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Tech Notes

PATCHING A GEL COAT

Recommended Procedure

Patching a Gel Coat

Background:

Gel coat repairs are commonly needed due to damage from de-molding or mishandling of parts, damage during assembly, pre-release, porosity, contamination, laminate air voids, and mold defects.

Whenever possible, the same batch of gel coat that was used to make the part should be used to make the patch to ensure the closest possible color match.

This procedure is designed to provide a method for evaluating the repair qualities of a gel coat. The following steps will be described:

Panel surface preparation

Gel coat/patch aid mix preparation and initiation

Repair spray-up process

Final sand and buffing process

This Tech Note is intended to address surface repairs of cosmetic blemishes (approximately 20-30 mils of maximum depth) only. Repair of areas exhibiting structural damage will require additional materials (putty, laminate patches, etc.) and is not within the scope of this document.

Procedure:



Equipment and Materials:

Gel coat sample

Gel coated and laminated panel of material to be patched

Patch aid (C-100-VUU or equivalent)

Methyl Ethyl Ketone Peroxide Initiator (MEKP) as designated

Touch-up gun for spraying of repair (Devilbiss EGA-503, Dayton 4RR06A, or equivalent).

Dual action (DA) pneumatic sander with 5" pad or equivalent.

220, 400, 600, and 800 grit sandpaper for DA sander

8" pneumatic angle polisher 3M superbuff III buffing pad or equivalent.

3M High Gloss Marine buffing compound or equivalent.

Meguiar's Diamond Cut 2.0 buffing compound or equivalent

Fast drying solvent such as ethyl acetate or acetone.

Electronic lab balance capable of weighing a minimum of 100 grams to +/- .05 grams.

Stopwatch

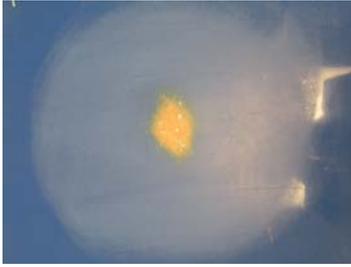
Room controlled to 75-85 degrees F.

Miscellaneous

8 ounce paper cups

Wooden tongue depressor

Thermometer



Panel surface preparation

Sand the flaw to be repaired and the area surrounding it with 220 grit sandpaper. Feather the edges surrounding the flaw with 400 grit sandpaper. The patch to be sprayed will only adhere to the sanded area.

Blow all sanding dust off the panel and clean thoroughly with a lint free cloth and solvent such as ethyl acetate or acetone to remove all traces of dust and contaminants from the panel surface.



Gel coat/patchaid mix preparation and initiation

Inspect the patch aid for wax separation. Warm the patch aid to 85 degrees F +/- 5 degrees F and mix well to dissolve any visible wax. The patch aid should be pink or purple in color. Patch aid that is brown or orange is too old and must not be used.

In an 8 ounce paper cup weigh 160 grams +/- 0.05 grams of gel coat that was used to make the panel.

Add 40 grams +/- .05 grams of patch aid to the gel coat and mix well with a tongue depressor. This gives an 80:20 mix weight ratio of gel coat to patch aid. When measuring gel coat and patch aid by volume use a 3:1 ratio (example: 150mL of gel coat mixed with 50 mL of patch aid).

To determine the working time of the mixture:

Adjust the mixture to 77 degrees F +/- 0.2 degrees F.

Pour off 100 grams +/- .05 grams into an 8 oz cup to check the gel time of the mixture.

Add 2cc of MEKP initiator. Start the timer and mix for at least 30 seconds, scraping the sides periodically to ensure a thorough and uniform mix.

Check the gel time by following CRSTP GC 305.

When the gel time of the mixture is known, initiate the remainder of the mixture following step #6 above to spray the patch.



Wax Separation



No Wax Separation



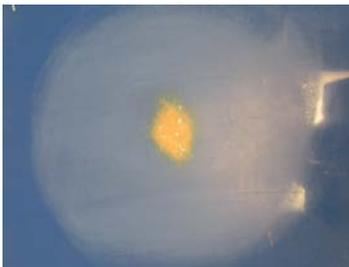


Repair Spray-up process

The air pressure should be adjusted to 40 to 50 psi for use with the touch-up gun.

With the screw on cup of the touch-up gun removed place the siphon tube into the cup of initiated gel coat.

Test the pattern on a piece of cardboard and adjust the air pressure as needed to eliminate spitting.



Spray the patch from 10-12 inches away in a small circular pattern working from the center out overlapping onto the un-sanded area of the panel slightly.

Follow this with a checkerboard pattern (Up and down, left to right).



Continue this spray pattern until the patch area is thoroughly covered with gel patch. Sufficient patch gel coat should be applied to the repair area such that the cured patch can be sanded and buffed to the level of the surrounding, non-repaired area.

