

## **An overview of replacing the fuel tanks in a 1984 Island Gypsy 36 Europa**

A retrospective from May 2023

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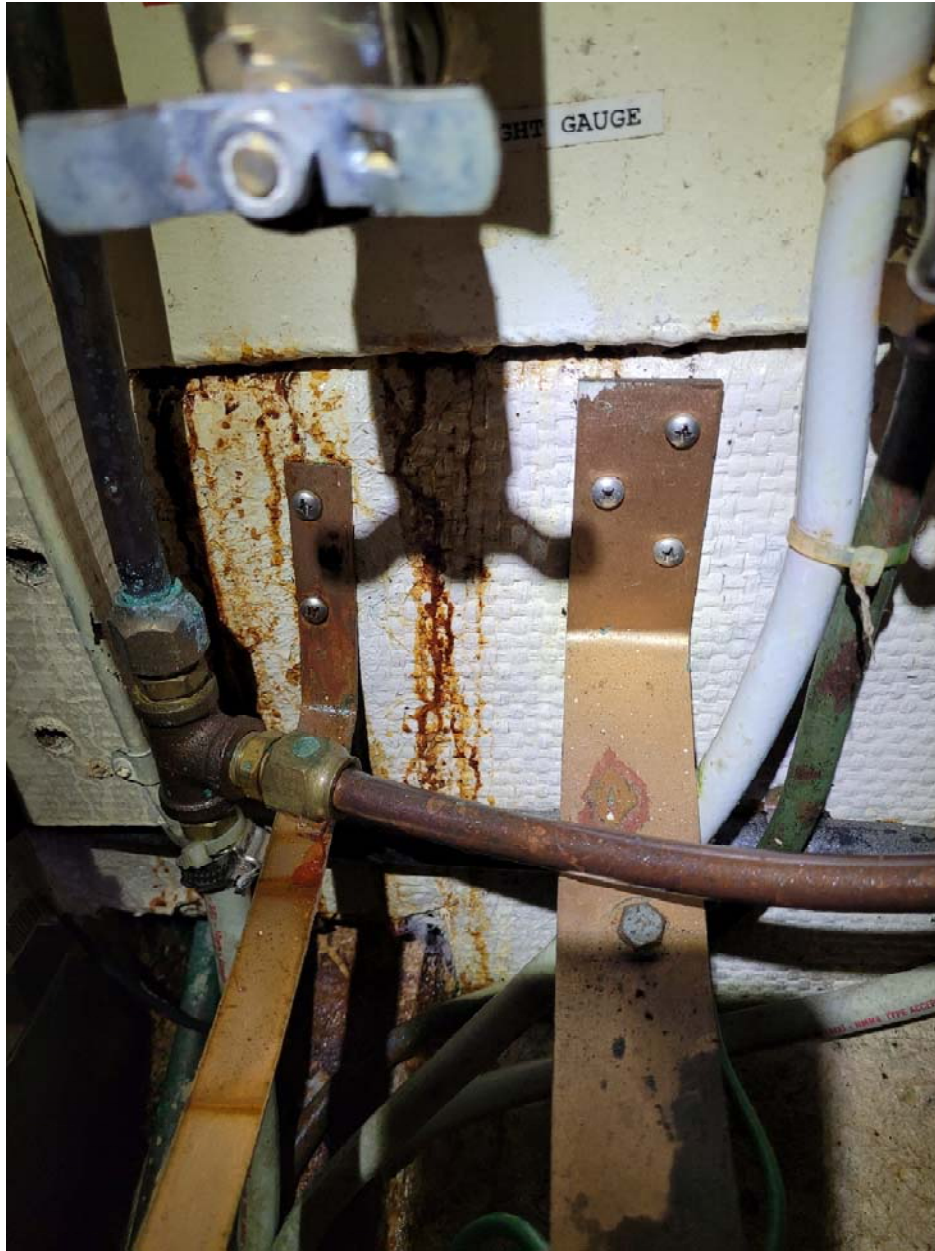
This is a condensed “exec summary” version of a surgical tank replacement project approach for a smaller trawler. Offered as food for thought in case others want to consider it.

The tale begins thusly...

I have an Island Gypsy 36 Europa, built 1984 in Hong Kong. Power is twin Lehman 135s & a Westerbeke gen. I’ve been her 3<sup>rd</sup> caretaker since purchasing her in 1997.

