coatings that make waves

cosmetic repair guide

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agitation

What is one of the most neglected gel coat repair procedures? Proper agitation. Who can help you solve for this underestimated problem? Ashland can.

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 thirty 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 ensure **efficacy**, the separated materials need to be redistributed evenly and 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-inches 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 film cure
- pre-release
- 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.

preparation of cosmetic spray patch repairs of gelcoat

This procedure has been prepared to provide general guidance on techniques and conditions that can give the best chance of achieving **alluring** professional spray patch repairs. The procedures may need to be adapted to the needs of the individual fabrication shop.

step 1: prepare to spray

1. To ensure the best color match of the patch to the part, use the same batch of gelcoat that was used to build the part.
2. Use gelcoat that is within its commercial warranty period. Refer to the technical datasheet for warranty period and to the Certificate of Analysis or container label for age.
3. Prior to drawing gelcoat for repair, make sure that the pail or drum has been agitated.
4. Check the storage temperature of the gelcoat and insure that it is not below 68 °F (20 °C).

step 2: set-up spray equipment

1. Standard patching equipment is either a 3M system or a Binks[1] #18 siphon feed spray gun with a 66 fluid tip (or equivalent spray equipment) or a Binks 115 touch-up spray gun (this always has a small tip).

   Note: Avoid using portable self-contained spray units (i.e. such as the Preval brand). These units require the gelcoat to be substantially diluted or 'thinned'.

2. The additional solvent can have a detrimental effect on the cure and color of the patch; excessive thinning can cause pigment shock and bad repairs.

3. The aerosol propellant cools the gelcoat contributing to cure issues.

4. Low air pressure, between 10–25 psi, is all that is required to develop the spray pattern. Excessive air pressure will result in heavy orange peel. The orange peel may be difficult to sand out, which may result in removing too much of the patch and requiring the patch to be completely redone.

step 3: prepare the patch area

1. Before making a spray patch, sand the area to be sprayed by hand. A courser grit gives a better repair, particularly with dark colors. 80 grit is a good place to start with no more than 120 grit on lighter colors. Sanding the area insures a good mechanical bond of the spray patch to the part. A poorly bonded patch will peel off when sanded. A poor mechanical bond may also result in a halo around the patch.

2. Clean and check the sanded area for shiny spots that show through the scratches. Shiny spots indicate that the sanding is not complete. Continue to sand the area until the surface is completely scratched. A clean or even sanding line will result in an excellent mechanical bond and will reduce the risk of a halo.

3. After thoroughly sanding, remove all sanding dust and other contaminates. Use fresh solvent (acetone or lacquer thinner) or a mild cleaning fluid to remove stubborn dirt and grease. It is very important to have the surface clean and dry before making the repair. A dirty or contaminated surface will also have an effect on the bond.

   Water is not recommended because of the length of time it takes to dry.

4. Using a ballpoint pen or china marker, draw a line just outside of the sanding line.

   During sanding procedures this line will indicate when the edge of the patch has been reached. When this line has been sanded out, the "feathering" of the patch edge should be nearly complete. This step will remove halos caused by incomplete sanding procedures.

5. Mark off or tape off the repair area to reduce over spray

   Rolling the edge of the tape can also help 'feather' and 'soften' the edge of the patch.

   Aperture tape (3M carries this) in different diameters is also available to help soften the edge of the patch.

gelcoat series	mass ratio gelcoat to propatch	maxguard gelcoat	cr-03000 propatch solution	total mass	nominal mekp mass/%
maxguard™ NPC, maxguard NPR, maxguard NRX series (and INSTANT™ variants NCPI)	2 to 1	2 qt (66 gm)	1 qt (33 gm)	3 qts (100 gm)	20 ml (2 gm) – 2%
maxguard LE or 33le series, maxguard MP series (and INSTANT variants LEI, MPI)	3 to 1	3 qt (75 gm)	1 qt (25 gm)	1 gal (100 gm)	20 ml (2 gm) – 2%
maxguard CG-47 series[2]	3 to 1	3 qt (75 gm)	1 qt (25 gm)	1 gal (100 gm)	20 ml (2 gm) – 2%

[1] Registered trademark of Binks Manufacturing Company
[2] Some shops spray propatch over the clear gelcoat or use pva sheet to seal the surface

step 4: mix the gelcoat for the spray patch

1. To avoid diluting the gelcoat with styrene or acetone, it is recommended that Ashland Maxguard™ CR-03000 propatch solution be used. This Ashland product contains the proper combination of solvents, resins, promoters, and surfacing agents. In most cases this product will be all that you need to add to the gelcoat. Use the table by gelcoat series for making your spray mix.
2. Mix the gelcoat and propatch solution together for 1 minute.

   Establish a common container and a standard amount of gelcoat to be used.

   Where possible for commonly used colors, pre-mix the gelcoat and propatch solution in quantities enough for all repairs that day.
3. Accurately add 2% of a MEKP initiator/catalyst to the patch (see table below).

   There are pipets available with ml markings that can be used.

   Use a 9% active oxygen content MEKP type initiator for the best results.

