

Chapter 16

Zen and the Art of Motorcycle Maintenance

In This Chapter

- ◆ Tools you need to maintain your bike
- ◆ Spotting potentially dangerous tire and brake problems
- ◆ Changing oil and why you need to do it
- ◆ Maintaining your chain

People either love performing maintenance on their motorcycles or they hate it. In his book *Zen and the Art of Motorcycle Maintenance*, Robert M. Pirsig writes that the reason some people hate motorcycle maintenance is that it is part of the “inhuman language” of technology. “Anything to do with valves and shafts and wrenches is a part of that dehumanized world,” he writes. Pirsig is from the other group, the tinkerers and fiddlers who think nothing of tearing apart their engines and adjusting their valves. He finds working on his bike a form of therapy, a communion with something greater than himself. “The Buddha, the Godhead, resides quite as comfortably in the circuits of a digital computer or the gears of a cycle transmission as he does at the top of a mountain or in the petals of a flower,” he writes.

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I'm firmly in the antitechnologists' camp on this one. It's not because I'm against technology. It's just that I'm not very good at mechanics.

Still, I perform most of my own maintenance. Financial realities dictate that I do my own work. And I've always managed to keep my bikes running. If I can do it, you can do it. Whether you are a mechanical savant like Pirsig or a ham-fisted fool like me, with a little practice, a little patience, a little knowledge, and, of course, some tools, you can do most of the things required to keep your bike on the road. In this chapter, I'll tell you how.

This chapter deals with routine maintenance, while Chapter 17 deals with repairing your bike if it breaks down. Many of the procedures used in routine maintenance are the same as those used to repair your bike, so use the two chapters together.

Tools of the Trade

Unless you own a Harley-Davidson, your bike will most likely come with a toolkit. This may be located under the seat, behind a side cover, or in a special compartment.

Most Harleys don't come with standard toolkits. Although BMW equips its bikes with high-quality toolkits, standard toolkits are usually of poor quality and are best left for emergency situations. When you do maintenance at home, you'll want to equip yourself with a decent set of tools. At the very least, you'll want to have these tools:

- ◆ **Air-pressure gauge.** Buy a gauge of good quality, and keep it clean so that it provides you with an accurate reading.
- ◆ **Wrench set.** Buy the highest-quality set of wrenches you can possibly afford—cheap ones will bend and break. The most versatile wrenches are combination wrenches. These have an open-end and a box-end (fully enclosed) spanner at either end. Harleys use SAE standard fasteners (the type of fasteners used by most American manufacturing firms, measured in inches rather than millimeters), so get a standard set of wrenches if you buy a Harley. All other bikes use metric fasteners.
- ◆ **Allen wrench set.** Many fasteners on motorcycles use Allen-head bolts instead of traditional hex-head bolts. This means the bolts are turned by an Allen wrench—a wrench you insert in the center of the bolt instead of around the edges. As with regular wrenches, get a standard set for a Harley and a metric set for everything else.



Motorcycology

The tips of screwdrivers are called *blades*. Like knife blades, they get dull and rounded off over time. When that happens, you're likely to strip screws. When the tips of your screwdrivers get dull, replace them.

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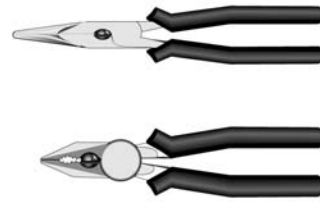
- ◆ **Screwdrivers.** You will need flat-blade and Phillips screwdrivers in a variety of sizes. As with all your tools, you will find that your work goes much better if you buy high-quality screwdrivers.
- ◆ **Ratchet and sockets.** These will become your most used tools, so, once again, get the best set you can afford. For motorcycles, get a set with a $\frac{3}{8}$ -inch drive ratchet, with as many different size sockets as you can. Again, Harley takes standard; everything else takes metric.



Air-pressure gauge



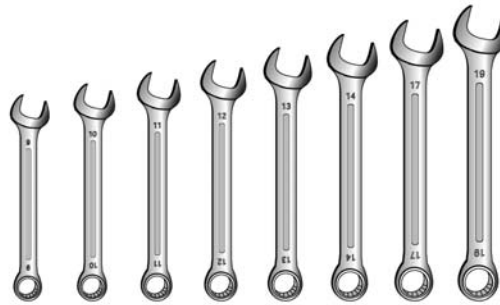
Allen wrench set



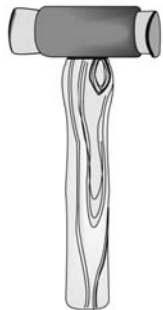
Pair of needle-nose and regular pliers



Socket set



Set of combination spanner wrenches



Mallet



Phillips and standard screwdrivers

A set of quality tools will make motorcycle maintenance easier and less frustrating.

