

# Replacing a cylinder head and servicing injectors

Geoff Higginbottom rebuilds his engine with a new cylinder head while Stu Davies demonstrates a DIY injector service

**PART  
2**

In part 1 of this article last month (available on [pbo.co.uk/engine\\_surgery](http://pbo.co.uk/engine_surgery)) we followed Geoff Higginbottom as he dismantled his Bavaria 39's 2005 Volvo Penta MD2030 diesel engine to diagnose the reason for its power failure and excessively smoky exhaust.

Geoff discovered a failure in the pre-combustion chamber in the aft-most cylinder, which led him to spend £1,200 on a brand new Perkins head (although Volvo insists its heads are machined differently to Perkins' the fact remains the engine started out life as a Perkins). The Volvo version would have cost 20% more; only time will tell whether that would have been money well spent...

Geoff also took the opportunity to do a full engine service, changing all fluids, replacing perishable gaskets, seals and installing a new thermostat. As part of that service he sent his three injectors off to be reconditioned for an excellent price, but if you're interested in doing the job yourself, turn to page 60 for a demonstration by PBO engine expert Stu Davies.

What we might never find out is what caused the engine failure in the first place. Stu suggests: "The MD2030 has a bit of a reputation of the No3 cylinder having problems. It is the one nearest the exhaust raw water injection point and if any



Pre-combustion chamber insert

The new cylinder head with intact pre-combustion chamber insert visible

blockage of the exhaust or failure of the anti-siphon valve occurs sea water gets back to that cylinder and starts to cause problems like Geoff has suffered. I'd suggest that he checks his anti-siphon valve to make sure it hasn't stuck!"

Geoff confirms: "I believe my anti-siphon is currently operating correctly but will obviously make it a priority to check when I get back on board. I'd noticed when I bought her there were signs of

discharge from the leak-off pipe, which I understand is a symptom of a dodgy valve, but these appeared to be old. I have in fact been running with the pipe detoured into a container so I could monitor for discharge, but there has been none. However I was totally unaware of the importance of this valve and the potential impact."

We pick up the story with the arrival of the new cylinder head...

## ABOUT THE AUTHOR



Geoff Higginbottom grew up sailing dinghies before moving onto bigger yachts around 18 years ago. After gaining his Yachtmaster he bought his own boat

in 2016. A previous career as a Royal Navy Artificer means Geoff is not shy about tackling repairs and upgrades.



LEFT Geoff's Bavaria 39 Tessa Jane ABOVE RIGHT The precombustion chamber insert on the left cylinder has completely disappeared





**1** Here are the old and new heads complete with new valves, new head bolts, a full gasket kit, new cooling hoses, serviced injectors with new nozzles, Molybdenum Disulphide grease which is required when fitting the head bolts, and the original valve rocker gear.



**2** The glow plugs needed to be transferred from the old cylinder head to the new one, and fitted using the correct torque – which is actually quite low and outside the range of my large torque wrench so this small wrench came in very useful.



**3** With the glow plugs and their tie bar installed, the oil pressure sender, oil pipe hollow screw and lifting eye were also transferred and tightened to their specified torque. The new head came already installed with its new lapped-in valves and springs.

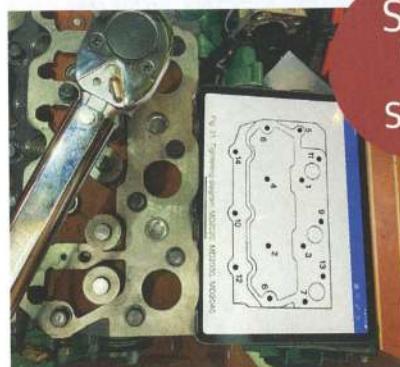


**4** Perkins had been a bit slap dash with their painting and there was overspray on the head mating surfaces which needed to be cleaned off. Not having a chemical paint stripper to hand, and concerned it may damage the surface anyway, I used very fine wet and dry to carefully clean all the paint off, going down to 2000 grit to leave a perfect finish.

**5** With the head now fully prepped my attention turned to the block. I spent well over an hour cleaning this to ensure it was free from contamination and that all oil- and waterways were also clean, not an easy process. There was some stubborn debris on areas where the gasket did not make contact but this fell into the category of 'good enough'. There was no need to use any form of gasket sealants as the new gasket is pre-treated and must be fitted to dry, clean surfaces, using the locating lugs at each end of the block.



**6** The new head bolts were then lightly greased and fitted finger tight. There are three bolts that are shorter than the rest, and these are located adjacent to the injector ports.



**7** Having the maintenance manual to hand showed the correct tightening order. Unlike old car engines I have worked on, there was no final tightening by x degrees, just a final torque setting given, so I tightened them in three stages to reach their final torque setting.

Step  
by  
step



**8** With the head now firmly in place the push rods could be inserted and the studs which hold both the valve gear and valve cover installed, using two of the nuts to tighten them. The valve caps were also transferred from the old head as the new valves did not have any fitted.



**9** The valve gear was then fitted, and a long reach socket used to tighten them to the correct torque, before adjusting the valve clearances. Using a ring spanner was a big help as you really need three hands to hold the spanner, the screwdriver and the feeler gauges. I'll need to re check them after the engine has had time to bed in the new valves. ➔





**10** While the raw water pump has nothing to do with a head replacement, as I had full gasket kit I pulled this and replaced the seals, O-rings, and the impeller as part of the engine overhaul.



