

Plastic And Composite Repair

Video Scripts



Version: 13.2

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Introduction

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Video: Topics Off Limits

It's important that we avoid topics which create a conflict with anti-trust laws or the combines act. Therefore, we will not talk about labor rates, parts or equipment prices, repair times, cost and profit margins, dividing up the market between customers and suppliers, a boycott or refusal to deal with anyone, judgment on the work of a specific shop or practices of a specific insurance company, policies and guidelines for settling claims, or how a shop or company conducts its business.

These topics have nothing to do with repair technology, so there is no need to discuss them in class. If they are brought up in class, the conversation will be stopped.

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Module 1 - Plastic Identification And Repair Considerations

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Video: Two-Sided Repair Part 1

(MANAGER) I don't know about this new guy. We got him over there doing a plastic bumper repair and he is really struggling.

(TRAINED TECHNICIAN) Well, I did warn you about hiring an untrained technician. Putting him on a plastic repair is just a recipe for disaster.

(MANAGER) Go check it out!

(TRAINED TECHNICIAN) All right I'll take a look. Looks like you might be having some troubles over here.

(UNTRAINED TECHNICIAN) Yeah, this adhesive is never going to stick. I don't know why you guys are having me fix this; we just threw away damaged plastic parts at the last shop I worked at.

(TRAINED TECHNICIAN) Well it looks pretty dirty. Did you clean it before you started?

(UNTRAINED TECHNICIAN) Would it matter?

(TRAINED TECHNICIAN) Yeah, it probably would. I don't think your repair is going to work. How about I show you the right way to do this? If you don't have a clean repair area, there is no way that the adhesive repair is ever going to be successful. So the first thing we need to do is clean the area using soap and water.

(UNTRAINED TECHNICIAN) Okay, we'll just clean the repair area and that should be good right?

(TRAINED TECHNICIAN) We should wash the entire bumper cover to make sure that all of the contaminants are removed, plus we've got some other repairs that we're going to have to do. So let's just go ahead and wash the entire bumper cover. Well, that looks a lot better already. Now the next step for any successful plastic repair is to use the recommended plastic cleaner based on the type of adhesive that you're using. So what I want you to do is use this and clean both the front side and backside of the repair area.

(UNTRAINED TECHNICIAN) I thought I just cleaned both sides already.

(TRAINED TECHNICIAN) Soap and water is only going to remove the water-soluble contaminants. This is going to help remove the non-water-soluble contaminants.

Video: Reshaping Plastic Using Heat

(HOST) This is Shawn Collins, an I-CAR instructor and a consultant for the Better Bumper Company. Shawn, what are you going to be showing us today?

(SHAWN) Today we are going to look at reshaping a plastic bumper cover using controlled heat.

(HOST) And how many bumper covers does the Better Bumper Company repair in a month?

(SHAWN) In a normal month, we usually recondition between two and three hundred bumper covers.

(HOST) So you do it once and awhile?

(SHAWN) We do it all the time.

(HOST) All right, Shawn, now that we have our bumper cover cleaned with soap and water and the appropriate cleaner, what's our next step?

(SHAWN) Well, the next step is to use a heat lamp to heat the entire general area of the damage.

(HOST) Now that we have the heat lamp set up, what distance does it need to be away from the bumper cover?

(SHAWN) Well, that's going to depend on the intensity of the equipment that we're using. Some equipment puts out a lot more heat than others, so the best way to accomplish that is to set up the heat equipment, and aim it at as direct of an angle as possible to the damage, covering as large an area as possible. The idea here is to relax the plastic in the surrounding area as well as much of the damage as we can. So we want to aim directly at the bumper cover and continue to monitor the heat to make sure that it's not being overheated.

The next very important part of the repair process is to push the initial damage out as far as possible. Now that the plastic has been heated in a wide general area, this is going to allow the sharper damage areas to relax a little bit. So what I'm going to do is push this out, using protective gloves, from the backside. After the majority of the damage has been pushed out, I'm going to reapply heat and allow it to continue to relax. It's a very important part of the process. So I'm going to push this out from the backside again, using some gloves. You can also use some tools, and as you can see, the majority of the damage has already come out. You can use some hand tools, such a dolly, to push on the backside and try to bring as much of the damage out as possible in this initial step. Now again, we're going to reapply the heat and walk away for a period of time and continue to allow that to relax. Even more of the damage will come out.

