

Fuel injection inspection



Mark Corke

Injectors will often last for years without giving any signs of trouble. If your diesel is hard to start, has a smoky exhaust, or runs rough when idling, it may be due for an injector overhaul.

Story and photos by
Peter Caplen

Given a supply of clean fuel, injectors usually work without complaint for many years. But if at some point the performance of your engine begins to decline—particularly if it has difficulty starting, smoky exhaust, high fuel consumption, or runs rough, especially while idling—the injectors may be the cause. Though they have a long working life, they do eventually wear and need servicing. When problems arise, they can be dealt with quickly and cheaply by removing the injectors and taking them to a diesel-injection specialist.

Removing injectors is a do-it-yourself job, but servicing them is definitely not. The precise manufacturing specifications require specialized



Keeping your engine running at peak performance requires routine maintenance. Top: Injectors are simple to replace; this one's from Yanmar

equipment and a clean working environment. You don't need a marine specialist. Check your local Yellow Pages for a service provider for diesel trucks.

Unless an engine's poor performance is clearly caused by some other factor, always consider servicing the injectors first. Injectors are the cheapest items to deal with and may solve the problem without further expense. Even if the problem is eventually found elsewhere, the overhaul is worth the few dollars it will cost you.

Most engine manufacturers offer

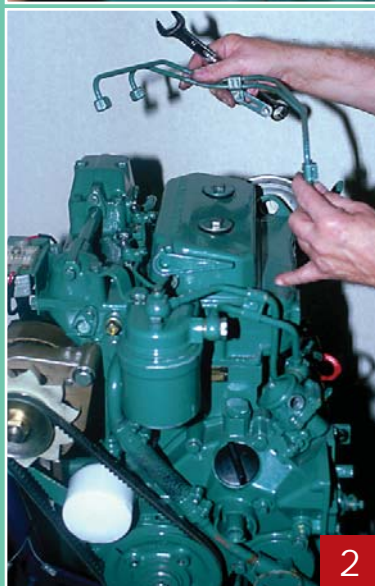
specialized tools for removing injectors, but you won't need one unless your engine is made by Volvo-Penta. Many Volvo engines use a sleeve, rather than the more common copper washer, to seal the injectors. With sleeved injectors, using a special tool that removes the injector while holding the sleeve in place is almost compulsory. If the sleeve has been disturbed, a new one must be installed—a costly job that requires a specialist. Removing sleeved injectors without a special tool is possible, but there is always the risk of disturbing the sleeve. **n**

BW BASICS

1 On this Volvo engine, first remove the high-pressure injector pipes that run from the injection pump to each injector. These are preformed steel and must not be distorted. It is possible to bend them out of the way, but on small engines with short pipe runs, this is bad practice and can ultimately lead to pipe failure. Loosen the pipe fitting on top of each injector and unscrew until free.



2 Do the same at the other end of each pipe, and then unbolt any supporting brackets along the length of the pipes. Once free, lift the pipes clear of the engine.



3 Next disconnect the fuel return pipes running from the side of each injector to the top of the fuel filter. Each connection consists of one bolt and two small sealing washers. Note the position of these washers on each side of the banjo joint (so-called for its vague similarity to the instrument) for subsequent refitting.



4 The injectors are normally fixed into position with one bolt that holds a securing bracket over the injector. Once the bolt and bracket have been removed, the injector-extraction tool is screwed onto the top of the injector. Tighten the nut on top of the tool; this draws the injector gently upward.



BWBASICS

5 Once the injector is free, carefully lift it out. (Note the securing bracket held alongside the injector.)

6 With the injector removed, check for signs of blow-by—gases leaking from the compression chamber—indicated by soot up the side of the injector, corrosion, or other damage. To replace the injector, reverse the removal procedure. Tighten the securing-bracket bolt firmly to the torque setting recommended by the manufacturer, but not too much. Once the engine is running again, check for blow-by. If you find a problem, tighten the securing bolt some more.

7 Lucas/CAV-type injectors are fitted to most other makes of diesel engines. Regardless of the make of injector (Bosch, Stanadyne, and Denso are some brands), the procedures for removing and replacing them are the same.

As with the Volvo injectors, you must disconnect the associated fuel pipes before the injectors can be removed. The return pipes join all the injectors to the return connection on top of the fuel filter and then lead back to the top of the fuel tank where excess fuel and any small quantities of air are deposited. The connection to each injector is the same banjo joint seen on the Volvo.

8 During disassembly, carefully retain the soft aluminum or copper washers used to form a seal between the



retaining bolt and the banjo joint (two per connection).

9 The preformed steel injector tubing must be distorted as little as possible while you disconnect it from the injector. On larger engines with much longer pipe runs, the pipes can be gently eased away from the injectors as the nuts are unscrewed rather than completely removed.