   Use the recommended catalyst percent. The proportion of initiator to gelcoat is a ratio based on available reactive sites.

   Do not exceed 2.5% catalyst or reduce below 1.5% catalyst in the patch mixture.

   Over-catalyzation of the gelcoat plasticizes the patch and reduces cure. It can cause the patch to cure off color, may cause porosity and can make the patch achieve poor gloss. Under-catalyzation can cause similar issues.
4. Mix the patching gelcoat with the initiator thoroughly for at least 1 minute.
5. The pot life of the catalyzed patching mixture is roughly 7–10 minutes at 77 °F (25 °C).
6. Patch at 65 °F (18 °C) or above. Warm the patch area to 100 °F (37 °C) at most (warm to the touch) if necessary.

step 5: spray the patch

1. To ensure the **integrity** of the process, before spraying, check your air supply for contaminants, such as oil and water. To check for contaminants, spray air only into a white towel or white rag. If contaminants are present, **DO NOT** spray patch until the supply lines are clean.
2. Spray the patch using the recommended spray equipment. Start the spray at the center of the sanded area and work outward in a circular motion toward the repair line, feathering toward the edge. A patch of 10-12 mil wet film thickness achieves a better cure than a thinner patch.

step 6: cure the patch

1. At 77 °F (25 °C), use a minimum of two-hour curing. Additional time is wise if wet sanding will be done after the cure. Also, darker colors will need a longer time to cure before sanding and buffing. The longer any gelcoat spray patch cures the better the color match will be. A longer cure will also help eliminate the chemical line or halo around the patch.

   Make sure the patch has fully cured before sanding and feathering. The patching gelcoat will filmcure faster than it cures through. If the sanding and buffing process is started before the gelcoat has cured, the spray patch may not feather, and the optimum gloss will not be attained, and halos may appear.

   The darkest colors should be cured overnight to give the best patch color.
2. Use toluene, naphtha, alcohol, or non-abrasive household cleaner for cosmetic cleaning. Clean from the inside of the patch to the outside.
3. If patch temperatures are 65 °F (18 °C) or below, heat lamps at 5 feet away or heat guns at 1.5–3 ft away can be helpful. Avoid heating the patch too early. Heating too early can actually extend the filmcure of the patch rather than speeding it up.

Heat guns can be difficult to use, the heat gun must be kept moving. Surface temperatures should not exceed 120 °F (48 °C). Heating from the backside of the laminate repair is best.

Risks of heating too much or too fast include deactivating surfacing agents, sealing the surface and trapping monomer, undercure in the interior of the patch, resulting i n discoloration.

step 7: sand the patch

1. Remember, the spray patch is probably no more than 10 mils in thickness. Be selective with your sandpaper choice. A good grit to start with is 220 or 320 grit paper. In most cases 320 grit will remove any orange peel. After the orange peel has been removed with the 320 grit sandpaper, clean the area and resand the area with the next finest grit (400) paper.

   Note: The edge of the patch should be feathered into the surrounding surface at this point. If sanding is not completed and the patch edge is not feathered, a halo will be present. In flat areas, knock down the bump by block sanding in an X pattern to flatten the repair.

2. The sanding process should be continued until the desired finish is obtained. The following is the proper order of sandpaper: 320 grit, 400 grit, 600 grit, 1200 grit, 2000 grit. Finish sanding with very fine sandpaper will produce the best gloss.

   Moving up in grit incrementally can actually speed up the processes and make a better repair.

   Dry wipe to remove the sanding dust from the surface before sanding with the next finest grit.

   As you move up in grit, increase the radius of the sanded area.

   When using a DA sander, make sure the pad is clean and free of glue build up. A DA pad that has an uneven surface will leave deep scratches that are difficult to remove.

   Run the DA sander at a medium or slow speed. Running the sander at a high rpm will cause the sandpaper to be less efficient and cause the sandpaper to clog or fill with sanding dust.

3. The extent of sanding will vary from one gelcoat to another. This is due to the difference in gelcoat formulas. Some gelcoats will require more time during the sanding procedures.

4. If wet sanding procedures are used, it is very important to keep both the sanding surface and the sanding water clean. The sanding water should be changed frequently. Also, insure that the sandpaper is clean. If the sandpaper falls on the floor, it should be free of dirt or grit before being used. Do not wash the dirty sandpaper in the sanding water bucket. The sanding water should also be changed when the sandpaper grit is changed.

   Wet sanding techniques are used with grits of 600 or finer to achieve a smoother surface prior to buffing.

   Note: Rubbing two pieces of sandpaper together (the same grit size) will remove any oversized grit particles. This is a very old practice that works effectively to prevent random scratches in the film surface.

   Clean the sanded area with water and wipe dry. After the surface has completely dried, visually check the surface for any unsanded areas and deep scratches that may not have sanded out. If the surface looks good, you are ready to compound and buff.