Be sure to complete the spray job with enough time to clean the touch-up gun before the mixture gels.

Allow the patch to cure for a minimum of 2 hours at 75-85 degrees F before sanding and buffing. Allowing the patch to cure overnight is preferable.

Patching at lower temperatures and/or shorter cure times can result in a patch that is under-cured at the time that it is sanded and buffed. The patch may lose gloss and change appearance over time as the patch continues to cure after it is worked. It will then need to be re-worked to restore the gloss to match the surrounding area.

Gel coats are designed to be used with back-up laminates. The heat generated by the laminate as it cures and the additional time required for the laminate to cure allows the gel coat applied to a mold to more fully cure before the part is de-molded. A post-applied patch does not have the benefit of the cure boost provided by the laminate so a warm shop and ample cure time combined with the use of a patch aid will yield the best patch results.

Final sand and buffing process



Begin sanding with 220 grit sandpaper. Do not exert pressure on the DA sander; allow the sandpaper to do the cutting.

The paper will load up quickly with wax at first. Change the paper frequently until all the wax is removed from the surface.

A fast drying solvent such as ethyl acetate or acetone can be used to remove the wax and uncured gel coat before sanding if flammable solvents are allowed in the area.

When the 220 grit sandpaper begins to create a lot of dust the wax has been removed and the patch is now being sanded.

Continue sanding with 220 grit paper and concentrate on the outside edge of the patch to help blend the edge with the original gel coat.

Remove the sanding dust. Change to 400 grit sandpaper and sand the patch and beyond the patch now to help blend the patch.

Remove the sanding dust. Continue sanding in this manner with 600 and 800 grit sandpaper. Work out as many sanding scratches as possible from the previous grit before changing to the next grit.

Wash the patched area with soap and water to remove all traces of sanding dust. Dry thoroughly with a lint-free cloth.

Buff the area with an aggressive compound (3M High Gloss Marine or equivalent). Use moderate pressure at first to remove sanding scratches. Reduce the pressure on the buffer as the compound dries to polish the panel and bring back the gloss to blend the patch with the original gel coat.

Wash the patched area with soap and water to remove all traces of buffing compound. Dry thoroughly with a lint-free cloth.

If additional gloss is desirable, buff the entire area with a polishing compound (Meguiar's Diamond Cut 2.0 or equivalent) and a clean pad. Use moderate pressure at first to remove sanding scratches. Reduce the pressure on the buffer as the compound dries to polish the panel and bring back the gloss to blend the patch with the original gel coat.

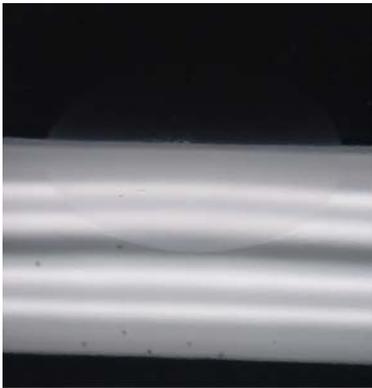
Wash the patched area with soap and water to remove all traces of buffing compound. Dry thoroughly with a lint-free cloth.



Evaluation of Patch Quality



Acceptable Patch



Patch that lost gloss due to post-cure.

Visually evaluate the color and gloss of the patched area compared to the sanded and buffed unpatched area immediately after the final washing step. If instruments are available, measure the 20 degree gloss and CIELab D65 10 Deg color. Take care not to scratch the panel while taking the measurements.

Visually evaluate the patch halo. This is the narrow ring around the outside edge where the patch meets the original gel coat surface. Halos are present in nearly all gel coat patches, but in high quality patches it is so narrow that it can only be seen at low viewing angles. A dark halo may indicate that one or more pigments may have poor heat stability. A wide shiny halo may indicate poor cure of the patch or that the patch edge was not sanded adequately before buffing. A narrow, shiny halo that is only visible at low angles is acceptable.

Visually evaluate the patch for porosity. There should be little or no porosity in the patch. Porosity around the patch in the original gel coat is a separate issue and must be addressed by formula or spray technique modifications.

Store the panel at 75-85°F and repeat the gloss and color evaluations and/or measurements every day for 3 days to determine if the patch quality is changing due to post-curing of the patch. The patch should lose no more than 1 gloss unit and change color no more than 0.25 DE units using CIELab D65 10 Deg settings.

If a customer has specific requirements for patching, the patch should be made and evaluated under those conditions. Keep in mind that temperatures below 70°F and cure times shorter than 2 hours are considered very challenging conditions. Patches made under challenging conditions may need to be re-worked several times before the patch will maintain an acceptable gloss and may never look as good as a patch made under more favorable conditions.