

Proving the old saying 'Ask and ye shall receive', Zoran saw the thread about my SV/MV project and the carbon tank I'd made. He also saw my reply to a question about how much it would cost for me to make a tank - to which I replied something like "I don't want to turn the hobby into a job and I prefer to make things like this for friends..."

Zoran's next post started out with "Well, my friend..."

Long story short, I've decided to build a carbon/kevlar tank for Zoran and his race SV. I thought you all might enjoy watching the start to finish process. I'll be posting as I move through the project and hopefully this will dispell some of the the black art and mystery around composites.

For those of you who've not seen the tank I made for my SV, (pic attached) I think you'll be surprised at what a hobbyist can achieve in the privacy of his or her garage. Perhaps after watching this project come together, some of you will be motivated to give it a try! I'm half tempted to host a 'come to Petaluma and learn how to make composites - maybe an exhaust hanger or something simple...anyone interested? I'd charge for cost of materials only...it'd be a hoot. Give me a holler if you want to know more.

So anyway, let's get going. I've not even started but let's look at the process I'm going to use. There are any number of ways to do this, which is half the fun - there are almost no rules...but here's what I like to do:

1. I'm going to start with a stock SV tank, fill in the gas cap area and modify the area around the seam that joins the top and underside stampings to make a more 'composite production-friendly' shape - more on this later in the project.
2. Once I have a shape I like, I'll make what's called a 'splash mold' (a non-production quality mold) of the top and the underside.
3. I'll use the splash molds to make fiberglass-only parts that will be bonded together to make what's essentially a fiberlass replica of the stock tank.
4. Zoran, an experienced crasher of SVs, has proven that the sides of the stock SV tank stick out too far and are very susceptible to damage - see attached pics of the fabulous donor tank he's provided me as the starting point... So, I'm going to modify the fiberglass replica and narrow it as a pre-emptive design modification to combat the literal impact that might occur when one combines gravity and asphalt.

Note: Carbon fiber won't dent, it'll crack and break and splinter and grind away to dust if you impact it (with enough force) or drag it across a rough surface. It's not impact resistant. That's what the Kevlar is for.

4. Once these mods are all done (lots of bondo, popsicle sticks, and hot glue!) I'll have a model of the final shape I want. This is called the 'plug'. And now it's time to sand, sand, sand to get the finish as close to perfect as possible.
5. Once the plug is finished, I use it to make the production molds. It will likely be a three piece mold: a two-part top is needed if there are any combined surface angles that would cause what's called 'mold lock'. Think of making a mold using a lightbulb - you couldn't get it out of the mold unless the mold could be split. So the top will utilize a 'splitter plate'. I'll need to make one in order to make the splash mold so you'll see one of those soon enough...
6. Finally, once I have the production mold, I can layup the parts and make the tank. Or should I say tanks!

7. I may decide to make these available to others, we'll see. Depends on demand, how labor intensive they turn out to be, etc.

Zoran will likely not be greeted by a large, lightweight Christmas gift but I'll work on it as time permits.

So, stay tuned and feel free to contact me with questions, comments, etc.

Chris Baker  
[chris.b.baker@kp.org](mailto:chris.b.baker@kp.org)



...and here's my SV custom tank. Well, the top part anyway - fresh out of the mold. It's even prettier in real life.



Kevlar is designed to be impact resistant - it's the stuff in bullet-proof vests. That's why you always see composite tank manufacturers mentioning that they use kevlar. I wouldn't get near a bike with a carbon-only tank...

*Originally posted by GearSlammer*

also, how strong does this stuff end up being?  
it would be nice to have a nice exhaust hanger.

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"Strong" is a relative term. A gas tank doesn't need to be 'strong' per se. It needs to be 'tough' and 'not leak'. Composites are just an alternate material that might be used to fabricate a part.

But for stuff like exhaust hangers, it's plenty strong. I made a carbon hanger for my '03 SV track bike - it took me all of about 1/2 day and that included letting it cure enough to allow me to do final shaping. I let it post cure on the bike.

So any of you with 2nd Gen SVs, we already have a mold we can use...



Well, I found some time this morning and got started on the project in earnest by making the splash mold of the underside.

Because this tank is going on a race bike and we don't need to preserve the stock mounting system, and because it'll be simpler to make the tank and add the mounting tabs later, I used a cut-off wheel and removed the stock front and rear mounting points. It was easier to cut out the entire section of the rear mount. But first, here's what I started with...



After removing the foam sound deadening and mounting points, I simply taped over the opening. No problem as the fiberglass will lay up just fine over the tape and I can always 'fix' any ripples, etc. when I make parts using the splash mold. Here's the underside ready to be waxed and PVA'd...



Now I have to apply a special wax as an important step in ensuring the fiberglass doesn't bond to the tank. I use Partall - available at TAP Plastics.



You wax the part just like you were waxing your bike/car. Wax on, Wax off. I usually apply at least two coats of wax. Be sure to completely buff off the wax between coats.



Once the part is waxed, it's time to apply the PVA which is a 'mold release'. It's a liquid that you can apply with a cloth or spray on. I just use a clean paper shop towel (those blue ones you can get at Kragen or OSH, etc.) and rub on a layer.

You need to move quickly so that you don't rub it once it starts to set up as that will spoil the surface you are trying to create. Essentially, the PVA dries to a very thin layer (you can't even tell it's there) that prevents the composite from actually touching the part - making it easier to remove the part from the mold. Hence 'mold release'.



Note the oh-so-high-tech Honey Bear PVA dispenser...gotta have a little comic relief every now and then...

Once the underside is set to go, I protect the top of the tank with a big trash bag.

Not pictured is all the fiberglass that's cut and ready to apply.





I use a pretty light weight glass for the first few layers at it drapes better and is easier to work into the tighter corners. Then I finish it off with layers of heavier glass to provide a bit of rigidity.

Occasionally, I'll even glass in a piece of metal or other stiffener, if needed. As I said earlier in this thread, there really are no rules - I use what makes sense to me.

I'm using the West Systems epoxies. I can get away with the 'fast' hardner for these simple layups.

And here's the end result: The underside splash mold all layed up and curing. I'll probably leave it in here for a couple days, especially because it's a bit cold in the garage.

Time invested so far, including all the cutting, cleaning, preping and layup = about 4.5 hours.



Ah, sweet progress. Popping a part out of a mold is one of the most rewarding events in life - particularly when it pops right out and, result-wise, is right on target. In other words, so far, so good.

Now on to the splitter plate and the top mold. Wish me luck!



*Originally posted by Friggin Chi*

when i used to work on custom car audio installs we used either speaker box carpet or cotton fabric<t-shirt like material> for splash mold material, since it doesn't need the strength of fibreglass, and because its cheaper..easier to sand..and most importantly it doesn't make you itch 😊

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Interesting, thanks for the info and idea - I may try that on a future project.

Hey, that gives me an idea - maybe I should use material as the outer layer (or part of the outer layer) of the final production part.

Hey, Zoran, how about a carbon tank with knee cutouts made from my old plaid flannel pajamas? 😊

And this underside mold would be suitable if I were to make a non race tank, too...

You can't see it in the pics but there are little dimples in the mold right where the petcock needs to mount - just like I wanted. I purposely 'dented' the tape when covering up the petcock mounting location so the location would be built into the mold. These marks will ensure there are no clearance issues with anything when we go to mount the final part.

Here's a shot of the other angle:



Focus, people, focus. This is a thread about a carbon SV tank. 🤔  
Let's start another to talk general composite stuff...



OK, to answer some questions:

1. My wife keeps me from over extending: "HEY! It's 1:00 in the morning...what are you still doing in the garage?!?"

2. The 2nd Gen SV tanks are not as straight forward as the early model due to the integrated fuel pump. Still do-able, just more steps involved. If anyone has a donor tank, let me know and we can take a look...