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- ◆ **Pliers.** It's useful to have several types of pliers. Basic pliers work in a variety of situations, but you'll also need to get a pair of needle-nose pliers—the kind that look like they're made from a hummingbird's beak. These are useful when working in tight places and with small objects. I also like to have a pair of Channellock or adjustable pliers. I use these for everything from holding odd-size large bolts to removing oil filters when my filter wrench won't fit.
- ◆ **Oil-filter wrench.** These wrenches come in several varieties. Get one that best fits around your particular oil filter—that is, if your motorcycle *has* a spin-on filter.
- ◆ **Soft-face mallet.** You will sometimes need it to convince an obstinate part to move.
- ◆ **Lubricants.** You'll need to have some kind of penetrating spray lubricant on hand to loosen tight bolts. If you have a chain-driven motorcycle, you'll also need special cleaners and lubricants for your chain.
- ◆ **Funnels.** You're going to need at least a few different-size funnels on hand. Get one small funnel for filling electrolyte in your battery, a larger one with a longer spout for filling oil, and a fairly large one with a screen in the spout for filling gasoline.



Steer Clear

Before you change your oil, make certain that you know where you can dispose of the used oil. It's illegal and unsafe to dump the oil or spread it on a road. Some areas provide certified oil-recycling stations. Usually, service stations or drive-in oil-change places have large waste-oil storage capabilities. If you ask nicely down at the local Kwiki Lube, they may let you dump your waste oil in with theirs. Just remember not to make a mess and to clean up afterward, or you won't be welcome back.

- ◆ **Containers.** You'll need to get a gas can and some sort of pan to catch oil in when you change your oil and filter. This container should be large enough to hold at least 5 quarts of oil, yet be shallow enough to fit under your bike when it is on its centerstand.
- ◆ **Stool.** More than one weekend mechanic has suffered debilitating nerve damage from squatting in one position for too long while working on a bike.

Finally, you'll want a repair manual. A new bike will come with an owner's manual; used bikes may or may not come with one.

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If you're serious about performing your own maintenance, your best bet is to buy an actual shop manual for your bike. These manuals, designed as guides for authorized dealer mechanics, are specific to your bike and generally tell you the best way to perform each procedure. These manuals are expensive, but they will save you money in the long run.

If you buy a used bike that is no longer in production, you might not be able to find a shop manual. In such cases, your best bet is to buy one of the aftermarket manuals from publishers such as Clymer, Haynes, or Helm Inc. If you can't find a manual for your exact model, you should be able to find one for another bike using the same family of engine. This isn't an ideal solution, but it's better than nothing.

Keeping the Shiny Side Up: Supporting the Bike

Before doing any work on your bike, make certain it's securely positioned. If your bike has a centerstand, use it for procedures that don't require you to remove any heavy parts from the bike, such as changing oil and tightening the chain.

If you need to remove heavy parts, such as wheels and tires, you'll need to find another method of supporting the bike because when you remove the parts, you'll change the weight distribution of the bike, upsetting the balance on the centerstand. You'll also need to use an alternative method of supporting the bike if it's not equipped with a centerstand.

I use a variety of materials to support my bikes, depending on the bike. I've created stable stands by using cinderblocks with two-by-fours as buffers to keep from damaging the parts under my bike. The key is to make certain that your blocking is stable.

Some companies sell special motorcycle lifts. While these are expensive, a good lift is your safest, most secure method of supporting your bike while you work on it. Some companies sell rear-end stands that prop a bike up by the swingarm, which are fairly affordable.



Steer Clear

If your bike has a fairing that extends around the bottom of the engine, remove this before placing your bike on any kind of support. The plastic cowl-ing isn't strong enough to support the bike and will break under the machine's weight.

Oil: Your Bike's Blood

Oil serves three purposes in your bike's engine:

- ◆ Oil reduces friction and wear, making all internal parts move more smoothly and efficiently.
- ◆ Oil dissipates heat. It carries heat away from the moving parts of an engine as it flows over them. On some bikes, oil is sprayed on the hottest parts of an engine, such as the underside of the piston domes, to enhance heat dissipation.
- ◆ Oil cleans the inside of your engine. The inside of your engine is filled with metal parts that rub together at tremendous speeds, causing microscopic particles of metal to shear off. Your oil removes these particles and traps them in your oil filter.

Two-stroke engines use oil differently than four-stroke engines (see Chapter 6). In a two-stroke, the oil enters the engine with the air/fuel charge and is burned up and eliminated with the exhaust, causing the characteristic blue smoke coming from exhaust pipe. This is why the EPA isn't very fond of two-strokes.



Cycle Babble

In a **wet-sump system**, oil is stored in the engine's crankcase. In a **dry-sump system**, oil is stored in an external tank.

Four-strokes circulate their oil, using either a *dry-sump system*, in which the oil is stored in an external container, or a *wet-sump system*, in which the oil is contained in the engine's crankcase. Most bikes use wet-sump systems.

Checking the Oil Level

On a two-stroke, you'll need to check the oil level every day because two-strokes are designed to burn oil. On a modern, properly running four-stroke, though, you need to check the oil level only two or three times a week. If you have a bike that uses lots of oil, check more often.

On two-strokes and dry-sump four-strokes, you'll check the oil level in the external tank, usually located either beneath the seat or within the frame itself (although on some late-model Harleys, the tank is down by the transmission). On a wet-sump four-stroke, you'll check the oil level at the bottom of the engine. In all cases, you'll either check by inserting a dipstick (a flat blade connected to the filler cap) into the oil tank,

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or you'll simply look into a sight glass (a window into the tank). The sight-glass method is much easier and less messy.



