

QUICK VOLVO ENGINE OVERHAUL BY JOHN HASKER

When the majority of us come to start our yacht engine, we carry out a few simple checks, then turn the key/press a button, and wait for the reassuring sound of the engine bursting in to life. So how long do you wait for your engine to start? A couple of seconds, time to count to 10, or are you still waiting having sung all the verses of 'Rule Britannia'? Although I wasn't singing, I was well aware that our Volvo 2002 engine seemed to be taking longer to start than it did last year.

All diesel engines require the injectors to work well and atomise the fuel in to a fine mist for the combustion to take place, and as removing the injectors is a relatively simple procedure, this is what I did first. However, when the injectors are returned with a note saying 'nothing wrong', its time to think again.

The other requirement for a diesel engine to start is good compression, in order to increase the temperature of the air in the cylinder to ignite the injected fuel. If the compressed air fails to reach the required temperature, this doesn't happen.

Engine compression can be tested with a relatively simple instrument, although at about £800, not many people own one. It took several days to find out who did own one in Weymouth, and to get the test carried out. The workshop manual gives a range of required pressures at cranking speed, and our engine was far short of the required pressure.

Loss of compression can be caused by several things, air is leaking out past the valve seats, past the injector, past the piston rings, or even out through the cylinder head gasket. Overhauling the cylinder head can usually be done with the engine in place,

but to re-new the piston rings will mean that the whole engine will have to be moved and turned on its side to get access to the connecting rod and crankshaft.

Reading the workshop manual gives instructions to remove the engine from the boat, take apart the timing gears, oil pump, speed control lever etc before getting to the sump and cylinder head, which has to come off in order to remove the piston/con-rod assembly. All I wanted to do was remove the sump and cylinder head, could I leave all the other bits alone? And do all this in the boat?

Yes, I could. After several long conversations with various marine engineers it seems that providing you are careful and don't drop bits in the timing gear case, it can all be done in the boat. This is what I mean by 'quick', you don't have to take the engine ashore, or take it all apart, just take off what's necessary, carry out what's required and reassemble the engine.

So much for the preamble, now to the nuts and bolts bit, well, almost. Just a thought about how to look after the cabin deck, cushions, table and other carefully looked after bits and pieces. What is required is enough SPACE to carry out the work on the engine, without leaving any long lasting scratches, gouges etc or any other semi-permanent reminder in the cabin. Out came the table, that went home. Then cover the cabin deck with plastic sheet, followed with cotton sheeting and finally thick rubber mats. Old car mats or door mats, will do well. The engine oil needs to be drained out at some time, and as its easier to do with a hot engine, now is the time to do it before we start removing bits and pieces.

I was told by some people that to move the engine, all that's required is to disconnect everything, then just push it forward and it will scrape along on the plates of the flexible mounts. Not keen on this 'scrape along' bit, I prefer to 'lift-swing-lower' any heavy item, so that it's under control all the time. However, its not possible to get a straight lift on to the engine from the boom, the Bridge Deck gets in the way. So I made up a lifting beam that is the shape of a large 'U' on its side. One side of the 'U' is secured to the engine lifting points, the open side of the 'U' is over the Bridge Deck, and the other side of the 'U' is now directly under the boom for our lifting gear.

There are several items already there for lifting the engine. The main sheet attaches to the 'U' and to the bottom of a rope loop which is round the boom, with the main halyard to the top of the rope loop and the topping lift is brought forward to a point above the engine. With the topping lift made off and the main halyard lead to a winch it's all ready for lifting.

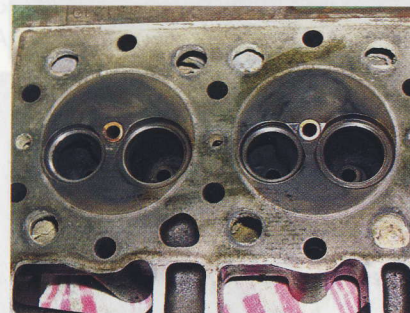
Disconnecting all the cables and pipes can take some time and there are some things easily forgotten. The battery negative connection and the fuel return line being two of them. The exhaust hose can be difficult, it may be easier to take off the complete exhaust elbow than try to ease off the hose itself. Although I've said engine, we are taking out the engine and gearbox together, so removing the bolts from all four flexible feet is what we must undo. Shut off the fuel tank before taking off the fuel supply line, after all, we're only taking out the engine today, not draining the fuel tank..... Also after removing the fuel pipe give some thought as to covering up the open connection. There is a fine filter on the engine but look after it and at least wrap something over the fuel connection.

