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## Finding Oil Leaks

BY PAUL WEISSLER

Illustrations by Russell J. Von Sauers and Ron Carboni

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Your tabby cat crawls into your lap, purring. Nice, but there's a huge patch of smelly, slimy, oily goo covering most of its back. Ick. Backtracking oily little catprints leads you into the garage, where a pool of oleaginous fluid has mysteriously stained the concrete floor. What is it and exactly what part of your car is oozing it? Time to put the cat down and get under the car. But there's leakage all over the engine compartment, and even a distinct pattern of windblown drops freckling the trunklid. Where's it coming from?

Begin by finding out what kind of oil is leaking. You can usually determine the color by putting a few drops on a sheet of white paper. Normally, engine oil turns black. Automatic transmission and power steering fluid is red but may discolor to brown or even be so dark that you can't tell it from engine oil. Washer fluid is blue and antifreeze is, well, it could be green, gold, orange, brown or blue, depending on the supplier. Feel the fluid. If it's very oily, it's lubricant. Antifreeze may have a light oiliness.

Your initial analysis points to oil, but you're not sure about the color or where it's coming from. Start pulling dipsticks. The power steering reservoir is a good place to start if the oil seems reddish. If the reservoir is topped up, and the leak is at the front, check the automatic transmission cooler lines, particularly if they have sections of rubber hose with clamps.



Clean the suspected area thoroughly and dry it. Coat liberally with powder to locate seepage.

If the oil is definitely black and the drops are directly under the engine, it's engine oil, which is the most common leak. But, once again, you're faced with that same question: Where is it coming from? A slow leak follows ribs on the engine block, is blown along the top of gasket joints, and oil gets everywhere. Put a lot of light in the engine compartment and take a look. You might get lucky and see the source. But unless you're sure, don't replace anything yet. A lot of gaskets are not only tough to replace, but they have sophisticated designs that are anything but cheap. It would be a shame to waste a day replacing a costly gasket and still have the leak.

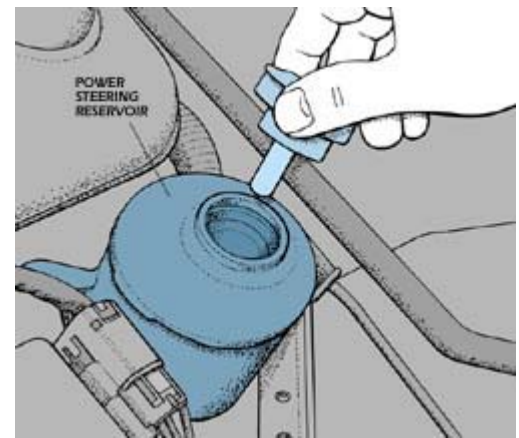
Oil also may be seeping past a worn crankshaft or camshaft seal. The rubber lip that seals to the rotating shaft will eventually wear to the point at which the tension in the garter spring won't keep oil from leaking. This type of seal will only leak when the engine is running--and when it does oil will spray everywhere from the spinning shaft.

Because pinpointing an engine oil leak can be difficult, you should get all the help you can and, fortunately, a method preferred by the professionals is within easy reach: trace dyes with ultraviolet (UV) light. These can be used for all fluids--oils, fuel, coolant, even a/c refrigerants. The trace dye is fluorescent, so under UV light (so-called black light), it produces an unmistakable yellow/green glow. Aim the light, and a small dye stain may show you the source of the leak. The newest trace dyes were formulated in response to complaints from mechanics about low visibility of the dyes and the difficulty of positioning the large UV lamps. Now you can find kits with compact, flexible lamps, improved trace dyes and coated yellow glasses that enhance the appearance of the dye.

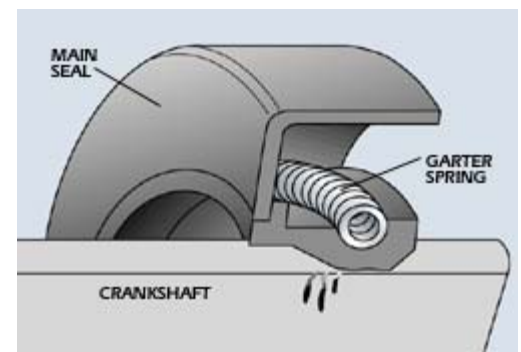
The kits typically include two bottles of dye, one for oils and another for antifreeze/coolant. The trace dyes for a/c refrigerants are very specific formulations, and they require special injectors. They are not part of the general purpose kits, but are sold in specific a/c kits.

We used the Tracer Products LeakFinder Kit, a product that won a POPULAR MECHANICS Editor's Choice Award at the 2000 Automotive Aftermarket Industry Week trade show. It's under \$60 and includes a compact UV lamp with a flexible head, so it can be aimed into all sorts of underhood nooks and crannies. It also comes with a 10-ft. cord that has alligator clips to connect to the battery terminals, yellow glasses, and 1-ounce bottles of trace dyes for both oils and antifreeze/coolant. You can buy individual bottles of any trace dye you use up.

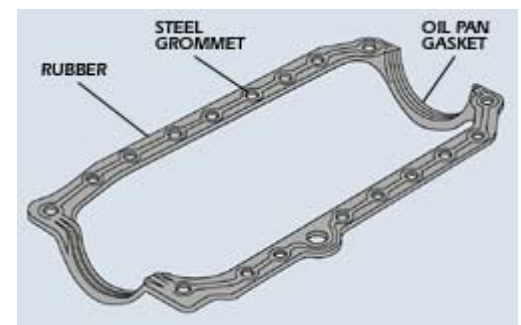
Start by mixing a dose of oil-leak trace dye (1/2 ounce, which is half the amount in the see-through bottle) with as much engine oil



Check the dipsticks to see where your leak is starting.