(HOST) Our bumper cover is looking great. What do we have to do next?

(SHAWN) Well, it's important that immediately after removing the heat with the heat lamp that we get back on this with heat from a heat gun. Addressing each individual spot, continue to push those out as far as we can and reshape it as close to the original contour as we possibly can in this stage.

(HOST) And why is that so important?

(SHAWN) Well, it's similar to metal finishing where the better job that you do and the more patience you have getting your contours out, the easier the rest of the repair process is going to be. Now I'm cooling the plastic off to try and freeze the plastic in place as it cools. I'm also putting pressure on that damaged area as I cool it down. That area has come out quite well I'm going to move on to the next area here and address these spots one at a time.

(HOST) What's our next step going to be?

(SHAWN) Well, the next step will be, as you see there are some minor imperfections in here yet. So the next step will be to prepare this for the plastic repair fillers. So we're going to sand this down, and as we do, we'll address some of these very small areas by block sanding some of them away. When we apply our filler, it will smooth out some of the very minor imperfections.

(HOST) Shawn, why couldn't we just sand off the finish and put filler right over the little dents? Why do we have to block sand?

(SHAWN) Right, the important thing to again remember is that this plastic does have a memory. So if we we're to fill in a small dent without bringing it out, this particular bumper cover, especially being black, would go out and sit out in the sun and might get up to 180° plus. In that process, if we would have filled a low spot on this bumper, as it gets hot, the plastic comes back to its original shape. Now we would have a high spot in that area.

Module 2 - Adhesive Bumper Repair

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Demonstration / Video: Static Mixing Tip

Here we have a static mixing tube that is used with a dual-cartridge adhesive.

One of the common complaints with using a static mixer is that it wastes a lot of product. This is a false statement, since there is actually very little waste. In most cases, there is only about a bottle cap worth of product left in the static mixer.

First, we run some water through the static mixer, then plug the end and allow some of the water out of the static mixer. This is done because the adhesive in the bell of the static mixer is not used. Now we can drain the water into this bottle cap and that's all of the product that was left in the static mixing tip.

Video: Two-Sided Repair Part 2

(TRAINED TECHNICIAN) Well, now that we've got it cleaned, we are on our way to a successful plastic repair. The next step is to use a backing patch. We have to use a backing patch on this repair because it's a two-sided repair. Following the repair instructions for this material, the first step is to abrade the back area using P80 grit sandpaper. Now when you're doing that, don't be too aggressive. We want to make sure we don't smear the plastic, just scuff across the area.

(UNTRAINED TECHNICIAN) So run the sander at a slower speed.

(TRAINED TECHNICIAN) Exactly. Once you've got that done, come back with this aluminum tape. Use this on the front side to get the bumper cover aligned. Then, when you're done with that, come and get me and we'll go over the next steps. Yeah, that looks pretty good. Now the next step in the procedure is to apply a light coat of plastic surface modifier. For that we're going to use this material. You just want to apply a light mist coat on there and then give it time to dry.

(UNTRAINED TECHNICIAN) Wouldn't a thicker coat be better?

(TRAINED TECHNICIAN) A thicker coat might actually decrease the adhesion of the material, so just a nice light thin coat and when you're using it, make sure you put a respirator on as well.

(UNTRAINED TECHNICIAN) Okay.

(TRAINED TECHNICIAN) Okay, the next step is to begin putting our backing patch on. What I want you to do is take the repair adhesive, put a layer on there, and spread it out over the repair area. Come back with your backing material, work the adhesive into the backing material, and then, if necessary, come back and put another layer of adhesive over the top of it. Again, smooth out the area.

(UNTRAINED TECHNICIAN) So the backing acts like a reinforcement.

(TRAINED TECHNICIAN) That's exactly what it does. It helps strengthen the repair area a little bit. Okay, now the next step in the repair process is that we're going to put a nice wide and gradual taper on the front side of the repair area.

(UNTRAINED TECHNICIAN) We didn't make a taper on the backside. Why do we have to do it on the front side?

(TRAINED TECHNICIAN) Well, on the front side we need to account for any expansion or contraction. We want to make sure that we have a nice wide area in order to make the repair less detectible.

(UNTRAINED TECHNICIAN) I finished the taper. What's the next step?