3. No plans and not currently interested in doing a 636 tank, sorry. Although...a buddy did just get a 636 so if he was interested...maybe. But nothing I'm likely to do anytime soon. (Haven't I convinced you to give this a go on your own?)

4. I'm hardly a master at this - more like a hacker who's willing to practice. Hey, that sounds a lot like my track day riding...

That said, if there was anyone who wanted to 'apprentice' on this tank project and be here to help me and get some hands-on experience doing some of the work, that would be cool. But you'd have to be serious, show up on time, etc. Contact me at [chris.b.baker@kp.org](mailto:chris.b.baker@kp.org) if you're REALLY serious and we can see what might be possible. I do essentially all of my composite work on the weekends, usually in the afternoon.

5. I'm looking to schedule the "Composite Party" and assume a weekend would be best for everyone. Or maybe some time during the week between Christmas and New Years as I have a bit of time then. The real issue is I'd want to get one or more big tables and set up work stations for everyone so you could each work on your own part (likely an exhaust hanger) at the same time. I figure I can handle about 6 people so if more than that are interested, I'll have to look at more than 1 event. As much as I enjoy this sort of thing, I can't do many of these.

So I'm going to start another post on the Composite Party and work the details in separate thread.

As far as this tank project goes, I hope to make the splitter plate and get at least 1/2 the top splash mold done this weekend. Pics as I make progress...

Thought I'd start the splitter plate today. The splitter serves as a temporary fixture that allows me to create 1/2 the top mold with the flange that's necessary when making a two-piece mold - the mold has to be able to be bolted together for final lay up then I have to be able to split the mold in order to get the mold off the final part - or off this donor tank.

I start by building a construction paper template, the shape of which will be transfered onto that laminate covered particle board you can get at the local hardware store. Use a jigsaw to cut out the shape and there you go! Here's the paper template in place.



And here's what it will end up like. This is the splitter plate on my SV/MV tank plug. I just pulled it out for this pic. I'll post pics of the detail creation of the splitter for the project tank as I get to it - hopefully, this weekend I'll finish the splitter, get it mounted and layup the first 1/2 of the top mold.





Turns out I found time to do some more work. First, I drew a centerline down the tank as a reference point. Then I put down a layer of lightweight packing tape that is offset such that one edge of the tapeline sits right on the centerline of the tank. The tape will server as protection under the splitter plate.

Since I need to narrow the tank anyway, I'll wait and fix the damage you see on this doner tank when I do final body work on the plug. I'll also deal with the gas cap area then, too.



I'm not going to bother posting pics of fabricating the splitter plate. All I did was transfer the construction paper template onto the fiberboard and try to do a reasonable jigsaw job of cutting the shape.

The splitter plate doesn't need to be an exact fit to the tank - and you're about to see why:

I run a large bead of bondo down the tape and press the splitter plate into it. The bondo fills up any minor imperfections in my jigsaw work. Once it sets up, I have a perfect fit. Quick, simple and effective.

Here the splitter plate right after it was pressed into the bondo.



It's important not to let the bondo cure fully as it would be near impossible to get a clean edge at the splitter plate - tank joint.

So, I keep a close eye on it and as soon as it's firm enough to be cut cleanly with a razor blade, I trim down the edge of the splitter plate and peel away the excess bondo.

Look closely and you can see the thickness of the bondo between the tank and the splitter. Some visible in some places (rear of the tank) and almost none in others. This is so much easier (for me) than spending time trying to make a perfect template and cut a perfect splitter. This technique also has another BIG benefit: It secures the splitter plate to the tank strongly enough that I can do the lay up without any additional fixturing. If the splitter was a perfect fit, I'd have to find a way to secure it to the tank. Remember, I'm after a complete seal and sharp 90 degree edge between the tank and splitter as when I pull the splitter, the fiberglass that is laid up against it will serve as the flange edge and the split line for the other side of the top mold.

Anyway, Ta-Da! All set for a wax, PVA and layup.





Just like prepping any part for layup, it's time to wax with the Partall and buff clean then apply the PVA. Let it dry - this took a while as it was pretty cold and damp up here today.

A word about that, while we're at it. I would not be making a final part in these conditions. I expect to have to build a 'hot room' in order to finish this project in the next few weeks. It'll be maybe 10x10 and heated with something suitable to about 70+ degrees. All the build materials will be in this room. The epoxy flows better and bondo doesn't expand/contract, the air will be drier...it's just better all around. But for this rough fab stuff? I've found it's no big deal. That said, once I have the hot room, I'll do all the work in it - hey, why not?

So anyway, I went ahead and did the layup. I have to say, I'm pleased with how fast this is going (knock wood!).

Remember, once I make the top part, I have to bond it to the bottom to make the initial plug. Then I get to narrow the tank, do paint-ready quality bodywork and **START THE PROCESS ALL OVER AGAIN**: make a two-piece, splitter plate based top mold, a new bottom mold and **THEN** make the actual tank...

But hey, it's all for Zoran so, I mean, it's worth it, right?

At any rate, here's the first 1/2 of the top splash mold in cure state.

Time invested to date: ~8 hours.



Using a flexible plastic putty knife, I carefully break the seal between the splitter plate and the flange area, trying REALLY hard not to disturb the seal between the tank and the mold. I want that in place through the curing of the other 1/2 of the mold.

Once the splitter/flange seal is 'popped', I just give the splitter a good rap with a hammer in the direction that will drive it straight up off the tank - parallel with the flange.

Ta-Da again - a nice flange all set to support the layup of the other 1/2 of the mold.

What I'll do first is to drill a number of counter sinks - not all the way through - in the flange. So this first side flange will have the female part of what becomes a quick and easy 'locking / locator'. When I go to fit the two halves together in the future, the nubs on the one side will lock into the counter sinks in the other and guarantee that the two halves are perfectly aligned. Kinda cool - another accurate, quick and easy technique.

So here's the result so far - ready for wax, PVA (after some tape over that gas cap area) and lay up. Hope to get to that later today.





I went to Home Depot today and picked up one of the oil filled heater units to see if that might be a stop-gap solution to the hot room. Turned out it worked pretty well so, depending on just how cold it is, I may be able to get away without having to build an entire room inside the garage.

Once things we're warmed up a bit, I did the layup of the other 1/2 of the top mold.

One of the big challenges for me is waiting until everything has cured sufficiently before I start messing with it. I'm like a little kid who can't wait...I am getting better so I expect I'll leave this to sit for a couple days before I pop it out.

But once it's out, I'm set to make the plug parts using my splash mold! Here's where the 'important' work really begins as I narrow the tank and determine the final top-bottom interface design.

What I mean by that is I won't copy the stock shape that has the seam running down the side of the tank. I'm planning to eliminate that vertical seam so the top part will actually have a horizontal surface that the underside can bond to. It's a bit hard to describe - the pics will make it easy to see what I'm up to. Look for those in a future post. For now, here's the other half of the top splash mold in cure state.

Time invested to this point: ~ 10 hours. I'm happy with that.





And just to help illustrate the 'do whatever works' approach I'm taking to the splash mold part of the project, here's my latest effort at speeding up the cure process a bit. But don't tell my wife! 🤫  
Might be able to pop the mold later this evening!



It's so near Christmas, I just COULDN'T wait to unwrap something! The fireplace autoclave worked wonders so I figured I'd pull the first side off. It's been curing long enough for a splash mold....

It's so cool to pull parts out of molds. It's the big pay off for all your hard work - or the agony of defeat shoved right into your face if you've screwed something up...

The composite is sealed against the tank and as you start to pry it off, the air sneaks in under the glass and you can very clearly see where the mold has released and where it hasn't. It's like watching the tide come in as the air pocket makes it way across the surface of the part.

I use plastic putty knives, popsicle sticks and other non-abrasive items and gently force them under various places in the mold. Then I use a plastic hammer and bonk (gently) the places that aren't released. Once I can see everything is released, it's time to exert a bit of lifting force here and there until...POP! The composite comes free from the part.

