoat temperatures are between 70–90 °F. Ensure catalyst is calibrated and decrease the amount, staying within in the 1.5–2.5% recommended range. Request slower gel time from INEOS Composites technical service representative.

APPENDIX IV

Possible Causes of Pinholes/Porosity

Gelcoat is designed to perform under robust conditions. The test protocol requires a minimum of 40 mils to have no porosity when sprayed at 70 °F with a 30 second flash time between passes. Porosity is determined by sanding the gelcoat surface with 220 grit sand paper for 90 seconds.

Possible Causes

Gelcoat applied too fast and too thick

This does not allow air to migrate away from the surface of the mold, and it becomes trapped in the film.

Spraying cold gelcoat

The colder the gelcoat gets, the thicker it will become (similar to honey). This causes a poor fan pattern, which in turn requires a higher pump pressure to break it up. The thicker gelcoat will also be less able to release air simply due to the viscosity.

Spraying gelcoat on cold molds.

The mold is a large heat sink. As soon as the gelcoat hits the mold, it will drop to the mold temp in a matter of seconds. This will cause the material to thicken and trap air.

Spraying gelcoat with high pressures.

This will over atomize the gelcoat, causing a loss of styrene in the system. This causes thicker gelcoat and reduces the ability for air to escape. It will also be more difficult to control the thickness, as the material will be coming out faster. Extreme conditions will cause the gelcoat to be blown around. This physically incorporates large amounts of air into the gelcoat film.

Spraying gelcoat with high catalyst pressures.

This can blow catalyst out of the spray pattern, causing raw drops of catalyst to fall out of the gelcoat. These concentrated areas of catalyst can cause large porosity/pits.

Spraying gelcoat with low pressures.

The gelcoat will not be broken up properly. This typically causes large porosity.

The gelcoat gun sucking air and spitting.

If the gun starts spitting, the gun should be held over a disposable surface and sprayed until the spitting stops. Once the spitting has stopped, continue spraying until an additional minute's worth of material comes through clean. Lab testing completed for one of our customers confirmed the presence of porosity in the gelcoat up to one minute after the gun stops spitting. This high volume customer decided to put in a gelcoat "day tank," so they would rarely, if ever, run the pump dry. Gelcoat spitting could explain random porosity filled parts, as it only typically happens at the drum switch over. Although, it is possible to have air getting sucked in through a poor fitting, which would increase the frequency of the porosity as well.

GELCOAT DOCUMENTATION

Date _____

Gelcoat Mixed? _____ Y_____ N

Temp _____ Humidity _____

Gelcoat Temp _____ Mold Temp _____

Gelcoat Code _____

Batch Number _____

Catalyst Type and Percent_____

Pump Pressure _____ Catalyst Pressure _____

Operator _____

Tip Size _____

Mils Applied

1st Pass _____

2nd Pass _____

3rd Pass _____

Additional Comments _____

_____

_____

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