(TRAINED TECHNICIAN) Well, for the most part it looks pretty good, but I do see that there are a couple of shiny spots in here. That is most likely some melted plastic. The adhesive isn't going to adhere really well to those melted plastic areas so what I want you to do is come back in here, hand sand those areas, and remove the shiny spots. Once you're done with that, come back in and blow off the area. Apply another coat of that surface modifier, and let that get setup. Then we'll put our next adhesive on.

(UNTRAINED TECHNICIAN) Okay. Well I got the front pretty much done. There are some sand scratches and pinholes, should I just add some surface modifier and another coat of adhesive?

(TRAINED TECHNICIAN) Looks pretty nice, but actually what were going to do now is we're going to go ahead and we're going to use this plastic finishing adhesive. It's a little bit different than the material we used before and one of the things according to the instructions is that it does not require an adhesion promoter or surface modifier. So it's

always important to read those directions. This stuff should featheredge pretty well, so go ahead and apply a layer of it on, sand it down, featheredge it, and then it should be ready for primer.

(UNTRAINED TECHNICIAN) You were right, it sanded really well.

(TRAINED TECHNICIAN) Yeah, it sure looks very nice. You know when you follow directions and clean the part properly and make sure you're using the right repair materials, you can be very successful with plastic repairs. We saved a perfectly good cover in this case. Let's go over to paint and get it ready for primer.

Video: Bumper Cover Tab Repair

(HOST) Broken tabs are a common type of collision damage. In many cases, these tabs can be repaired. Today Eddie is going to be showing us how to do a tab repair. Eddie, I noticed there is actually a piece of the tab missing. How are we going to go about repairing that?

(TECHNICIAN) After we have the part clean, we're going to remove any loose plastic from the tab. We're then going to follow that up by doing a repair taper, and then we're going to drill holes so that we can start the pinning process.

(HOST) Why do we have to drill holes in the tab?

(TECHNICIAN) We drill the holes in the tab to allow for extra bonding surface for the adhesive, which adds extra strength.

(HOST) Okay, I'll check back with you a little later. Wow, it seemed like you only had a few seconds to actually form that tab.

(TECHNICIAN) Yeah that is something you really have to keep your eye on, because this product has a very short work time, and that is why it is very important to read the directions before you start any repairs, because temperature has a big affect on it.

(HOST) I saw you using a plastic film, what was that used for?

(TECHNICIAN) The plastic film is used to shape the repair material and it is also designed to easily peel from the repair. But you have to be careful not to peel it off too early.

(HOST) What would happen if you did peel it off too early?

(TECHNICIAN) If you peel it off too early the plastic repair material might peel off with the plastic film.

(HOST) Okay, thanks for showing us the tab repair and I'll let you finish this up.

Module 3 - Fiber Reinforced Plastic (FRP) Repair

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Video: Sheet Molded Compound (SMC) Repair

(HOST) Today we will be doing a repair on this SMC composite panel that has a puncture in it. Eddie, what's our first step going to be to repair that?

(TECHNICIAN) We're going to start out by cleaning that part with soap and water followed up by wax and grease remover. But before we do that, we're going to have to tape off the repair area, preventing any cleaners from entering the fibers.

(HOST) Why do we need to worry about that?

(TECHNICIAN) If we don't do that, we may have adhesion problems later on.

(HOST) That's something we definitely don't want. What repair products are we going to have to use on this?

(TECHNICIAN) We're going to be doing a two-sided repair on here, so we will need a backer and we will be using a two-part SMC adhesive.

(HOST) All right, sounds good. I'll let you get back to work and I'll come check your progress later. Well Eddie, it looks like your just finishing up.

(TECHNICIAN) Yeah, I just knocked down all the high points and I'm just getting ready to featheredge.

(HOST) Now the repair didn't seem to be all that different from a two-sided plastic repair.

(TECHNICIAN) They are very similar, the only difference is you have to use SMC specific repair materials.

(HOST) All right, I'll let you finish this up and get it to over to refinishing.

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Module 4 - Plastic Welding Repairs

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Video: Airless Welding

(HOST) We're back with Shawn Collins again. Shawn, this bumper cover has a tear in it. How are we going to go about repairing it?

(SHAWN) Well, we're going to do a two-sided welded repair with an airless plastic welder. Because there is no material missing from the repair area, we're going to be able to fuse that repair together using just the material that's there.

(HOST) What if there we're some material missing? What would we do then?

(SHAWN) If there were a hole or some material missing there, then we would have to use an additional plastic welding rod to fill in that missing area.

(HOST) All right Shawn, now that we have our bumper cover all cleaned, what is our first step?

