Teak deck recycling - s/y MyWay

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28 years and 3..4 sandings are enough for a teak deck: lost plugs, open seams and small leaks. Just re-caulking the seams would not be enough. Also, water had leaked into the balsa sandwich structure. The seller had sanded the teak, repaired some seams and retightened some screws, but the results were more cosmetic than anything else. The deck was in dire need of a thorough rebuild.

The most elegant solution is to have a craftsman build a new teak deck. Ordering new preassembled modules from Skandinavian Teak Deck gives almost the same result. However, new teak cost 300+ €/m^2 plus the labor, teak imitations almost as much, and the deck area was close to 20 m^2.

The teak planks were in good shape, so I decided to try recycling if they could be taken up undamaged.

The web pages of West Systems describe installation of a new teak deck with epoxy gluing. The Swedish epoxy producer Nils Malmgren proposes a teak deck where 3...4 mm thick teak ribs are glued to the deck with epoxy. I reasoned that if I could take up the teak planks intact, cut them into 5 mm thickness and glue them back with epoxy, the teak deck would get some 10…15 years more of useful life. The epoxy would also permanently seal the 900 small screw holes from the first version of the teak. And recycling the teak is an action that supports the image of sailing.

Checking and repairing the leaks into the balsa sandwich structure of the deck required opening a part of the deck, anyway, because I did not want to do the repair from underneath inside the cabin.

I tested the method first for the rear deck, 4 m^2. The following spring I processed the foredeck, 10 m^2, The cabin top was made the 3rd spring. This is the summary of the work:

Preliminary considerations:

This is going to take time but is not difficult, and an exercise well within the skills of an average handyman. If you have for the boat a protected place where to work, try it.

Preparations:

Remove all the fittings, genua rails, stanchions etc. which are bolted on the teak. I had a minor challenge with the stanchion feet, where the ss bolts had over time corroded and frozen in place solid; I finally gave up and cut them off in pieces with a grinder.

Lifting up the teak:

Open up the teak plugs with a good 10 mm wood drill bit and remove the 900 or so screws that attach the teak planks to the deck: break each screw loose by hand with a screw driver and then use an electric drill to unscrew it.

I did not remove the seam caulking between the planks in advance; one could do that with a tool bit available for e.g. ‘Fein Multimaster’. I just run though the seams with a sharp knife or with ‘Bosch Multitool’ blade. Most of the original old seams had a thick yarn as a gasket at the bottom of the seam caulking: pulling the yarn up cuts also the caulking of the seam open.

Before lifting the teak, I marked an ID to each plank in a couple of spots with carpenter’s pen or felt tip pen: that way, the planks will at the end find back to their original locations.

Bosch Multitool was used to cut loose the rubber cement between the plank and the glass fiber deck, one plank at a time: push the tool's cutting blade under the teak plank, starting at a properly exposed side of

the deck, and then proceed for the length of the plank. When you have cut the rubber cement for the full length of a plank, it can be lifted up without damage.

In case of 'MyWay', a good part of the 30 year old, sparingly applied 'Thiokol' rubber cement had already let go and dried, which made the job easier; some sections were still like fresh and caused more work. Good to keep in mind that if you hurry and damage a plank, you have to use time to make a new one..; patience pays off.
The smallest pieces of teak were attached loosely onto a piece of masonite, to keep the order during the transport and further processing.

Cleaning and preparation of the teak planks:

The teak was quite humid when taking it up in March, so that I took the planks inside for a few weeks to get dry. It would be better to take the teak planks up in the fall, at the end of the boating season, and to process them during the winter. In that case, you have to cover the screw holes in the boat deck from possible rain and snow melting water.
Removing the residues of the rubber cement from the planks can be done with Multitool and a belt sander.

I then used a small planer to remove first a 1 mm slice from the bottom side of each plank: this will give a good clean surface for the epoxy glue. A small planer/thicknesser costs 300 € and is ok for this job.

Then, copy the ID markings of the planks onto the bottom side.

After this, the top side of each plank is cut to get an overall thickness of 5…6 mm. Teak is a hard material and you may cut off max 1 mm at a time. The planks were 7..12 mm thick, depending from which part of the deck they came. This means that you have to pull each plank several times thru the thicknesser. The smallest teak deck parts are a puzzle and too small to push through the thicknesser; they have to be processed with a belt sander.
As a result, you get a good and clean upper surface to the now thin teak ribs.