And it turned out just fine. FYI, this pic is right off the tank - I haven't even washed off the PVA. And as far as finish, shiny is really good. Composites will pick up EXACTLY the surface of the mold. I've had parts come out with wax swirls built into them - you couldn't feel them but you could see them. I'll get into more detail about this as I'm prepping the plug.

For now, enjoy the first 1/2 of our top splash mold.



A bit of trimming (I use a pair of metal cutting shears, of all things...) and sanding, just to smooth the edges and we're almost set to begin making the top of the plug.

I think I'll end up making the underside first, though.





Splash mold is done!

Decided to pull the other side off this evening. I'm going to have a bunch of work to fix the overall plug so this splash mold is not critical. OK, OK, I admit it - pulling parts out is fun! Plus, I just want to get on to the important stuff.

So here we are, a complete splash mold for a dented gen 1 SV tank. Wow, that's got to be worth maybe, what? A nickel .98?

The inside of the underside mold and the outside of the tops:



Same but with the tops flipped to show the inside. On to plug fabrication!



*Originally posted by lizard*

**I love this thread.**

**Hey tygaboy, what's the ballpark cost for materials for this project?**

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Glad to hear you're finding this interesting - that was the hope!

Cost of materials isn't bad. I think I'm going to use a 2x2 twill weave carbon as I think it's prettier than the plain weave. Either weave can be had for under about \$30 per 50" wide yard. I'll use less than \$100 worth of carbon fiber, then there's the Kevlar - maybe about \$50 for that. Hard to estimate the epoxy but less than \$75...I'd bet I'm into a tank for under \$250. Just don't ask about the time invested...I'm into the splash mold for about 11 hours and it's the easy part.

*Originally posted by HellFyre*

**I think someone asked this a while ago, but I didn't see or missed the answer. When you're done with either a glass or CF tank, does the fuel go right in it? Or into a bladder?**

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The epoxy can stand up to the fuel but before I bond the top to the bottom, I like to paint the inside with a tank sealer. Once the tank is all together, I slosh a bit around the top/bottom seal, just for extra insurance.

Product wise, I've been using POR-15. 2 years in the carbon tank on my SV and all's well.



Plug fab begins!

Ah, nothing like the smell of epoxy in the morning...

I was able to start on the plug yesterday and decided to layup the underside using the splash mold.

Remember, the plug will start off as a replica of the stock tank but then I'll go after narrowing it and re-designing / re-shaping how the top and bottom join together. Given that, I don't need to worry about the quality and finish of these initial plug components - they'll end up bondo'd and hot glued and who knows what else done to them. At this point, it's all about getting the parts put together so I can start final plug shaping.

So, Merry Christmas, Zoran! It ain't pretty, but it'll do! 🤖





the other side...



## Template time

Time to start thinking about how to lay up the composite in the mold. As before, there's no 'right' way to go about this. And since we're still talking about the plug, I'm not too concerned about quality. So this is a great time to learn how the composite wants to fit into this particular shape.

Unfortunately, you can't just take one big piece of carbon fiber and lay it into the mold and get a perfect fit, no seams, etc. Carbon fiber, Kevlar and fiberglass fabrics are woven materials and as such, have what's called a 'draping' quality. That is, how well do they conform to compound contours? Different weave patterns and weights of fabric have different draping characteristics.

Want a home demo of the challenge we're about to deal with? OK, take piece of cloth and try to make it lay flat all over your gas tank with no overlap, bunches, etc. Can't be done. You'll see places where it bunches up or overlaps itself and if you make that spot fit well, it'll lift off of other places. Since woven materials, at least the ones we're working with, have no elastic qualities, we have to coax them into conforming to all the complex shapes we have on this gas tank.

So in order to get the material to lay nicely in the mold, it's necessary to make a set of templates to figure out the shapes of the pieces we need to use to combat this situation.

I start off with a section of newspaper. It has poor draping characteristics so I know if I can get a decent fit in newspaper, the composites (which can flex and shift a bit) will be fine.

So, I take a section - it's already folded in half - and I tape it into the mold with the seam running down the centerline of the mold...





Do a bit of cutting and trimming, make the needed relief cuts, add other sections as needed to cover the entire side of the mold...





Then just unfold the section(s) to see how it lays into the entire mold...



Pull the parts out and I have a set of templates that I can transfer onto the fiberglass. Time to prep the mold with a few coats of Partall and a coat of PVA. Four layers of fiberglass lay up later and we'll have the top part of our plug! I hope to get to the layup later today.

I'm sure I'm going to go with a different template design for the final carbon pieces as the seam locations on these aren't going to be the most attractive. But I'll tell you, this SV shape is going to be tough because it's essentially one great big curved surface with no great places to put seams that will look particularly good and ALSO make it easy to lay up. My SV/MV tank has a lot more flat-ish surfaces that dictated pretty obvious seam locations. But again, this is just the plug so I'm not going to agonize over it just yet.

If the tank were going to be painted, seam location would not matter and I could just make templates that made the lay up as easy as possible.

These are the times when I wish I was more of a 'Function over Form' kind of person...but I've always been a sucker for a pretty face so I'd like to make it look good in raw carbon. We'll see. Anyway - here are the plug templates, ready to be used to cut the fiberglass.





Now that we're approaching the 'important work' - making the plug - I thought I'd step back and give you a quick tour of 'Magnolia Composites'. It's just a corner of my garage with a fairly large work table for cutting fabric and a roll-around cart where I do most of the layup work. Most supplies are stored in the cart while the fabric rolls live on the table. I'll eventually build some sort of fabric rack/storage but for now, this is working fine.





And here are the primary tools of the trade. First, the all important 'self healing' mat. If you've never seen one of these, they're pretty cool - cut them with a razor blade, etc and they show no sign of it. Which is great because when cutting fiberglass or carbon fiber, I use a rotary cutter - that's the cutting wheel you see in the pic. Just press firmly and roll across the fabric and you're good to go. You can cut nice curves and not worry about pulling the weave out of alignment. And the mat doesn't even notice.

You can get the mat and rotary cutter at most any fabric store. Personally, I shop at JoAnn's Fabrics...!

Regular scissors (the red handled ones) are always handy and I often use them for last minute, in-the-mold- adjustment cuts.

The orange handle pair are shears that are a must-have for cutting the kevlar. Nothing, and I mean NOTHING, cuts kevlar. Forget the wife's nice kitchen scissors - I showed those to the Kevlar once and I swear I could hear laughter...Get a nice pair of these shears. It's still slow going but they get the job done.



So let's cut some fiberglass using our pattern. Unroll the 'glass and lay the pattern on top. I try and get the pattern onto the 'glass at a 45 degree angle as the weave doesn't fray at the cut edge when cut at that angle. Keeps things a bit tidier when doing the lay up and it's less messy as the roll doesn't fray when it's being handled.





Using the rotary cutter, just roll around the pattern, make the relief cuts, etc and in seconds, we have our first piece, ready for lay up.





I've already waxed and PVA'd the mold (and bolted it together after drilling a few holes in the flange...but more on that when we get to the production mold). Then I mix up a 'pot' of epoxy (OK, I use small paper cups from the supermarket...), paint a pretty thick layer into the mold and start laying in the fiberglass pieces. Again, no real rules - I just try and remember how many layers I've put where as it's easy to forget. That's why I always like to cut all the pieces I need and account for total layers prior to doing the lay up. That way, once all my pieces are gone, I know I've got the thickness I want.

So, here's a pic of today's lay up 'in process'. It's nice to work with 'glass as while I'm wetting it out, it's easy to see where it's fully saturated because it goes clear - not so with carbon fiber or kevlar. And any air pockets that form are easily seen and can be chased out to an edge or be eliminated in other manners such as making another relief cut, etc.