(SHAWN) Well, the first step is to make sure that the tear is perfectly aligned. So if there is any deformation of the plastic in that area, we're going to want to heat that up and reshape it to make sure that the tear is perfectly aligned.

(HOST) Why do we want to start on the backside?

(SHAWN) We always want to start on the backside first because when we're using an airless welder on the back, it's actually going to push up a small lump on the front side from the heat. So we'll address that lump when we turn it over and repair the front side.

(HOST) Alright, let's get started.

(SHAWN) So the first thing I'm going to do is secure the tear to make sure that it stays aligned throughout the repair process. So I'm going to use some aluminum tape and apply it over the surface. I'm going to press it down firmly with a spreader just to make sure that the tear stays perfectly aligned as we make our repair.

(HOST) I see you have several different attachments for the airless welder. Do you want to explain what the difference is?

(SHAWN) That's right, this is the traditional tip that most technicians are used to using. This was used because we used a welding rod, and you would feed the welding rod through the melt tube and melt the plastic into the repair area. But in this repair, because we're not going to use a welding rod, we're going to actually use a tip like this that has a larger surface area. That allows us to melt a path through the repair material to create a nice, wide melted repair. For the next step in the repair process, I'm going to begin to fuse this material together. Again, because we have enough material left there, I'm not going to be using a welding rod. I'm going to melt together the existing material. The important thing here is to do a small spot one at a time, where I'm going to do a few little spots and go back and smooth it over before it has a chance to cool. So we're going to take it step by step, down the tear. So I'm going to begin at the end of the tear here. I'm going to press into the weld area and begin to melt that plastic. As you can see I'm going to go back over it before I get too far and smooth it all together. The important thing here is to push down at least halfway into the plastic. When we flip this over and do the front side, I'm going to press halfway down into the front so we're fusing the entire length of the crack together completely through the plastic. You want to try not to overwork and melt it too many times as well, just one pass works best. So the backside is completely fused together. The next step is going to be applying a type of reinforcement to the repair area.

(HOST) Shawn, I see we have some aluminum screen there. What are we going to be using that for?

(SHAWN) Well, we're going to melt this into the damage area that we've already fused together. This is just going to provide some additional reinforcement and strength to the repair area. So the first thing I need to do here is take a piece that fits into the repair area. Then I want to trim that, to make sure there are no loose ends or frayed edges. Cutting this down to size, I want this to overlap that damaged area by about three quarters of an inch on each side. The next thing I'm going to do here is press this into place over the damage area. I'm going to begin by using my welder, which has been previously cleaned, and push this metal screen down into the plastic. This is the reason we repair the backside first because as you can see I'm applying some pressure and pushing down. The pressure, along with the heat from the welder, tends to push a high spot onto the front side of the bumper cover. This can be done by just pressing down with the welder and backing up slowly and pushing the screen into that repair area. You're going to want to adjust your welder so that it's hot enough to melt the plastic to sufficiently push the screen under the surface. So now we've completely pushed the screen under the plastic surface just to provide some extra strength and reinforcement. We're ready for the next step in the repair. The next step we need to do is to remove the aluminum tape from the front side of the repair area. Once I've removed the tape, you can see that there's a slight high spot here from the heat of the backside. We also have allowed the repair area to cool sufficiently

before the tape is removed. The next step in the process is to remove the paint coatings from the repair area. So we can fuse the front side together.

(HOST) I see that we have all of the finish removed from the repair area. Are there any special considerations that we have to take?

(SHAWN) Yes, the important thing here is to make sure that we get all of the paint out of the damage area. We don't want to mix any paint residue with the molten plastic. So I'm going to begin by fusing the plastic together as we did on the backside, on the front side using the airless welder. I'm taking care to make sure that I'm pressing down halfway into the plastic and melting halfway in to join the molten plastic from the front side with the plastic we melted on the backside. So the entire crack is completely melted. Once this step is completed, we'll have to sand this surface down and prepare it for a plastic repair material.

(HOST) Well our repair is looking great. Is there anything we have to watch out for?

(SHAWN) Well, one common mistake that's made is that while sanding this repair area to prepare it for a filler, technicians often leave some small areas where there is shiny molten plastic left. They want to make sure they sand those areas completely to remove any shiny plastic. Any plastic that is melted, repair material will not stick to it, and it will often fail in the bake cycle during the paint process. So we want to re-sand this and make sure any of the shiny areas are removed.