**11** My attention turned to the main water pump and thermostat. It would be difficult to change the thermostat at a later date because the rear bolt is obscured by the heat exchanger when everything is in place, so now was the ideal time for an overhaul.



**12** The pump housing, adapter plate, hose connections etc were all carefully cleaned, a new thermostat installed, and the pump refitted with new gaskets. The bolts were all cleaned and greased before being put back.

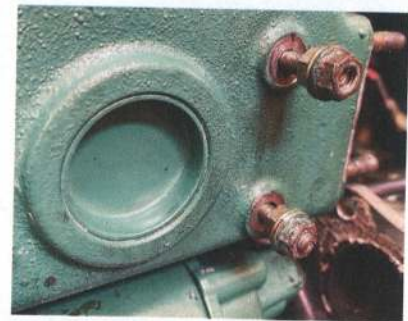


**13** The oil pipe which feeds the head with oil was then refitted, ensuring the copper washers were on the front and back of the banjo bolt.

Step by step



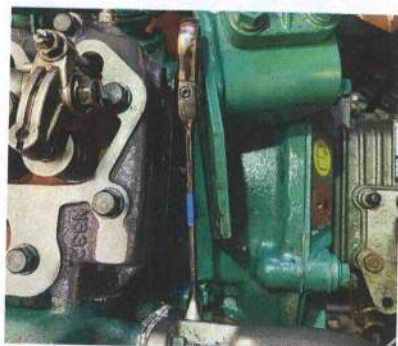
**14** Before installing the heat exchanger, the wire for the water temperature sender was connected, and the larger of the two new cooling water pipes loosely installed (my old pipes were showing signs of cracking). The two studs used on the rear cylinder were temporarily used to locate the new gasket. The gasket was then given a thin coating of exhaust sealant as I like to ensure a good seal is made and none of the nasty gases escape into the boat.



**15** The heat exchanger can then be slid over the studs, and all the bolts fitted after a quick clean and thin application of grease. Opposing nuts were used to tighten the studs on the rear cylinder.



**16** The exhaust elbow then had the old gasket remains cleaned off before I fitted a new gasket with a thin coating of exhaust sealant on both sides to ensure a good seal.



**17** When tightening the elbow is when I realised that having the fuel filter bracket away from the engine body allows easier access to this bottom inboard bolt.



**18** There is also a bracket for the electrical box which needs to be fitted to the top bolt during installation of the exhaust elbow.

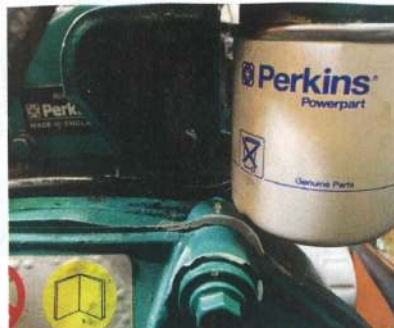




**19** Now I could break out the newly serviced injectors which have new nozzles. Parts4Engines charge £50 for the service and supply of new nozzles, which seems excellent value to me. They came with new copper washers, and the heat shields were included in the gasket kit which was also supplied by the same company (see over the page for Stu Davies' DIY injector service guide).



**20** The injectors were then installed and, given they need a significant 85Nm of torque, my bigger torque wrench was pressed into service.



**21** I now reinstalled the fuel filter mounting bracket. Again, in hindsight, removing the filter first would have made locating the inner bolts much easier – especially as I was going to change the filter anyway.



**22** New rubber gaskets were next installed in the valve cover. The larger one is basically like a large O-ring, and care is required when installing as it's easy to stretch it and end up with excess, so it needs to be pushed in vertically. The other piece is a single straight section, and again needs to be pushed in vertically

and not stretched, so I started from the middle and worked my way to each end. There were some signs of some old silicone sealant where the two gaskets meet, so that was cleaned up and I'm hoping the new ones will solve the small weeping oil leaks which I discovered during the dismantling process.



**23** With the valve cover installed, the remaining plumbing was refitted. In addition to the new cooling pipes, I also installed new heat exchanger end caps and clamps working on the theory that if one of them was showing signs of breaking down, the others were probably not far behind.



**24** When I fitted the new impeller, it was coated with the supplied grease, however I also always top off the water strainer with the seacock closed as this fills the system with water, so the impeller is never run dry. Once the lid is refitted to the strainer, the sea cock can be opened, and a vacuum prevents the water draining away.



**25** After fitting new oil and fuel filters, refilling with oil and adding fresh coolant, the final steps were to fit the fan belt, tighten the alternator, then reconnect the remaining electrics including glow plugs, oil pressure sender and the main power cables.

## Restarting and reflection

I bled the low pressure fuel system then turned it over with the engine stop engaged for approximately 20 seconds to try and get some oil pumped around the system. For the actual start, it took ten seconds of turning over as the high pressure fuel system self-primed before the engine fired into life.

Apart from sourcing new parts, the whole process took two days of actual work. I believe it's well within the capabilities of boat owners who have some engineering know-how, but if in doubt an engineer could assist with just the rebuild to help keep costs down.