BW BASICS



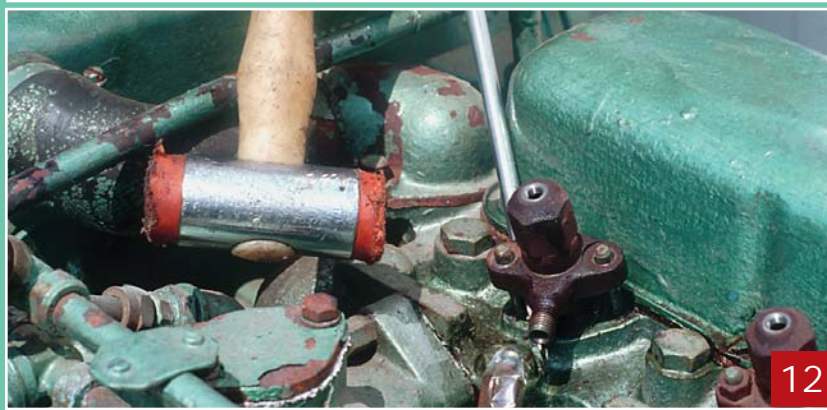
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10 These injectors may be held in the cylinder head with two studs and nuts. Remove the nuts by slackening them equally a little at a time, to avoid distorting the injector. It is good practice to cover the end of the injector pipe once it's disconnected so no dirt can enter.



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11 An injector that has not been disturbed for several years will probably be difficult to remove from its bore, as carbon deposits will have built up around the tip. Apply a generous portion of penetrating oil around the injector body and into the bore to break up any corrosion seal. Let it soak in for a few minutes (or a few hours, if it's really stubborn) before attempting to remove the injector.



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12 A light tap with a soft-faced hammer—or light hammering against a block of wood—around the body is usually sufficient to free the injector. If it is particularly obstinate, you may need to lever it up with a bar under the securing flange while you gently tap around the body. Ensure that the leverage does not distort the securing studs, and do not exert excessive force in any one place. Patience and light tapping will eventually do the trick.



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13 Once the injector begins to move, it can be lifted out of its bore.



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14 With the injector removed, check that the copper sealing washer is still attached to the end of the injector body. If it isn't, you'll find it at the bottom of the injector bore. Hook it out with the end of a screwdriver or similar tool. Be particularly careful not to drop the tool inside the cylinder; you'll have to remove the cylinder head to retrieve it.

BW BASICS

15 Wipe out the injector bore with a clean rag wrapped around a suitable rod; the handle of a socket wrench is ideal.

16 After servicing, refit the injectors. First replace the sealing washer. New ones are generally supplied when the injectors are overhauled. If for any reason new washers are not available, the old ones can be annealed to renew their sealing properties. Heat them cherry red over a stove burner or a blow lamp and then plunge them into cold water. Fit the new washer over the end of the injector body prior to replacing the injector into its bore in the head.

17 Run the retaining nuts down the studs until they are finger-tight, and tighten both equally with a socket or other wrench to ensure a gas-tight seal. Being careful not to distort the pipework, refit the injector pipe connections and firmly tighten the nuts. Also take care not to strip the fine threads through overtightening when refitting the tubing. Just nip them up enough to prevent leaks by lightly compressing the soft sealing washers on each side of the joint face.



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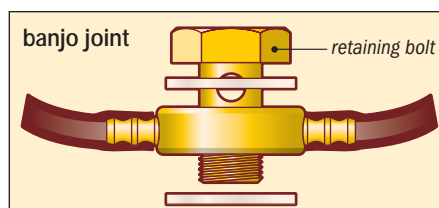


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The ins and outs of fuel injectors

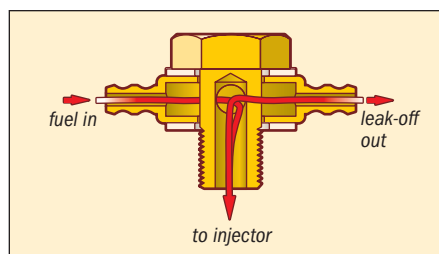
BANJO UNIONS

The retaining bolt on each banjo joint is drilled through the middle and also in the side to coincide with a channel around the inner edge of the banjo itself. This channel has one or two outlets that allow connection to the return pipes.



INJECTOR SERVICING

Once the injectors have been removed, wrap them up carefully, taking care to protect the small nipple on the end. If this is broken, a new end cap will be required, raising the price of the overhaul. The injectors can be taken to any diesel-injection specialist for overhaul. Costs vary, but truck dealers are usually the least expensive.



STARTING THE ENGINE

If there is evidence of blow-by from an injector once the engine is started, the two most likely causes are that the sealing washer has been inadvertently omitted or the retaining nuts have been tightened unevenly. The cure for either problem is obvious.

THINGS TO REMEMBER

Bleeding the system should not be necessary if the injector pipes have not been removed. On small engines where the pipes were removed, simply loosen the pipe connections and turn the engine a couple of times on the starter to fill the injector pipes and clear the air. After the pipe connections are retightened, the engine should start normally. If it doesn't, repeat the pipe-bleeding procedure.

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