This story starts in fall 2020, when I first noticed this weeping from between the Stb fuel tank and the stringer it sat on...

The discovery caused chills along my spine...



I'd pretty much prefer almost any other problem than this. I have friends who worry about engine problems. Heck, engine problems are easy in comparison. Engines can be taken apart, rebuilt and reinstalled.

The fuel tanks were dropped in before the deck was placed on the hull. There's just no easy way to replace them. You can't even see all sides of the tanks. Calypso's fuel tanks are 225 Gal each. One port, one starboard.

So, I began to research solutions to the problem. Can't patch them (at least I didn't discover what I would consider a reliable method to do so), can't line them (baffles prevent an inside bladder approach).

Frankly, I didn't much like what I learned and spent around 6 months in denial.

Fuel tanks can be self-healing – right? Right?!?

I found that if I kept the Stb fuel level below ½, the weeping stopped. That bought me time and let me get some local cruising in during 2021.

### **Project approaches**

There are a couple of ways to deal with this problem...

1. Sell the boat (at a fire sale price). Calcs said that I'd get less for her in this condition than I'd get for parting her out. Then I'd have to pay to cut up the hull and dispose of it. Emotionally, I was not ready to take that approach.
2. Cut out the old tanks in pieces, install multiple smaller tanks and interconnect them. This results in a loss of capacity and all the interconnections are potential points of failure. This also requires disassembly of much of the engine room equipment to gain tank access – lots of time & labor (\$\$) involved.
3. There is an outfit I found in Fla that brings two semi-trailer rigs to your boat. One has material and a CNC plasma cutter, the other generators, welders and AC to cool the engine room while they work. They will cut out the old tanks and then build new single piece tanks in place. Then they test and cert the tanks and away you go. They'd even work on the west coast – I'd just have to pay the travel costs for 2 semi's and the associated lodging costs for 2 way travel and the job time. Turned out not to be cost effective for my location in San Francisco Bay.
4. Replace the tanks with new, custom one-piece tanks. No capacity loss, more reliability, less work within the engine room (no pulling engines, gens, etc.). The challenge is getting the old tanks out and the new ones installed as one component.

### **Researching Yards:**

During winter 2022, I took Calypso to essentially all the major yards in the San Francisco Bay and discussed how they would solve the problem. I requested formal quotes for the job. Some yards said they didn't want to do tackle the project – they get points for honesty. One well respected yard quoted an absurdly high price (\$75k+) without an upper bound on the possible cost; it was a “we don't want this job but won't say so directly” quote. I figured it was good to know their business approach - as now I know I'll never be doing business with them (for anything).

I considered taking Calypso to Baja Naval in Ensenada (lower yard labor rates). The extra logistics involved with a long-distance project made that unattractive to me. I also didn't want the risk of the trip with leaking tanks.

I ended up with 3-4 bids. Two were Time & Materials estimates w/o an upper bound on the costs. Two credible yards provided detailed bids on a “not to exceed” or “fixed price” basis.

One proposed the multi tanks approach, and one proposed removing the tanks through the sides of the hull. The two quote amounts were within a couple percent of each other.

By spring 2022, I'd decided that the Custom one-piece tank approach was the best choice for me. At first pass it was really scary to contemplate - as it involved cutting 6' by 3' holes in each side of the boat.

I'd never do that with any random yard. Getting to know the skills of the yard and the owner got me past that. I have a friend who has known the yard owner for many (30?) years. The yard's expertise includes building 40+ ft carbon fiber racing sailboats from scratch. I was able to inspect those projects to see the quality of their work. The yard had also done the tank replacement project several times before. Their quote was virtually the same cost as the multi-small-tanks approach.

A big factor for me was that when all done, I would have freshly repainted topsides (a topsides paint job in this area runs around \$300-\$350/ft, or \$11k-\$12.5k, as a standalone task). That would make a huge appearance difference for my 38-year-old trawler.

By March / April 2022 I'd decided to go ahead and do the project. Well, I decided to pay to have it done. This was not a DIY project for me. It requires "heavy lifting" equipment, custom fab metal work and expert lamination skills.

The soonest I could get into the yard schedule was June. That's meant Calypso would be out of commission for the summer of 2022. She'd be at the "spa" instead.