Now it's just a matter of lay in the next piece, wet it out, lay in another piece, wet it out and repeat until done.



And here's the top of our plug in cure state. And the real treat is that you get to see one of the top secrets of the trade as practiced by me, hacker that I am...clothes pins!

Here's the deal:

Woven fabrics don't like to go around corners, especially sharp-ish ones. When they are asked to do so, they often do their best to straighten out into their natural position - flat. Sometimes, this is a good thing - like when straightening out forces them more firmly into the mold.

But with the part we're making here, the straightening out actually pulls the 'glass off the mold at the edges of the tank, which is the worst possible thing we can have happen.

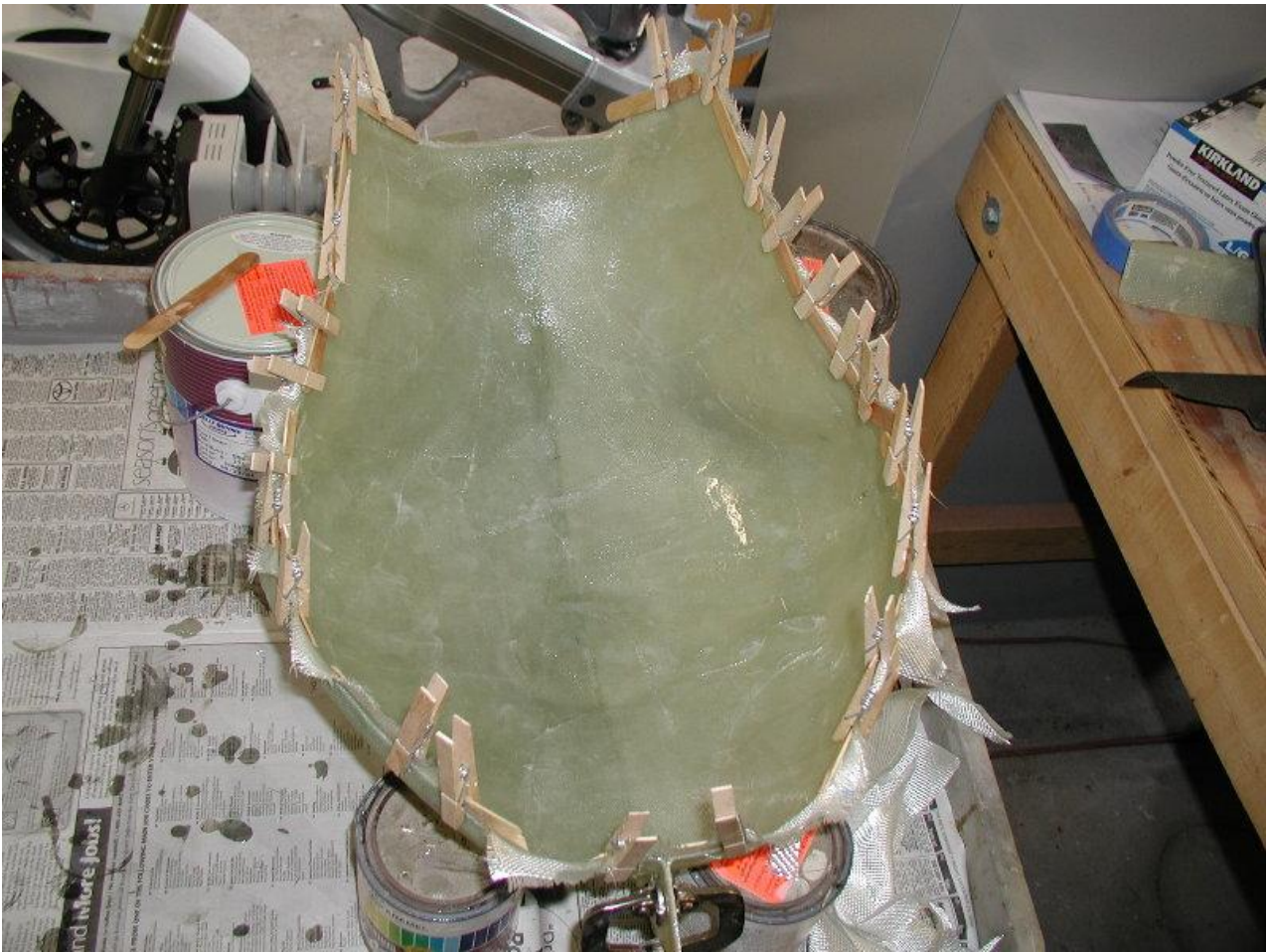
To combat this, we actually have a few options:

1. We could paint in the initial layer of epoxy and let it cure until it's just barely tacky to the touch. Then fast as humanly possible, lay the first layer into the mold. and press it into the nearly cured layer. The tack holds the first layer right where we want it and after things are fully cured, we come back and lay up the rest of the part. But this is a plug that's going to be reshaped anyway so I don't care about a few flaws.

Plus, this method means I have to keep close watch on the part and I have a limited amount of time to get that first layer in. In all, it's too much effort for this plug and not necessary at this point in the process. I'm after investing as little time as I can in these non quality-critical parts.

2. We could vacuum bag the part. We'll be bagging the final carbon parts but again, for my money, overkill for this plug.

3. We do what I did here. I used the Partall on some large mixing sticks that I normally use to stir the hardner into the epoxy. Then I clip them to the mold to hold the composite in place during cure. Benefits? I don't have to play the waiting game in method #1 and I avoid the bagging process (more supplies used = more money) of method #2. Plus, it always tickles me to see this sort of thing used in this world of composites. So full of mystery and black art...and now, clothes pins and popsicle sticks, too!



*Originally posted by lizard*

hmm, maybe I could fab a larger capacity gas tank for my Monster for sport-touring purposes. An extra gallon would make a big difference.

hmm...

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As Yoda might say, "There is no 'maybe', there is no 'hmm...'. Only 'do'..."

Of course you could make a monstrous Monster tank. That's half the purpose of this thread - to encourage others to give this a try. The hardest part for you would be modifying your plug to make it the size/shape you want. Which is the same thing I have to do here - I'm just going the other way in that this tank will be narrowed and capacity is not an issue. But with regard to your Monster tank, I say go for it.



Plug coming to life!

The clothes pins worked just fine and the waxed popsicle sticks came right off, as planned. (I love it when things go the way you hoped...)

I pulled the top part from the mold this afternoon, did a quick, rough trim and...Presto! One plug top piece!



Here's the initial fitting of the underside. I still have to trim it to fit better then bond it into the top.

Essentially, we now have a fiberglass replica of the dented tank with which we started. Once the top and underside are bonded together, I think I'm going to fill the tank with expanding foam so that when I start to narrow the tank and reshape the top/underside junction, I'll have something solid behind the 'glass.

I hope to get the underside bonded and the foam poured in the next day or two.

Once the plug is shaped and prepped, I start the entire process you've seen so far over again in order to make the production mold. This time, however, 'Neatness Counts'.

Total time invested to date: ~15 hours.





Originally posted by drizz

👤 For your MV/SV tank, I'm guessing the plug is where you blend the top from the MV with the SV bottom?

---

Short answer is yes. And thanks for the well timed question, Drizz. It gives me the excuse to talk about the top/underside interface that I keep mentioning as having to modify on this plug. Below is a pic of the underside of my SV/MV plug next to our stock SV underside. (Geez, can you believe how well an SV underside can be made to fit the top of an MV tank...? What are the odds?!?!)

You see that nice big flat area running around the outside of the bottom of the SV/MV plug?

That is the 'interface' I have to develop for this stock tank plug.

When I lay up the underside mold using this plug, I lay it up such that this flat surface is part of the underside mold. Then, when I lay up the top mold on this plug, I wrap the lay up around and again use this flat surface as part of the top mold. When I make the production parts, both parts have this flat section in common. These flat surfaces get bonded together to join the top and underside. It does make the tank 'taller' by the dimension of one of those flat surfaces, but that has virtually zero impact one way or another.