Video: Nitrogen Hot Air Welding

(HOST) We're here today with Kurt Lammon from Urethane Supply Company. We have a bumper cover here that has several different damage areas on it. Kurt, do you want to go over what it is we're going to be doing today?

(KURT) Sure Scott, we've got a Honda Accord bumper cover that's polypropylene. Most of the bumpers today are made of a polypropylene blend. I'd say probably 98% of all bumper covers are made of polypropylene, TPO, TEO - that type of plastic. So the Honda Accord here is very common. We've got three types of damages on here. We've got one big split here in the middle of the bumper, we've got one split down here in the corner, and we have one of these slots here at the edge where it pops into the quarter panel. This is particularly difficult to repair, but I want to show you the process using the nitrogen hot air welder on all three of these.

(HOST) It's called hot air welding, what kind of precautions do we need to take?

(KURT) Okay Scott, when your welding with a hot air welder, a tool that's putting out air anywhere in the range of 600 - 1000°F, you need to be very careful with the metal barrel and also with the air that's coming out of the tip of the welder. When your actually doing your weld, it may put of some fumes so you may want to work in a well ventilated area.

(HOST) Now that we have the aluminum tape on the front side and we have ground the backside of the repair, why didn't we need to grind a v-groove in the backside?

(KURT) Well in this particular location, we don't really need to have a flat surface on the back. So it's easier and faster to just go ahead and grind the overspray off and get down to some raw plastic.

(HOST) Well, let's get started and see how it's done.

(KURT) On this one, I'm using the wide polypropylene ribbon. I'm going to first want to preheat the bumper itself until it starts to a bit glossy. When it gets glossy, you can kind of see that the rod kind of wants to tack down onto it. Then I want to focus the heat of the nitrogen welder at that junction point, right there were the bumper and rod come together. What I'm doing is fusing the bottom surface of the rod with the surface of the bumper. I'm not melting the entire rod all the way through, and you see I've got an angle of about 45° to the bumper. With this wide rod, I'm slowly moving the welder tip back and forth between the two ends of the rod. The critical thing is that I want to apply enough pressure on the rod itself, so that I get some squeeze out of the plastic on ether side and in front of the rod. The speed is also important. You don't want to go too fast, you want to do about 4 - 6 inches per minute. This wide rod is really hard to turn, I'm going to go ahead and cut it off at this point. That backside is done now, we just let that cool, and we'll come to the front side, v-groove the front side, and weld the front with the same method.

(HOST) Now that we have the other repair done in the flat area, are there any special considerations we have to take when we're repairing damage that goes to an edge?

(KURT) You use the same process Scott, except in this case we're going to weld down the crack like we did before. But in a corner in a high stress area like this, it's good to lay a piece of welding rod across to take the stress in this direction. You can heat the ribbon until it turns clear, which is the proper melting point. Then I can use my airless welder to shape the edge.

(HOST) Now we're going to repair this tab. How do we make a repair on something that has such a small area to work with?

(KURT) Scott, what we'll do is taper both sides because we want to weld on both sides of the tab to give it the strength that it needs. So we'll taper it on both sides, and then I'll use some aluminum tape across there to support the melted welding rod when I make my pass. Pre-melt the plastic, stick the rod down, make your pass, cut it off, and then we will heat the plastic until it turns clear. Then we'll use our hand seamer to press the melted plastic into the bumper and to line up the damage. I'm going to do the same process on the other side, pre-melt the plastic, stick the rod down, make your pass, and cut it off with the edge of the welder. I want to pre-melt the rod to get it clear and then I want to use the hand seamer again to impress the melted plastic into the bumper and to line-up the tab. After the weld has cooled and we want to reestablish the dimensions of the hole, there's a couple ways we can do that. We can use the airless welder to melt the slot back into position, or we can use a small die grinder bit.

(HOST) Kurt, now that we've sanded the repair area, what's the next step?

(KURT) Well, if we have any really low spots, we can actually make another pass with the welding rod if you want to. But the way that we've got it here, I think just a skim coat of epoxy filler or a flexible polyester glaze would be enough.

(HOST) In the low spots, is there anything that we have to especially watch out for?

(KURT) You want to make sure that there are no shiny spots. So if you have a little low spot, you want to make sure that you go back in there with some sandpaper and just scratch up the bottom of that little shiny area. Then you can apply some adhesion promoter before you put your two-part on.

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