I didn't find many online stories of this approach to tank replacement. It seems a more common approach on larger vessels (often for engine swaps, to meet newer engine emission standards).

A tidbit: I've found this makes for an interesting YC bar topic for the boating addict. Now that I have some carbon fiber in the hull, I can join in the bar talk with my rag bagger friends about how Calypso is noticeably faster and more efficient etc. 😊

OK, on to the **project steps** –

After hauling out, it was time to locate the tanks precisely. This involved careful measurement, and judicious drilling of location reference holes from inside. This transfers the tank location to the outside of the hull.



Next you prepare to remove the patch area to get to the tanks. This starts with grinding a wide (compared to the cut line) shallow Vee, centered on where the cut will eventually be, into the hull. The wide Vee becomes the area that provides the scarf ratio for later re-lamination.



Here is the port side before plug removal:







Here's the section that was removed:





A blend of brute force grunt work and finesse is involved in removing the plugs (stb side pic) due to internal bracing etc. Note: secondary FRP bonds are way easier to break than one might expect.



The access hole made seeing the core problem easy:





Combine 38 years, a suspected past leak at the deck fill fitting, steel tanks, and this is the result:



The tanks had reached the end of their life – they were terminated with extreme prejudice.





With the old tanks out, you get some uncommon views.... I could literally stand on one side and see out through the opposite side of the hull.



Moral of the story? That little bit of caulking around deck fills is really important! It's much easier to redo it periodically than to replace tanks! You can bet we re-bedded all the deck (fuel and water) fills.

The replacement tanks are works of art:



Here's the test fitting of the port tank:





The tanks were then epoxy coated, installed and secured:





Lots of other major maintenance tasks got done “while we’re here”. Ex: new exhaust hose runs to the transom.



I also improved the tank connections. Calypso has a fuel polish system I added to the original fuel plumbing. She now has independent polish system draw and return fittings in the new tanks. The old sight gauges did not let you see the level at the top and bottom of the old tanks. The top is not much concern... but the bottom is where you really want to know the fuel level. A sump was added to the new tanks to make drawing for the polish system the lowest point, and the sight gage fitting is there too, so the bottom of the sight tube starts below the bottom of the tank.



I replaced (90%) of the original hard copper fuel tubing with A1 rated hose.

Fast forward, lots of other things get done along the way... I'm convinced yards have a magic customer scanner which checks to see how much money is left in your wallet each time you visit a yard.

Eventually you turn the corner and start putting things back together.

There was lots of prep work to replace the plugs – added internal bracing to hull stringers that had to be cut to remove the plugs. The liberal use of a 2000 psi adhesive bonds the plugs to the new supports (located between the tanks and the hull). Then it's ready for re-lamination.

Here is the port plug initially replaced in the hull.





Then re-lamination is accomplished. Afterward fairing and prep for painting gets done:



This pretty much completed the major tank replacement work.

As of Late Oct 2022, I thought I could see the finish line (it was part mirage).

The next steps were (some would be done in parallel):

- finish up some engine room plumbing,
- do some periodic engine maintenance tasks, stuffing box service etc.
- topsides primer, then Awlcraft topcoat,
- bottom job,
- launch and then adjustment and testing of all systems touched while in the yard.

It all took longer than expected/ desired. During 2022, the supply chain problems were still real. Simple things caused disproportionate delays. Fuel hose was an example – we ran out and it took a several weeks to get more as it was not in stock anywhere.



I filled the tanks on the hard from a tanker truck brought to the yard. That got the fuel for a wholesale price. Great! I thought... You can thank me personally for causing world fuel prices to start dropping 2 weeks later. It's like washing a car – it won't rain until you wash it.

Calypso was relaunched Nov 28<sup>th</sup>, 2022. Here's a pic of her just before launch:



Now there were a few days of punch list items to finish up, and testing for all the systems that were touched during the project. I finally got her back in her home slip in early December.

Elapsed project time? Well, way longer than expected (Sigh, it's a boat yard project). It was 6 months elapsed until relaunch; a tad more by the time she was back home. Then I had to restore all the stuff which I'd removed that had been in storage during the project.

Finally, by Mid December 2022, she was back at her home slip:



This summary leaves out many details (how the tanks were mounted on closed cell foam to isolate them from moisture etc.). If someone is curious about other aspects of the project, let me know.

'nuff said...