Also, you may notice that I modified the shape of the underside - I eliminated a lot of the details as they're just more work during lay up. I'll likely do the same on this project.

BTW, those holes are where, after making the production underside mold, I mounted a bracket to the plug to allow me to hold it in a vise while doing the layup of each side of the final production mold. Makes things much easier. You'll get pics of the fixturing as I reach that stage.





*Originally posted by kurbycar32*

question. if the fiberglass mold is made by placing fiberglass on top of the existing tank doesn't that make the fiberglass one slightly larger, by about the thickness of the fiberglass?

---

You are correct; the MOLD is thicker by the thickness of the fiberglass. - but the INSIDE of the mold is the exact dimension of the outside of the tank. When we use that mold to make a part, we're building 'in' from that exact outside dimension. When done, the part taken from the mold is the exact dimension of the tank from which the mold was taken.

Simple, no?

*Originally posted by GetaGripGreg*

Question: Why make a glass plug to modify in the first place, if you're going to fill it with foam? Why not just make a foam plug from your original mold, modify it, then seal it and finish for your production mold?

Great thread!

---

Thanks for the kind words. I suppose I could make a foam plug, I just haven't ever gone that way. I'll learn a bunch about working with expanded foam here in the next few days and may very well come away with an updated method.

Having never worked with foam, I've got no idea what the 'right out of the mold' foam surface is like. If it's totally smooth and essentially 'done', I'm all for it - that's what the 'glass is like. I can get a surface that's perfect with no additional work. If foam can do that too, sign me up!

Thanks for jumping in and making a suggestion. That's what I hope happens in this thread. As I've said all along, I don't profess to be expert at this - I just do what I know and try to learn new techniques along the way.

*Originally posted by eisenfaust*

HAVING had quite a bit of experience with foam, I can tell you that no, it won't have a smooth finished surface after it cures. The denser foams will be closer, but still not quite right.

To get a smooth surface out of foam you're going to have to coat it and sand it.

Back when we'd make styling bucks at AAC, the general technique was to make a rough shape with foam, poke a bunch of holes in it, then lay down styling clay. Paint the clay, and you've got a great surface for making a mold.

Alternately, instead of coating the foam plug, you could make a cast copy from resin, and finish the surface in the (much easier to work) resin. Of course, for a plug the size of a gas tank, you'd have some serious issues with molds warping, etc.

I think your hybrid glass/foam plug idea is a good one. Just be aware that you're going to have to bondo the foam and do some serious sanding to get it as smooth as composite gel coat. :-)

Thought I'd try out the foam this morning.

I mixed up a small batch and poured it into the plug top, focusing on the area I want to narrow.

All I want to do is have something to serve as a base as I start to reduce the width of the tank. The foam didn't flow out to the edges as far as I wanted so I did a 2nd pour to get a bit more surface area.

Having never worked with foam, I was guessing as to the result I'd get but it turned out pretty much as I hoped!

Here's the top plug ready to be reshaped.



Next, I went after narrowing the tank. This was total guess work on my part. Essentially, I want to remove the 'shoulders' that end up dented when SVs get horizontal.

The nice part is that since the tank we pulled the mold from was dented in just this area on both sides, I could tell what I wanted to remove.

A little head scratching to determine where to cut and a few minutes with a small air-powered body working saw and I have exactly what I want!

I'm very happy with how this worked out. The foam performed just as I'd hoped and will serve as a nice backup to the body filler I'll need to get to final shape.

One narrowed SV tank, ready for bodywork!





I was hoping to get a dramatic shot that showed the difference in width. It looks pretty different to me. The shape is certainly going to be recognizable as an SV but it should be narrow enough to avoid being thumped if, heaven forbid, Zoran falls. For the next few days, just call me 'BondoBoy'...I'll also get the underside bonded in and go after the top/underside joint redesign. A safe and Happy New Year to you!



Here's a shot from the back of the tanks. Pretty significant difference...



I fitted the underside by bonding the lip of it to the lip of the topside. This is all well and good but creates the very issue I now need to resolve - I now have a 3/8" vertical wall sticking up around the underside of the tank. This is not the nice flat surface I need...

So I set about creating a mating surface that will be suitable when bonding the final top and underside.

If you look back a few pics, you'll see the plug from my SV/MV tank. It's got a nice wide surface that gets used when making the mold for both the top and underside. So, I've decided to remove the stock tank's lip, flatten and/or create a bit of the same thing on this plug.

Sounds great, right? But wait a second, isn't that lip the very thing that is holding the underside and top together? 🤔

Hmmmm, what to do?

Expanding foam to the rescue!

I noticed that the foam sticks pretty well to the fiberglass (and just about everything else it touches...!) so I figured what if I just filled the tank with foam? That should allow me to remove the lip but still hold the top and underside together. And what do you know? It worked. Here's the underside with the lip removed. If you look closely, you can see areas between the edge of the top and underside where the foam is exposed.





Now it's a 'simple' matter of creating the flat surface I want. It needs to run around the entire edge of the tank underside.

I talked with Zoran about his application, expected clearance needs, etc. and since this is going on a race bike with flatslides, we don't need to worry about clearance for the airbox, etc. so I have a bit of luxury in terms of taking up some of the undertank space. A bit of Bondo to build up the surface I want and...

I've got a bit more finish work to do but this give you a good idea of what I'm after - a nice top/underside interface.

Time invested to date: ~ 20 hours.



I've decided to complete the underside, pull the mold and make the final production underside and go after the top section after that. Why?

OK, I'll be honest, after all this 'glass work, I'm itching to lay up some carbon fiber! I'm going to do this tank in a 2x2 twill weave rather than the plain weave of my SV/MV tank and I've only made some small pieces in the twill - a exhaust hanger and undertail for my '03 SV track bike - and I can't wait to work with it on a bigger part.

So, yesterday and this afternoon it was:

Sand, sand, sand, bondo, bondo, sand, sand, sand, sand, sand, sand, bondo, bondo, sand, sand, sand, sand, sand, bondo, bondo, sand, sand, sand, and finally paint.

I'm using a scratch filling rattle can primer that works great. I'll hit it with finer and finer sand paper and finish with a 2000 wet/dry then polish it. After that, it's time to make the production mold. Until then, here's the result - ready to be wet sanded. Turned out nice, don't you think?





Sorry for the lack of progress - busy with other life stuff. Plus I've been working on my SV bodywork - but that's a whole other thread - and the SV motor in the RVF chassis. Anyway, I needed more scratch-filling primer and the paint store (Hawley's in Santa Rosa) was out of grey so I ended up with this oxide red color. Same stuff, different color. And you know what? It shows up flaws better than the grey. I love these accidental learnings... So, in preparation for making the production mold, I laid down a few coats of the primer, hit it with 1500 grit wet/dry (wet) and then hooked up a polishing pad to my air-powered grinder and went after it with a medium cut Meguire's polish. Once that was done, I went back and hand polished it with a Meguire's Mirror glaze. So here we are, all ready to lay up the production underside mold. Purdy, ain't it?



OK, after a brief delay (work, other projects, one Saturday 'seminar' and generally crappy weather for composite work), we're back to it.

It was a beautiful day today - the temperature got up there enough that I decided to take advantage of it and make the production mold for the underside.

The scratch-filling primer has been polished so it's time for a couple coats of release wax and some PVA.

Mmmmmm, so nice and shiny....

This is all goodness since we want the smoothest, shiniest finish we can get. Just that much less work to get the mold ready for the production parts. I wrap the other side in a garbage bag to keep stray epoxy from mucking up the other areas of the tank.





I'm after the nicest possible finish so I'm going to do the first two layers in a really light weight 'glass - for better drapability and ease of lay up - and then back that up with some much heavier weight 'glass to add the needed strength.