Lifting out the engine-gearbox assembly is obviously something best done with two of you, this I leave to you to sort out which friends, relatives you plan to coerce into assisting you, but eventually the assembly will be there, by itself, on the cabin sole.

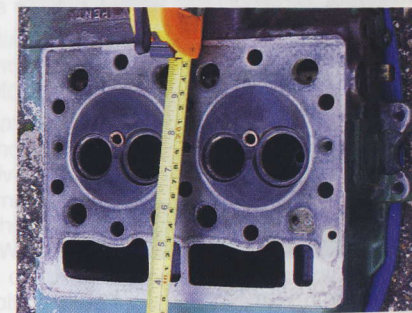
Now is a good time to think about what else we could do as the engine is in an easy-to-get-at position. Check the engine mounts, easy to do now, and the gearbox spline connection, does that need doing? Also the oil pump pressure relief valve spring can be taken out and checked for length. The correct length is given in the workshop manual. The starter motor could also be taken off and checked, likewise the alternator, although the alternator could be done with the engine in its normal place.

Removal of the cylinder head starts with the rocker box and rocker gear coming off, and then lifting out the pushrods, but only after we have somewhere to keep them in their correct order. A piece of card with four numbered holes in it will do. As the engine may end up upside down, I pushed a piece of cardboard tube down to keep the camshaft followers from dropping out. The followers are located above the camshaft and at the bottom end of the pushrods, they simply slide up and down, but the cardboard tube will stop them falling out and getting muddled up.

The cylinder head bolts also need to be kept in the correct order on another piece of card, so that they can be correctly replaced during assembly. Once the head is off we can then use a valve spring compressor to remove the valve springs and collets and then get the valves out of the head. Now all the valves and their seats can be inspected.



Cylinder head showing re-cut valve seats

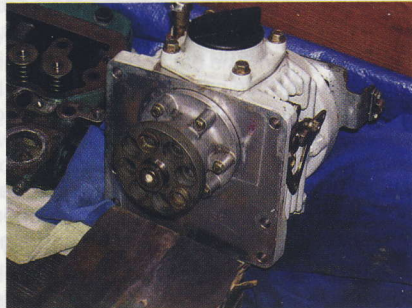


Cylinder Head showing pitted exhaust valve

Should we just grind in the valves with fine grinding paste, or renew all valves and get the valve seats recut? The photos show the valve seats before and after they were cut, and as new valves are only £30 each, with the new valves and re-cut seats only very light

grinding was required. To check the sealing of the valves leave the head upside down with the valves and springs fitted and put paraffin in the combustion space. If the paraffin does drain out overnight, the valve needs further work.

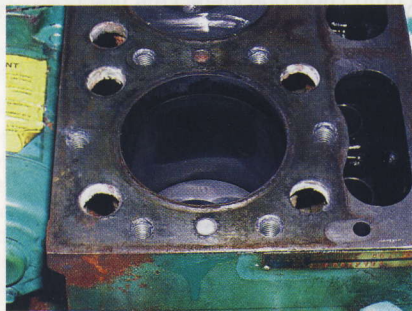
A lot has been written about the gearbox input shaft spline failure, so if your gearbox has not yet been modified, now might be a good time to do it. Our gearbox had the modification done 6 years ago and the damping sleeves that fit over the Allen bolts were still in good condition. After the gearbox is off, the starter motor can be removed then the flywheel. This leaves the flywheel casing to take away before we can take off the sump. As we have not taken off the timing gear casing, there are two lots of bolts to remove, the sump set and those securing the timing casing to the sump. The sump set will include bolts and guide sleeves for the crankshaft forward and aft main bearings.



Gearbox input shaft, showing damper plate and sleeves

Once all these bolts are out, we can get the sump off and get to the con-rod bolts. The crankshaft centre main bearing will keep the crankshaft in place but we need to be very careful when cleaning up all the joint faces that no 'bits' fall in to the timing gear spaces.

With the cylinder head off and the sump removed we can now remove the pistons and con-rods. Note that the top of pistons are marked with an arrow pointing to the camshaft side of the engine and the con-rod caps are numbered with their con-rods. As we are going to remove the glaze from the cylinder bores by using a honing stone, its a good idea to cover up the crankshaft bearing surfaces to keep them clean. The photos show the cylinder bores before and after treatment with an oiled honing stone, the final dull matt grey surface giving plenty of roughness for the process of bedding in the new rings and providing minute oil reservoirs for sealing the piston rings which in turn gives good compression. There is no point in renewing the piston rings without removing the glazed surface of the bores.