Finally, you wipe the bottom side of the ribs with rags and degreaser (I used acetone from a car parts shop) to remove the natural oil in teak, and then sand the bottom side with nr 60 grinding paper on a belt sander.

The ribs are now quite thin and fragile, so that they have to be handled with care.

Repair of the balsa sandwich deck:

The wet balsa distance material of the sandwich deck is easy to repair when the teak has been removed. I located the wet areas with a hygrometer, cut the top layer of deck open in the problem areas, replaced the wet balsa core, and glued the top glass fiber layer back with epoxy. When the damage is limited, this is something that you can quite well do by yourself.
There are a number of descriptions of this type of repair in the magazines and on epoxy producers' web pages.

Preparation of the deck:

Before starting any grinding and epoxy work on the deck, you have to cover the rest of the boat with protective sheets, so as to prevent the dust and epoxy from spreading all over the place. I used a handy plastic film with an adhesive tape on one edge to cover the whole topsideand freeboard of the boat, and thick cardboard for the parts of deck that one has to walk on during the work.

The teak planks were originally put in place in 1979 with 'Thiokol' rubber cement directly ont the anti-slip surface of the glass fiber deck. I first cleaned the most of the rubber cement with the Multitool, and then used a belt sander to grind the deck surface smooth. If you are extremely careful, you might use an angle grinder with a carbide grinding disc tool to do the same; that will blow a sick cloud of dust that spreads all over the place, however.

When ready, you vacuum clean the whole deck and surroundings, and wipe the deck with rags and degreaser (I used acetone).

Now the surface of the deck is clean and ready for the epoxy.

Re-laying the teak deck with epoxy:

I chose West Systems' 105/206 epoxy, mainly because it is well documented, readily available and comes with a practical dosing pump system. Colloid silica was used as thickener, and graphite powder for color and UV protection in seams, all from West Systems.

The working temperatures have to be around +20 ^{o}C for working with the epoxy. Cold nights and wet days are no good. Then, again, temperatures over +25…30 ^{o}C make the epoxy cure too fast.

Before starting, check and protect the toe rails, free board etc. with masking tape against epoxy splashes and thumb prints. The bolt holes for genua rails and other fittings in the deck have to be closed with foam plugs or masking tape, so that epoxy does not seep into the cabin. You will drill the holes open later.

Cover the top side of each teak rib with a good quality masking tape. NM proposes a layer of boat varnish as protection on the top side, to be sanded away when the ribs are in place; it probably also works.

Always use a protective respiration mask, gloves, and eye wear when working with epoxy !

Now, you degrease the bottom side of the ribs one more time with rags and degreaser; I used acetone. Copy the ID markings of each rib to the masking tape on the top side.

Lay the ribs tentatively into their proper places, so as to verify that you have all the pieces in their original locations and that the screw holes in the ribs still coincide with those in the deck. Then put the ribs aside in good order, to be taken into use when gluing the deck one section at a time.

Select a section of the deck to start the work at and mark it with felt tip marker. I started by putting the center line plank into place first, then proceeded to starboard a few ribs at a time. The port side was done the next day.

Working alone, I managed to prepare and re-lay 3...4 full length ribs at a time with one batch of epoxy. The limiting factor is the pot life of the mixed batch of epoxy: it is 30 min. at 20 C and gets shorter when the temperature rises. If you are working with sections where there are short teak ribs, you get more pieces but less area done in the same time.

Actual epoxy gluing:

When working on the deck, keep the epoxy containers, cups and tools on a low cardboard box: if a cup tips over, it then does not spread its contents all over the place.

Mix a small batch (1 cup) of epoxy, and spread it with a brush to wet the surface of the marked starting section on the deck, and the bottom sides of the teak ribs that will belong to this section.

Mix another batch (you may reuse the rests of the previous batch, too) and thicken it with colloid silica to consistency of ketchup. Spread this with the brush on top of the already wetted section of the deck, to a

layer 2…3 mm thick. If the deck is not fully level, the epoxy has to be thickened more, so that it will not run.

Now, you take the pre-wetted teak ribs and place them into their original locations. I used some cocktail sticks in the screw holes as guides. Then, put a sheet metal screw into each screw hole and slightly tighten them to fix the rib into its original place and form. Before tightening the screws, adjust the rib so that the seams are about equal between the ribs.