A leaky main seal will spray oil all over, and will need to be replaced.



Oil pan gaskets may be a simple cork cutout or a pricey engineered rubber molding with metal inserts.

as you have left in your top-up bottle, then pour that into the engine. You could just pour the 1/2-ounce dose into the engine, but if there's a leak you're probably down on oil anyway. If you just pour in the trace dye dose, it will coat the oil filler neck, and take a lot longer to be washed away by engine oil and mixed thoroughly into the oil supply. And it will take longer for the leak to show up.

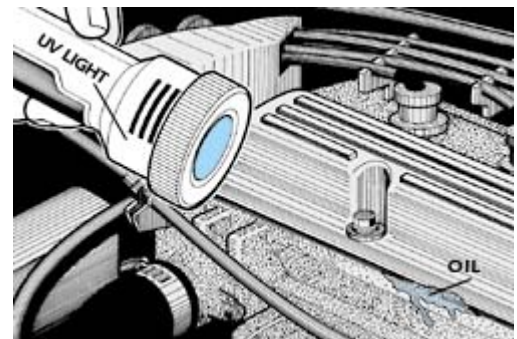
After driving the car long enough to allow oil leakage, park the car over newspaper to catch the leaking oil. Check the drops on the paper with the UV lamp. If the drops glow, you're ready to look for the leak. Jack up the vehicle, support it on safety stands and connect the lamp clips to the battery. Then, put on the yellow glasses, aim the light up from underneath and press the switch.

Because leaking oil may follow a twisty path, look for the highest point of any oil trace, and that should lead you to the source. In our case, the path started at the oil dipstick tube, which had a leaking O-ring seal. In most cases, you'll find a loose gasket joint, which you may be able to tighten. However, in many cases, the gasket will have taken a severe "set" in the joint, and retightening won't stop the leak.

If you don't want to make the investment in a trace dye kit, there is an alternative method for finding a leak. You can use a couple of products you may already have at home--one in the garage, one in the medicine cabinet.

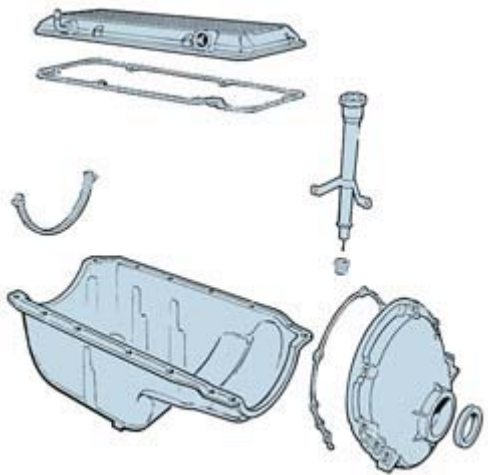
The garage item is aerosol engine degreaser/cleaner. Use the aerosol cleaner to loosen road film, then remove the film from the engine, transmission and adjacent underbody with a water hose. Drive the vehicle to dry it off--or when you jack it up and support it on safety stands, wipe the area clean and dry with a cloth. That's what you may have to do anyway to remove a lot of the road film. The objective is to clean the underbody well enough so road film and leaking black oil aren't confused.

From the medicine cabinet, get aerosol powder, such as that used to treat athlete's foot, and spray the underside of the general area of the leak, going as high up the block as possible. The powder will adhere to and coat the metal, producing a white haze. Then, drive the vehicle until the oil leaks--be careful to avoid wet, muddy roads in the process. The hope here is that the leak will take a single large, reasonably direct downward path (even if there are some streaks from airflow). If it does, it will show up as a primary "stream" down the engine. You may have to perform a similar treatment closer to the top of the engine to really pinpoint some leaks, particularly those from intake manifold gaskets. However, if the oil stream is blown through a complex path along the engine



Ultraviolet light will make trace dyes glow brightly.

before a drop hits the ground, using a trace dye and UV light is a surer way.



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## HOW IT WORKS: Gaskets

When you look at a pair of machined surfaces, or even today's well-finished engine surfaces, you may wonder why a gasket, an O-ring or other type of seal is needed to prevent an oil leak. Except for seals around rotating parts, wouldn't clamping the parts together tightly be enough to prevent oil leakage?

The answer: close, but no. Sorry, even mating joints bolted together look a lot more precise than they really are, and fluids can seep past them. It takes a flexible material in the joint to compensate for any unevenness and looseness to prevent, or at least minimize, leakage. That flexible material is a gasket. The design of a gasket itself is a complex art. Simple materials such as cork compress nicely and compensate for a fair amount of unevenness, but under the compression of a line of bolts, cork gaskets soon take a "heat set," also called a "compression set." Retightening gaskets helps and may work for a considerable time. But when it doesn't, the gasket must be replaced. Today's oil-sealing gaskets (like all automotive gaskets) are made of high-temperature synthetic materials, in combination with natural fibers, that are more resistant to a compression set. They have engineered shapes that, when compressed, provide a more effective seal. There may be metal grommets around bolt holes to prevent overtightening. The gaskets often are made with raised rubber "beads," in some cases a single broad bead, in others, two or more riblike layouts, which set up a series of barriers to oil leakage. Gaskets often are shaped to fit into grooves in the mating metal surfaces. Or a gasket may look almost like a large rounded band or square-cut rail and fit into a groove in each gasket surface.


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