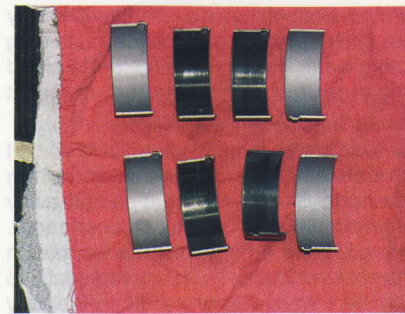


Polished cylinder bore, not what we want



Only forward cylinder bore has been honed so far

We can now check all the new parts and start re-assembling the engine. The workshop manual gives details of piston ring gap when in the bore, and clearance when fitted in the piston and don't forget the 'top' mark on the piston ring when fitting it. A valve spring compressor is used to squeeze the piston rings in to the piston grooves as the piston is offered up to the bore.



Old and new bottom end bearing shells



Old and new flexible mountings

The crankshaft bottom ends can be checked for ovality, it seems strange that these well lubricated bearings can actually wear, but they do, and its easy enough to fit new bottom end white metal bearing shells. A decent torque wrench is required to do up the bottom ends, in the two steps as given in the manual. After tightening each bearing on the crankshaft, just make sure it can be turned by hand and that nothing has bound up. A new piece of jointing will be required at the front face of the sump and also a tube of RTV jointing for the mating surfaces of the sump. Don't forget that the sump casing holds the crankshaft main bearing shells in place, so care is needed with the sealant. After fitting a new seal and 'O' rings the flywheel casing can be bolted on and tightened up.

With the engine the right way up, the flywheel, starter motor, cylinder head can all be refitted in turn, using the manual for details of correct tightening torques. Getting as much as possible back together before putting the engine back in place gives us more space in the cabin and also a chance to give the engine bay a good clean while its accessible. The threads in the holding down bolt pads were also cleaned up using a thread tap. Giving the flexible mounts a good twist revealed that both front mounts were cracked, so time to renew them.

Now the head is back on the rocker gear can be fitted, not forgetting to set the tappet clearance, before the rocker box cover and lifting lugs are bolted up. Before replacing the gearbox its now easy to get to the drain plug and so drain the gearbox oil rather than sucking it out. Draining will get out anything sitting in the bottom which will not happen by simply sucking the oil out. Once the gearbox is all bolted up then its time to consider the flexible mountings.

As we replaced the two forward flexible mountings, the alignment will need to be adjusted, so slacken and just nip up the nuts that adjust the vertical alignment before replacing the engine.



Reassembled engine, note slot in mounting plate and rag tied round fuel pump banjo bolt

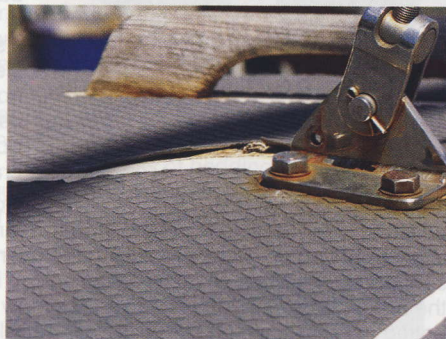
The plates that bolt directly to the bearers have a hole at the aft end and a slot at the forward end. This allows the engine to swivel and move side to side if required during engine alignment. Using the nuts on the four mounting plate studs, the up and down position of the engine can be adjusted. What we are trying to achieve is that the two halves of the coupling are parallel to each other and in line before bolting them together. This is another job that is easier with two of you, one each end of the engine to make the adjustments as necessary.

Now its just a question of bolting on all the engine connections, speed, stop, fuel supply and return, seawater supply, exhaust, battery positive and negative, control panel multi-plug and the exhaust pipe. A few liquids, engine oil, cooling water, gearbox oil and fuel to bleed through fuel system before we can start the engine. And start it does, far quicker than it did before and has now done so all season.