The long ribs on the side decks often have a curved form which has released its shape a little and will have to be bent back slightly when putting the rib into its original place; this can be easily made by hand, starting with screws at one end of the rib, and proceeding to the other end.

This way, each rib goes into its original place and is fastened temporarily with new screws in the original screw holes. I used 4.2x19 mm flat head sheet metal screws here: they were long enough to bite a little into the old holes in the glass fiber. Tighten just enough that some epoxy will ooze from under the rib.

You may have to add some more screws in places where a rib lifts up from the deck, not setting onto the epoxy. Drill a small hole into the teak rib and use some self-tapping screws there.

NM and West both suggest placing the flat head screws into the seams to hold the planks /ribs. This probably works well when you are doing an all new deck. When putting back the old teak, you might just as well use the existing screw holes.

Seams:

I filled the seams between the teak ribs with blackened epoxy, right after laying the ribs of the section. My thinking there is that when you fill the seams with epoxy when the epoxy used for gluing the ribs is not yet completely cured, the epoxy poured into the seams will adhere with the epoxy at the bottom and the total will be mechanically stronger. The time window for filling the seams is around 1 hr. with West 105/206, depending of the temperature.

For filling the seams, prepare a batch of epoxy: use graphite powder as color and UV protection, and silica for thickening it to ketchup. If the deck is not level, the epoxy has to be thickened more to prevent running, all the way to consistency of mustard for steep sections.

Use a large syringe to fill the seams between the teak ribs with the epoxy, so that the seam is a bit (1 mm) over the top side of the ribs. Do not leave air bubbles in the seams under the epoxy. It pays off to be careful here because fixing the bubbles and holes after the epoxy has cured gets laborious.

I used a flushing syringes from a pharmacy. I tried a dispenser for building caulking material but it did not work: the epoxy, when in a larger lump, heats itself too warm and sets solid, glogging the dispenser.

..and the same again:

When you have completed the selected section, take a new one, mark its border, and then do the same again. Preferably proceed so that the epoxy at the previous section has not yet completely cured, i.e. within the 1..2 hr time window. Short coffee and snack breaks are ok, but if you stop for the night, you will have to sand and clean the dried epoxy at the seam next morning, before continuing from that point.

Doing the epoxy gluing alone by yourself works quite ok, even if a bit slow. Two doing the job is optimal: one is spreading the epoxy and laying the ribs while the other one is preparing new epoxy batches, tightening the screws etc. This makes the progress swift, and you can avoid unnecessary seams.

Finishing touches:

When all the ribs are in place and seams filled, let the epoxy cure for 2...3 days. Then you can finish the work:

Loosen and remove the screws that kept the ribs in place during the curing.

Drill each screw hole open with a 10 mm wood drill bit, through the the teak rib (5…6 mm) to the top of the glass fiber deck but no deeper. Do not drill into the glass fiber.

Use vacuum cleaner to remove all debris from the drill holes.

Get a cupful of 10 mm teak plugs.

Mix a few spoonfuls of epoxy, thicken it a bit to consistency of ketchup.

Seal every screw hole with a teak plug: dip the bottom of the plug into epoxy to take a drop of epoxy with the plug, and place the plug into the drilled-open screw hole (I used electrician's nose pliers to handle the plugs) and tap it lightly into place. The drop of epoxy will seal the screw hole at the bottom, and will keep the plug in place. The 30 min. pot life of the epoxy lets you put 50...100 plugs into place.

Let the plugs set for 2 days. In the meantime, you may finish the perimeter of the teak against toe rail and cabin walls with Sikaflex.

When the epoxy has cured, you can carefully cut away the tops of the plugs to the level of the deck; I used the Bosch Multitool here.

Peel off the masking tape that has covered the teak ribs. Part of tape is stuck under the epoxy from the seams and will be removed when sanding the deck.
Cheap masking tape that has been in place for a longer time leaves a sticky residue on the ribs; this will bind some epoxy dust when grinding and will show as grayish spots on the deck. The glue will dry in the sun during the first season and can be removed next spring by a light sanding.

Sand the epoxy in the seams and eventual minor irregularities in the teak level with the rest of the teak. Use a belt sander and work carefully into the direction of the seams, not across them. I cut the highest spots and lumps of epoxy in the seams first down with the Multitool.

Use a dust suction system with the sander, to prevent the blackish epoxy dust from spreading all over the place.