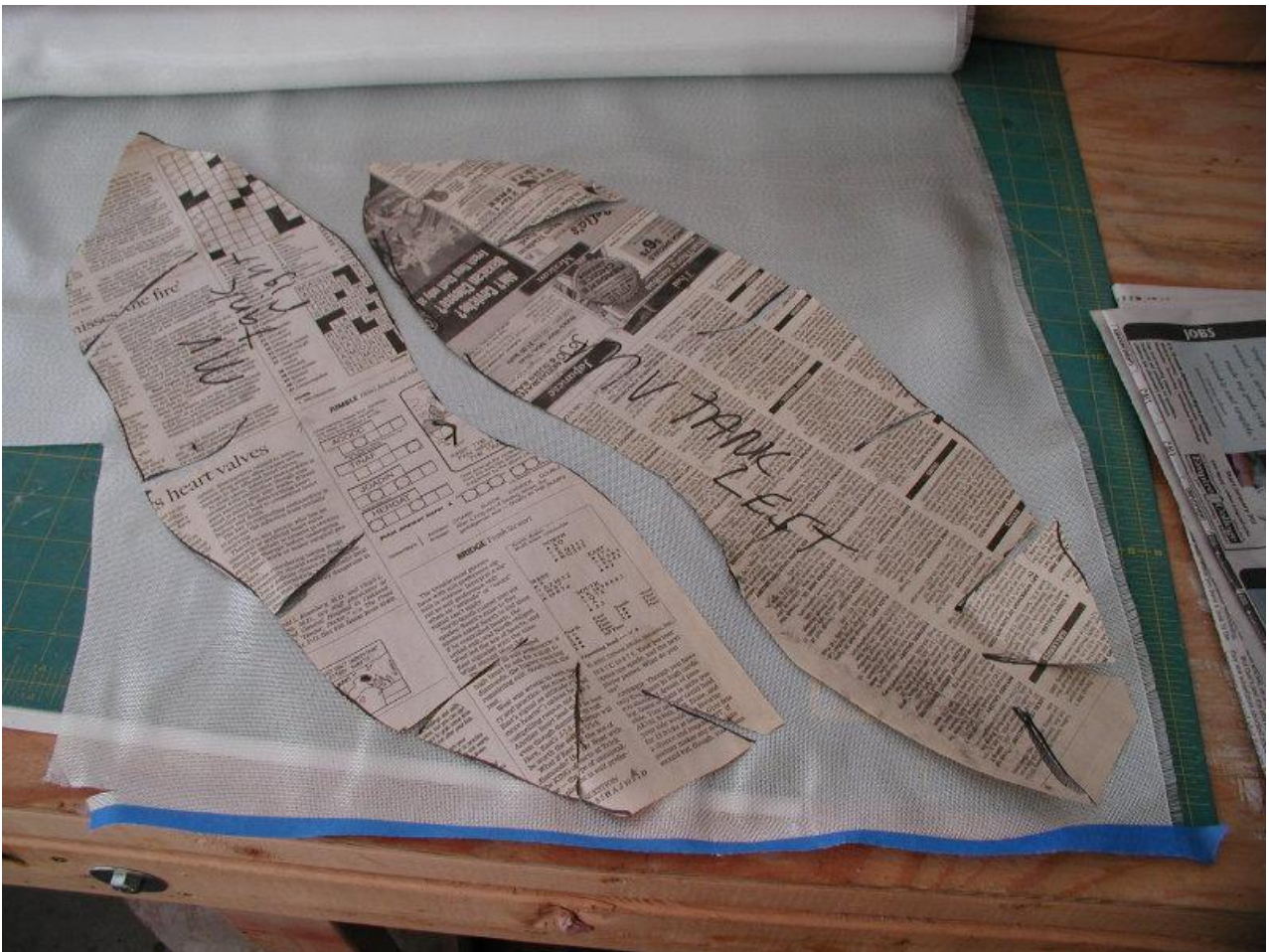
Here's a shot of the two weights I'm using. Pretty big difference.

Using the lighter weight 'glass right against the surface of the mold also reduces the likelihood of air bubbles in the surface of the part - look how much room there is for air in that (comparitively) heavier weave...





Since the underside of my SV/MV tank is essentially the same shape as this one, I was able to use the patterns from my 'old' tank. Note the relief cuts needed to get the material to lay nicely into the mold without bunching and lifting.



As I mentioned earlier in this thread, as we move into building the production molds (and final parts!) 'Neatness Counts'.

Whereas with the splash molds and plug parts, we didn't really care too much how the parts turned out because we were going to cut and glue and foam and bondo them, now we REALLY care about our results - the finish we get on the mold will translate every flaw right onto the final production parts.

So, I cut out the entire schedule of materials and lay them out so everything is easy to get to, the different weight 'glass is in the correct order, the pieces are on the appropriate side and pointing the right direction, etc. Now I can move quickly through the lay up without having to mentally keep track of how many layers I've put where, etc.

Here we are, ready for the lay up to begin.



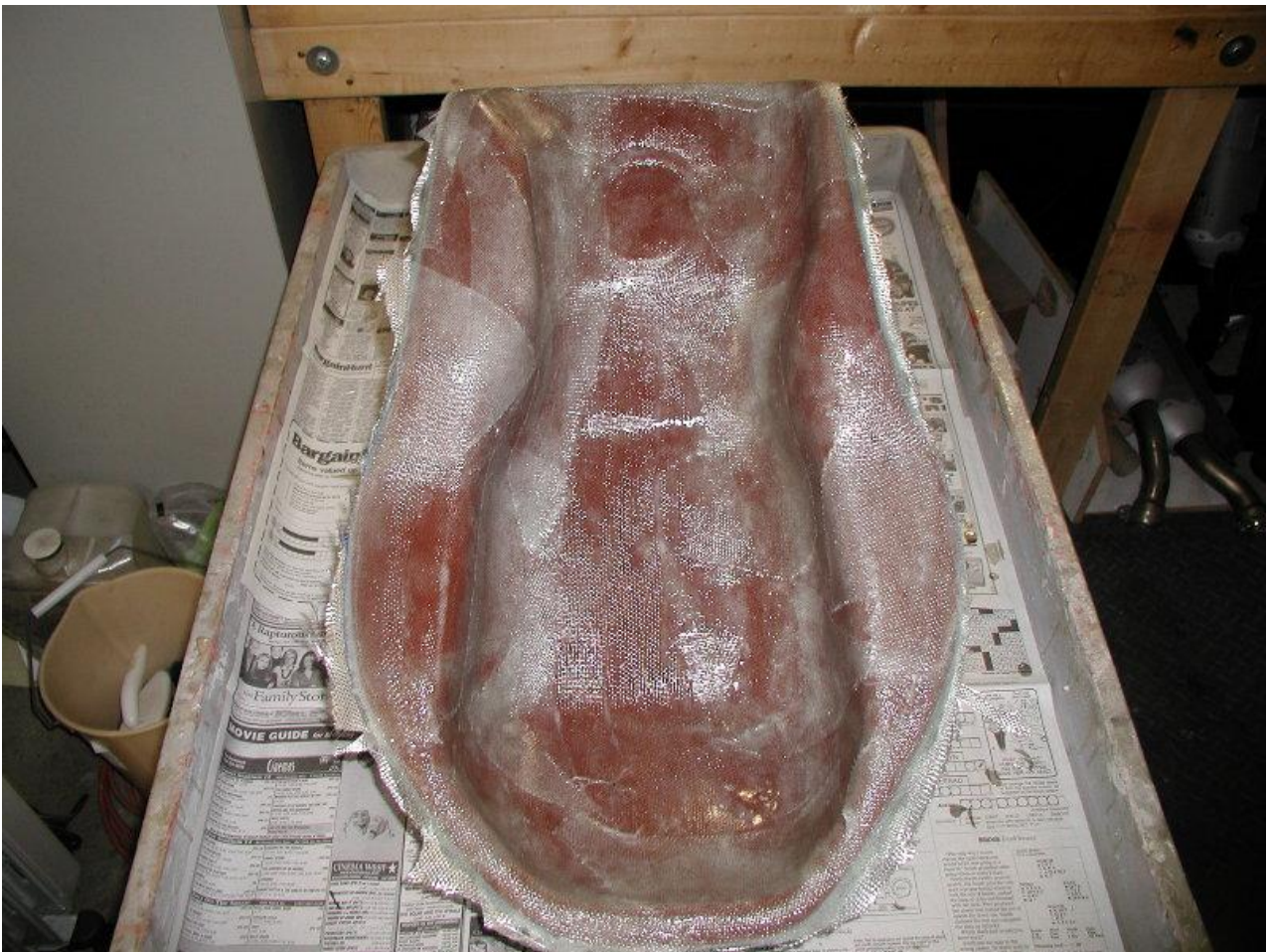


And here we are, one production mold lay up in cure state. It's kinda wild looking - like a big piece of meat or something that used to be alive...As I said, I've never used the red oxide primer and it looks creepy, don't you think? 🤩