In doing all of the above, I was fortunate in several ways. For recutting the valve seats I was charged an hour's labour and I was able to borrow a honing tool for the bores from the same engineer. A word of caution with the honing tool, its easy to get carried away with this and remove too much of the bore, we only want to take off the glaze, no more. I also have my own workshop manual, torque wrench, valve spring compressor, piston compressor, molybdenum grease, vernier micrometer, welding set, used for making up the lifting beam and a good selection of hand tools. There were delays waiting for delivery of parts through the post, also one piston ring was received in a broken condition, more delay. Several local Volvo suppliers would order parts by post, so it was just as simple order parts myself through Volspec, although there may be a handling charge. However, I now have an engine that starts easily, runs well and should only require simple annual maintenance for a few years yet.

BABY STAY BULGE BY GRAHAM AND TANYA LEECH

Walking across the foredeck of our Corsair (CS118), *Thursday's Child of Lee*, I suddenly noticed a great bulge in the deck around the baby stay. My heart sank – yet another problem to add to the growing list. We'd laid the boat up ashore in a yard in Tahiti for longer than we'd intended, and in our absence, this bulge had appeared. Everything in Tahiti is expensive, the yard wasn't great and we didn't have time on our side, so we decided to re-launch and carry on sailing westwards towards our intended destination of New Zealand.



Baby stay bulge

The sailing should have been largely downwind, but in fact the tradewinds deserted us for much of the next three months, and it was our 20 year old Volvo that we ended up nursing along to keep us moving through days of flat calms, rather more than the rig. Our stressful moment came on the 1200 mile passage from Tonga down to New Zealand - a trip renowned for giving most crews a gale. With just 200 miles to go, our friendly weather guru on the SSB gave us a forecast of 40 to 45 knots.....We rigged a line from one of the forward deck cleats, around the mast immediately above the first set of spreaders and back down to the other deck cleat, tensioning it as tightly as we could. It meant we couldn't tack without rolling the genny first, but that was the least of our worries! We simply had to get the boat and the rig to New Zealand in one piece. When it comes to boat repair facilities and



The woefully inadequate backing plate was pulled right up through the GRP

expertise, there's simply no contest between tiny Pacific islands and the great sailing nation that is New Zealand.

In case you're wondering just how we managed to rig this line whilst bouncing around in about 25 knots, the solution was to stand in the aft end of the cockpit and throw a heaving line forwards (downwind) over the spreaders. In the absence of a monkey's fist on board, we grabbed the nearest object of sufficient weight, but reasonably soft – in our case this was a plantain (a type of banana that is eaten cooked).

It was with immense relief that we arrived in the Bay of Islands and a week later, in an excellent boatyard in Whangerei, we were able to make a full investigation of the problem. Removing one of the headlining panels in the forepeak, revealed a pitifully small backing plate beneath the baby stay and the boatbuilders were critical of the complete lack of strengthening members across the foredeck to tie this area into the main structure of the hull.



Graham on the foredeck by the safety line we rigged

The solution is to cut the damaged section out of the foredeck, add strengthening cross members and make good the deck, Treadmaster and so on. Fortunately, we think the work can be carried out without interfering with the joinery of the forward heads compartment, but its still quite a major job that's going to dent our cruising budget. We're also lucky that the work will be carried out by structural GRP specialists who are experts in this field.

But our advice to other owners is to check the structure of your foredeck beneath your baby stay. It only takes 10 minutes with a screwdriver to remove the headlining panel just inside the forepeak, and see how much, or how little, support this vital element of your rig has. For 20 years we ignored it, but without any warning, the deck failed.

David Symonds (another Corsair owner) says:

This is a known problem with Corsairs (and other Westerlys with baby stays) but it is normally limited to some minor lifting. This is clearly an extreme case and, unless there is a defect with the deck, is caused by excessive tension being applied to the baby stay itself. Experience indicates that one of the most likely causes is by cranking up hard on the backstay at some stage. It is relatively easy to pull the masthead rearwards which puts a severe strain on the baby stay.

The role of the baby stay is to prevent the mast inverting when under heavy load. Early Westerlys had two forward lowers and a baby stay was fitted as a cost saving measure. One permanent solution is to replace the baby stay with two forward lowers attached to chain plates bolted through the deck to the saloon forward bulkhead. John Easteal's article in Edition 77 shows this permanent solution which definitely cures the problem in an elegant, but simple and straightforward way. I have carried out the modification, which incidentally also makes for easier tacking and frees up space on the foredeck.

Editor's note: Two other Corsairs had the same problem and one had a stainless bracket/backing plate made that attached to the heads/forward cabin bulk head. (This is how the