Alternatively, one might use an angle cutter and a lamell disc for grinding: it is faster but the dust will spread into every corner and locker of the surroundings. Secondly, the grinder may open up some of the seams.
Then, vacuum clean the deck and wipe of the rest of the dust and residue with rags and acetone. Remove the protective covers and clean the whole boat.

After grinding and cleaning, you can go through all the seams and use small batch of epoxy to fill any minor cracks, holes and bubbles that were left without filling in the first phase. Let these cure and then sand those spots smooth.

Then, the bolt holes through the teak are opened carefully with a proper drill bit. Now you can re-install the fittings, stanchions, genua rails and all the other stuff that was removed at the beginning of the work.

..and that is it - almost:

At the end of the first season, you may check the epoxy seams for empty spots, air bubbles etc. and refill them with graphite epoxy. Then you may sand the deck slightly, to remove the last smears of epoxy and other irregularities.

I have not used any oil or chemicals treatment on the teak deck of my boat: the teak gets a stylish grey color (as does the skipper) and is easy to maintain. Secondly, I do not need to worry about the possible impact of different chemicals to the seams of the deck. I rarely wash the deck, either, except after a visit of some ill-mannered seagull.

Time and money..

It took me overall some 15 working days to practice with the rear deck. Front deck, including the sandwich deck repair, took some 20 working days, and the cabin top another 10 days. I worked alone; having an assistant will cut down the glueing and finishing times substantially.

If you take the teak planks up in the fall at the end of the boating season, and prepare the deck surface early, you can prepare the teak during the winter and install them in the spring as soon as the temperatures allow. That way, you have not lost too much of the sailing season. On the other hand: you do this repair one time for the next 10…15 years.

Money used for the 20 m^2 deck area:
- Epoxy (4 canisters), Sikaflex, screws, tape, teak plugs, other necessities: abt. 1200 €
- Hobby planer/thicknesser, belt sander, Multitool, other tools: abt. 800 €,
(I did not go trying to borrow the tools, because especially the epoxi work will smear them anyways).

..plus some replaced fittings, stanchion feet etc. which are not counted for here.

Health and safety aspects

Grinding and epoxy work are not free from health hazards:

- Glass fiber, gelcoat and teak dust is harmful to your lungs and respiratory system: use protective filtering and dust removal systems when sanding the deck or working the teak

- Epoxy and particularly the hardener fumes are harmful to your health: use proper respiration protection mask with active carbon filters.

- Epoxy dust causes eye irritation and inflammations: protect your eyes when sanding the epoxy.

- Use protective gloves on epoxy work: the thow-away surgical gloves in 100 pcs packs are practical.

- Take care of sufficient ventilation: Do not work in a closed tent, but lift the skirts of the tarpaulin up when you work on the boat. To protect the curing epoxy from moisture, pull the tarpaulins back down for the night or eventual rain.

- Using an angle grinder is not risk-free, especially when working in an un-ergonomic position on your knees on the deck. Do not use these machine tools when you are tired. The belt sander is safer.

Summary

The deck is now sealed watertight.

The work can be done by a hobby worker: there are no overly complex stages in it. Quality of work is quite ok, when you reuse the existing teak material.

The work is not irreversible: If recycling the teak would prove to be impractical, for some reason, you may always peel the teak away and put something else on the deck: a new made-to-order teak module, teak imitation, paint or similar.

When in place, a 5 mm thick teak rib can be sanded a couple of times when the surface starts to show signs of wear.

The recycled teak deck on my boat has been in place now for 5 seasons: it still looks ok and does not leak anywhere. Overall, I'm satisfied with the exercise.

Plan B:

If the 10 or so first teak planks refuse to come up intact, it is time to consider a 'Plan B':

- take up the planks and remove the screws anyway

- clean the rubber cement residue from the deck and sand it clean

- seal all the screw holes with epoxy.

Now you also can check the deck for eventual water intrusion into the sandwich material, and repair where necessary.

Then you may consider your options:

- Take cardboard or plywood, prepare patterns of the teak deck sections, and order ready-made teak sections. These you can glue to the deck with proper adhesive, and you have a 'new teak deck';

- use a teak imitation material (FlexiTeek, TekDek etc.) to build a 'look-alike teak deck';

- take Treadmaster or similar anti-slip material and glue it to the deck;

- paint the deck with an anti-slip paint.

In each case, you still have a functional deck, and all the screw holes have been sealed.