I used some of the scrap pieces of 'glass to reinforce the mold in a few places. No sense throwing it away when I can slap it on here and gain a bit more rigidity in the mold. May not be as pretty, but who cares? It's the underside of a mold!

So, now it's time to be patient - which is always hard for me... You know how much I love to pop parts off of molds but this is the important stuff. I'll let it sit and cure for probably two days. Maybe pop it out on Wednesday. As soon as I do, you'll know...

Total time invested to date: ~ 25 hours





What to do to move the cure cycle along?

Last time it was the fireplace, this time, a space heater set to medium/low. Don't want to light anything on fire...

Again, I'm always trying out different approaches to see what works best for me. It's also REALLY nice weather up here today so I may lay it outside in the sun. That's proven pretty effective in the past.

Do you think I'll be able to leave it alone for 2 whole days? 🚗

I bet not...but seriously, I won't pull it when there is any serious risk of messing it up.



3...2...1...PRODUCTION MOLD!

Well, I made it all the way until 7:00 PM on Tuesday before I just had to pull this part out! (I'm so proud of myself...)

The nice weather and a bit of space heater cured the lay up and it was time to pop the part out.

This first pic shows how, as I use a plastic putty blade and start to separate the part from the plug, it's obvious where the part has released from the mold (the milky white areas) and where it has not (the parts where the color shows). This is easy with 'glass since it's transparent. You'll see it's not so obvious with the final carbon parts.





The blade is easy to get under the flat edge sections but how to break the seal in those inner areas? Well, how about wacking it with a rubber mallet? Yep, that's what I do. Not full swings or anything like that but enough to flex the part and cause the separation. Remember, 'glass is pretty tough stuff. Just be sure not to damage the plug.

Notice the one separation spot that looks like it's about the size of the head of a rubber mallet? I just keep wacking it 🥊 until the entire part is released.





Even though the part is released, it doesn't just fall out. I have to get something well under a few areas to get the final separation. I use that plastic blade, the big popsicle sticks and any other flexible kind of 'pry bar' that will not damage the part or the plug.

Pry, pry, pry, tap, tap, tap until...

POP! One SV tank underside production mold, fresh from it's birth place, all ready for trimming!



Ta-friggin'-DA!

Here it is, all trimmed up, ready for wax, PVA and some carbon layup and vacuum bagging. I'm REALLY pleased with how this turned out. It's near perfect. One of the best parts I've made, if I do say so. Finish is super.

I expect I'll be doing the production carbon part this weekend. Then you'll see the vacuum bagging process in all its glory.

For now, let me introduce you to our production underside mold, ready for action.

So far, this project is going just great. I'm excited by the results we've achieved.



Let the bagging begin!

Well, let's get into some new stuff, shall we? As I've been saying all along, I want to vacuum bag the final parts. Why? Vacuum bagging helps 'consolidate' the laminate layers and forces excess epoxy out of the part. Achieving the correct ratio of epoxy to fabric is key to getting the strongest, lightest possible part.

I'm not going to get into a discussion of autoclaves except to say that I don't have one! 🤔 For our purposes, a wet lay up and vacuum bagged part will be just fine. So, here we go!

First, the 'tools of the trade'. This pics show the basic stuff we'll need. First, that clear, pinkish material is the bagging material. I use something called 'Stretchalon' that has the ability to - wait for it - stretch! This makes it a bit easier to get it to do some of the trickier stuff and allows me to make small mistakes and not pay a big price in terms of creating a bridge, etc. The roll of yellow stuff is 'sealant tape'. Essentially a strip of goo that we'll use to seal the bag. The thin, lighter weight material is called 'release peel ply' or just 'peel ply'. It is treated with a magic substance that won't bond with epoxy. Once I do the lay up, I'll cover the wet laminate with a layer of this and when everything cures, I'll be able to - here it comes again - 'peel' it off the part!

Finally, the fluffy looking material is called 'breather'. It sits on top of the peel ply (which is pourous, by the way) and it absorbs the excess epoxy that the vacuum squeezes out of the laminate as it's curing.

Pretty simple, eh?





Let's build our bag. You can't buy pre-made bags that are big enough for what we're doing - at least, I haven't found any. I build them to meet my requirement.

First, determine how big a bag is needed. I do a really rough fit being sure to leave PLENTY of excess. The bag has to totally conform to the shape of the mold, go in and out of all the contours, etc. And remember, the part will be wrapped in the breather so it'll be significantly bigger than just the mold.

And be careful - the bagging material can be punctured and chasing leaks during the bagging process is a big pain. It's not delicate material, just be careful and prepare well. For example, I sanded the underside of the mold where the raw fiberglass is exposed to ensure I didn't have some little splinter that would perforate the bag.

One very rough fit to determine the amount of material needed...



Next, I fold the material in half to determine the middle line and I mark it with a Sharpie. Then open the material and, starting at the middle point, lay a strip of sealant tape down one edge being careful to keep the material flat. Leave the protecting paper on the sealant tape so you don't get other stuff stuck to it while working the one side. Press the sealant tape hard onto the material to get an airtight seal...



Peel the paper off the sealant tape to expose the other side. It peels right off.





Carfully fold the bag in half and, starting at the middle point, press the 'top' of the bag onto the sealant tape. Be careful to keep the edge aligned. Then fold the open edge back at 45 degrees and do the same on the opposite edge. Note the sealed edge on the other side of what is starting to look like a bag!



Peel the protecting paper off the sealant tape and carefully press the top of the bag into the sealant down this other edge.

Ta da! One vacuum bag.

I'll put the sealant tape in the open end just before doing the lay up and bagging it. No sense having it there where it might get messed up, etc., until we need it.



For now, let's fold it carefully and set it aside until we're ready to bag.





### New patterns for this tank

Even though I was able to use the patterns from my SV/MV tank to make the mold, we want the final product to look as nice as possible. The SV/MV tank underside is 'close' to this shape but we really need specific patterns for each part. So I started with the top. This is a much easier shape to deal with, compared to the top - see the pattern making we did for the top earlier in this thread for details about that.

Newspaper works just fine. Cover as much of the surface as possible while checking fit and taking the draping issue into account.



Fit, fit, cut, cut, fit fit, trim, relief cut, fit and...  
One set of SV underside tank patterns.

Prep that mold with wax and PVA, cut the carbon to shape and I'm ready to lay up and bag!  
👍👍👍👍



*Originally posted by tz250racer*

Chris,  
this thread gave me the inspiration to try this stuff myself. I've got a question for you. What brand scratch filling primer are you using? I've got some duplicolor primer but it doesn't seem to hold up very well to heat generated by the epoxy.  
Thanks,  
Brian

---

The stuff I'm using is a rattle can brand called "Tempo". I think any scratch-filling primer will work.