   Avoid wiping freshly cured gelcoat patches with acetone. The patch will absorb the acetone and cause the patch to become lighter in color. This condition is more prevalent in darker colors. Even after 24 hours, acetone can cause discoloration or spotting.

step 8: buff the patch with compound

1. A low speed buffer will take out 800 grit scratches and in some cases will remove scratches from 600 grit sandpaper. Compound will effectively remove the scratches of the finer grit paper such as 1200 and 2000, and this will result in a much higher gloss.
2. Use 100% wool buffing pad to reduce heat. Repairs buffed with polyester or polyester-wool blend pads are not as durable. Wool pads remove scratches while polyester or blends may only polish the scratches.
3. Choose a compound that is designed for the type procedure you are doing. Water based compounds are recommended for cooler buffing and reduced swirls. For instance, **DO NOT** use a compound with a mechanical buffer that specifies hand rubbing only. A medium grit machine compound will usually take out 600 grit-sanding scratches. Several types of compounds are available. Freckla supplies a 1 step/1 pad compound and 3M supplies a variety of compounds. Follow with a polishing compound (Aqua Buff[3] 2000 or 3M[4] buffing compounds or a suitable water based compound).
4. When applying compound by hand, use a cotton cloth or a small brush. Apply the compound in a thin layer over the area to be buffed. Do not rub the compound into the surface when applying it. This will cause scratches which can be difficult to remove.
5. When applying compound with a mechanical buffer, use an 1800 to 2800 rpm buffer with medium pressure to spread the compound evenly over the surface. Use a machine that has no more than 2800 rpm.Using a machine with a high rpm can create friction and heat build-up on the surface, causing the original gelcoat surface to blush and not buff up to a high gloss.
6. After the compound is spread, clean the pad with a buffing star or a tongue depressor. A clean pad will appear 'fluffy'.
7. Randomize the buffing pattern to avoid swirls or parallel scratches.
8. Reapply the buffer to the surface again with medium pressure, moving it rapidly over the surface. As the compound starts to break down, re-clean the buffing pad. Repeat this procedure two or three times, reducing the pressure each time the buffer is applied until just the weight of the buffer is being applied. Repeat the entire procedure until all the scratches have been removed and the desired gloss is attained.

   Be careful not to apply heavy pressure on the buffer. When heavy pressure is applied, heat is generated. This heat will dull or blush the entire surface as well as the patch. Keep the buffer moving rapidly over the surface to also avoid 'hot spots'.

   When changing from one compound to another, use a clean buffing pad. When setting the buffing machine down, make sure the pad does not touch the floor or any other contaminated surface.

   Do not try to buff out deep scratches. If after two or three applications of buffing compound, if the scratches are still visible, sand the area with a fine grit sandpaper, and repeat the compounding and buffing procedure.
9. If the compound is dry and difficult to spread, apply a few drops of water to the surface before spreading the compound with the buffer. This will help to spread the compound and act as a lubricant to reduce friction and heat while buffing.

   However, the use of too much water will cause the compound to build up of cake onto the buffing pad, causing the pad to leave deep scratches.
10. The final gloss can be enhanced by the application of a high gloss polish or wax.

[3] Registered trademark of Hawkeye Industries, Inc.
[4] Trademark of 3M

care for the gelcoated surface

A molded fiberglass vehicle requires minimum care and can keep its **allure** by following these easy maintenance rules:

1. Follow general housekeeping.

   Cover if possible to keep your vehicle looking its best. Store in a dry, covered area.

   Remove any unintentional fuel or oil spills from the gelcoated surfaces as quickly as possible.

   Give your vehicle a fresh water wash after saltwater use or after driving through salted roads.

   Never place a non-breathable cover on a vehicle that is still wet.

2. Clean, buff and wax the exterior of the vehicle twice a year, especially prior to storage.

   Wash your vehicle with only mild, non-abrasive detergents.

   Never use any abrasive cleaners or brushes on the exterior surfaces.

   Avoid aggressive buffing.

   Care should be taken not to cut through the gelcoat surface when buffing.

   A power buffer may be used with care or the vehicle may be buffed by hand, using a rubbing compound.

   A high-performance marine or automotive wax should be applied after buffing in accordance with instructions provided by the manufacturer.

3. Touch up and patch scratches, scars and small breaks.

   Remove any small scratches or scuffs using a fine rubbing compound.

   Repair any major breaks as soon as possible, consulting your authorized dealer to avoid any additional damage.

cosmetic repair troubleshooting

patch not curing, staying rubbery

- temperature too cold
- patch over-catalyzed
- too much solvent in mix

patch staying sticky

- not enough catalyst, below recommended percentages
- air temperature too cold
- no surfacing agent in mix
- gelcoat or additive out of spec

poor color match

- repair gelcoat batch different than part
- too much solvent in mix (pigment shock)
- over-catalyzed
- undercured, not cured long enough prior to sanding and buffing
- applying too much heat
- using a high-speed buffer, causing the gelcoat to blush and change
- solvent wiped on a newly finished patch

halos

- surface prepped with too fine a sandpaper (finer than 320 grit)
- spray patch not cured enough prior to sanding
- spray repair over-catalyzed
- surface contaminated / not cleaned properly
- poor mechanical bond/area not sanded prior to patching

pin holes

- wax separated in solution
- gelled particles in gelcoat or propatch solution
- over-catalyzed
- too much solvent
- oil contamination

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