I'm getting a spray gun and am going to give FeatherFill a try. It's supposed to be twice as thick so should be a time saver.



BAGGED!

Found a bit of time this afternoon and thought I'd lay up and vacuum bag the production underside part.

Let me start by introducing you to my vacuum pump rig. It's just a little Gast model I got off e-bay for about \$100. It pulls around 24 inches of mercury so less than 1 atmosphere but plenty for what we're up to here.

The set up consists of the pump, specific vacuum line (regular plastic line would collapse under the vacuum), a shut off valve, a vacuum gauge and a through-the-bag type connector.

You can see in the pic, I've cut a small X in the top of the bag and fitted the connector to it.

The idea is that once the part is under full vacuum, I close the valve and shut off the pump. It is certainly not the case of letting the pump run during the cure cycle - it wouldn't last as this one is not designed for continuous duty.





I won't take you through the lay up process. It's the same as what I've done with the 'glass - use the patterns to cut the carbon, lay it all out so it's easy to work with and go to town. I did learn one new thing - this is the first time I've worked with the 2x2 twill on irregular shapes and it does NOT like to stay together. It pulls apart at the edges and moves around like mad compared to the plain weave. I hadn't noticed that on the exhaust hangers and other small parts I've used it for but man, it was hard to keep it looking nice at the edges. So if you sharp eyed readers notice, the carbon you see here is the plain weave. Yep, I realized the twill was going to be a bitch so I only used it on the outside layer - the one that will be visible when the tank is assembled. Just like the Wizard said - "Pay no attention to the man behind the curtain..!"

But I can sure see why the finishes the pros get with the prepreg is so nice. I hope to some day get my hands on some prepreg. Mmmmmm....prepreg...

Sorry, back to reality. I used three layers of carbon and two of the heavier weight fiberglass. No kevlar as it's not needed here.

And here we are, all layed up and ready to bag.



Once the layup is complete, I fit the peel ply over the laminate as neatly as possible then wrap it in the breather. Then it gets put in the vacuum bag. I have already layed in the final strip of sealant tape along the mouth of the bag so once everything is inside, I seal up the bag and turn on the pump.

You may not have noticed but the pump-to-bag connector can't just go any old place, it has to have an air path to the breather. So I wad up some extra breather and lay it under the connector and up onto the breather that's wrapped around the part. Again, a simple little trick that keeps the connector off the part and eliminates the possibility that the part picks up the imprint of the connector...don't laugh, I have a Ducati exhaust heat shield with a nice big connector-looking imprint in the finish...

When the vacuum starts to pull and the bag starts to clamp the part, the fun really begins - trying to be sure the bag is fitting everywhere it needs to fit while it's starting to clamp down and quickly become harder and harder to adjust. Remember, it's important to ensure there are no bridges in the vacuum bag and that the breather and peel ply are staying where I want them to be.

If I see something I don't like, I shut down the pump and bleed air in to release the bag so I can make the needed adjustments. It usually takes me a couple tries to get things where I want them. Once I do, I let the pump pull until it maxes out. Start to finish, to get all the air out, it only takes about a minute.





And here's the other side. Look closely - see those slightly darker spots all over the side and top? The excess epoxy is being squeezed out of our laminate, through the peel ply and into the breather. The vacuum is doing just what we want. We're going to get a lighter, stronger part than we would if we just did the wet lay up and no vacuum. Lighter AND stronger. Cool, huh? Now to let it cure. With a bit of luck, we'll have the first half of our tank ready to go tomorrow afternoon! So far, so good. Now it's on to the top and back to the Bondo. Time invested to date, about 27 hours.



*Originally posted by lizard*

Hey Chris, how come you're not using kevlar on this project?

---

Ah, but I am. The entire top of the tank will have a layer of kevlar. I'm skipping it here, on the underside, as the odds of the underside taking an impact are (hopefully!) zero.



Production Underside is ALIVE!

I got everything all nice and hot and it cured enough to pull the part. I had a couple problems with the bag that I figured would bugger the part so I decided to pull it out, figuring I could always make another.

I suppose this is kind of an excuse or at least an indication of my approach but it usually takes me two tries to get the result I want from a process. And I haven't bagged a complex part since I did my SV/MV tank about two years back. So I'm re-remembering those "oh, yeah...that was a problem last time..." learnings. Anyway...

Here's the peel ply and the breather being pulled off. And it's not like things just fall off.

Remember, that breather has some epoxy in it and the peel ply, while it won't bond to the laminate, still grips it such that I have to apply some serious force to pull it off. Here, I've run a blade down a few sections and am peeling it all off a strip at a time.



The part is still on the mold but now it's been freed from the peel ply and the breather.

Here you can see one of the problems I had:

The breather got wrapped under the peel ply on the right and left side flanges. Not good, but since I have plenty of room, I hope to be able to trim those areas such that we'll be OK. I don't need that much area to get a strong top-to-underside bond. Let's see how it looks once it's out of the mold and trimmed. Fingers crossed...





I did a little warming with the space heater. The sun was out so I took advantage of that to do a bit of solar curing, too. Just laying it in the sun yields surprising results. The part gets very warm and speeds the cure along nicely.

Normally, I'd wait another day before pulling the part but again, since I saw there were a couple flaws, I figured I'd pull it now and if it wasn't what I wanted, I'd call it a 'learning part' and start over. But it's cured enough that if the flaws are liveable or can be eliminated, it'll work just fine as a production part.



OK, here we go... I've trimmed and sanded the problem areas and guess what? We're Good To GO! It's going to be just fine. 🙌 (Huge sigh of relief...) Let's start with the 'inside' of the part.





And finally, after all this, here's the money shot: One carbon fiber SV tank underside production part! Can I get a 'Hallelujah', people?!?!? 🤖

Sexy, wouldn't you say? And it weighs about as much as a bag of potato chips. OK, you can see there are a couple stray fibers but like I said, that twill weave is a bitch. Pretty as it is, I think I'm going back to plain weave, at least for the complex stuff. I'd rather have a higher quality part. So a bit of function over form seems OK to me. Plus it's not like plain weave is ugly or anything.





And here, I've painted on a coat of the tank sealer. I like this as an insurance policy. I keep it away from the flange as that's the part that will bond to the top part of the tank and I want a carbon-to-carbon bond. This part can be set aside until final assembly. On to the top...





*Originally posted by xtasie99*

**Did you use any sort of gelcoat?**

**Also, you are just brushing on the pva, right? The only time I brushed it on, it turned out complete crap and I've sprayed ever since. But yours turns out very well.**

---

No gelcoat and I did get some pin holes with the twill weave. But the finish on my plain weave stuff comes out great. Essentially, the first layer of epoxy is the gel coat. If I want to ensure no pin holes, I just let the first coat of epoxy get uber tacky then lay in the first layer of carbon. That usually results in a perfect surface.

As to the PVA, I just use a blue shop paper towel to wipe it on. I've never had any problems with that approach.

*Originally posted by drizz*

**Any movement on the top part yet? Or is that on hold for a bit?**

---

Back to sanding, shaping, etc, on the top. Also taking some time to make my SV fairing parts. And since I've already posted the process for how I make splitter plates and top molds, I figured no one would find that very interesting. Thought I'd just post the new stuff as I get to it. I was going to throw in 'progress' pics but go light on that until something new was happening.

Let me know if you want the full play by play. - I'd be happy to document the whole thing...

*Originally posted by Dan071*

**How did you "polish" the CF piece, once you pulled out of the mold to the pic where it is all shiny?**

---

No polishing, no nothing. The purpose of making the plug as perfect as possible is that when the mold is made from the plug, it is as perfect as the plug. And all parts that come off the mold are as smooth and shiny as the mold. That's why I've invested so much in the mold making. This part was taken out of the mold and all I did was wash off the PVA. That's the beauty of a nice mold.