Motorcology

When you are checking oil, your bike should be in an upright position (unless otherwise stated in the owner's manual). On bikes without centerstands, this means you need two people: one to support the bike and the other to check the oil.

Another thing to keep in mind is that most bikes require you to simply rest the cap in the hole to get an accurate reading on the dipstick, rather than requiring that you screw the cap down. Your owner's manual will tell you which method to use.

If the oil level gets down near the add mark, fill the tank back up to the full mark, but be careful. It usually takes much less oil than you might imagine to fill the tank to the full mark, and overfilling your tank can cause as many problems as running it too low. Pour in a small amount and then recheck the level. Keep doing this until you reach the full mark.

Changin' Oil

The single most important thing you can do to ensure a long engine life for your motorcycle is to perform regular oil changes. As you ride your bike, two things happen to your oil:

- ◆ The molecules in the oil break apart, causing the oil to lose its lubricating properties.
- ◆ The oil gets contaminated with the microscopic particles that wear away from the parts inside your engine, causing the oil to become more abrasive.



Motorcology

Recent friction-modifying additives used in some automotive oils may seriously damage your bike, so you should use motorcycle-specific oil. I use an automotive synthetic oil (Mobil 1), which so far has not incorporated the offending additives. It's much less expensive than motorcycle-specific oil and performs well. However, if Mobil begins putting friction-modifying additives in Mobil 1, I'll switch to a motorcycle-specific oil.

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Steer Clear

Drain the oil when the engine is hot because then the oil will be less viscous and will drain completely. This creates a challenge because the oil will be scalding hot, as will the engine and other components. Be especially careful to avoid the exhaust pipes, which can cause serious burns.

Here's how to change your oil:

1. Drain the oil. Locate the drain plug, which is somewhere on the bottom of the engine on wet-sump systems (the location varies with dry sumps), and place your pan-shape container under the plug. When you remove the plug (usually a hex-head bolt), the oil will come out with some force, so take that into account when placing the pan.
2. Remove the filter. Change the filter every time you change the oil. There are two types of filters—the canister type, which has a replaceable filter element located in a canister attached to the engine, and the spin-on type, which spins on and off like an automotive oil filter.

When removing a canister-type filter, be extremely careful not to strip the fastener(s) holding the canister on, and thoroughly clean the area around the canister before removal. There will be a spring and some metal washers inside the canister to hold the filter in place. Note their location for when you install the new filter; after you remove the old filter, wipe out the inside of the canister with a clean rag. Be careful not to lose the spring or the washers.

A spin-on oil filter is much more convenient to change than a canister-type filter.



Canister filter

Filter cover



Oil seal



Spin-on filter

3. Clean and replace the drain plug when the engine is done draining. Some drain plugs have a magnetic tip to collect metal shavings from inside the engine. Thoroughly clean the tip before replacing the plug. Most drain plugs have an aluminum crush washer to enhance the plug's seal. Make certain that you don't lose this washer when removing the plug. Also make certain that the surface of the engine is clean before you replace the plug/washer combo.
4. Replace the filter. With a spin-on filter, lightly smear a drop or two of clean oil around the rubber seal attached to the new filter before mounting it, to create an oil-tight seal between the filter and engine. Do not overtighten.

A canister-type filter will come with a rubber O-ring seal for the canister. Make certain to use a new O-ring with each change. When you have the seal in place, lightly smear it with a drop or two of clean oil, making sure you don't get any foreign material on the O-ring, before replacing the canister. Mount the new filter inside the canister, making certain to assemble the spring and washers correctly. And when tightening the fastener(s), be extra careful not to strip the threads. Because of the spring holding the filter in place within the canister, it is easy to get the canister slightly askew when mounting it, which could lead to thread misalignment. If you encounter the slightest resistance when replacing the fastener(s), make certain that everything is aligned before proceeding.

5. Fill with fresh, clean oil, using the recommendations in your owner's manual for the type of oil and the amount. Next, restart your engine to pump oil into the filter. Be extra careful when doing this, and don't rev the throttle any more than is necessary because your engine will not be properly lubricated upon startup. Let the engine idle for about a minute; then shut it off and recheck the oil level. It will have gone down because of the oil pumped into the filter, so refill to the full mark on the dipstick.

After you have changed the oil, keep a close watch on the oil level, and visually check for leaks around the drain plug and filter. The most likely source for an oil leak is around the filter in a canister-type unit. If you get even a small particle of foreign material between the rubber seal and the engine, you might notice leakage from the canister. This will only get worse. If this happens, you need to get a new rubber seal and do the whole thing over again.

Air Filters: Clearing the Sinuses

Air filters prevent dust and dirt from getting sucked into your engine, but over time they become plugged up with all that dust and dirt. When this happens, your bike

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doesn't get enough air to properly mix with the fuel charge entering your engine, leading to poor performance and increased gas consumption. Air filters are made of paper or foam. Foam filters must be soaked in a special oil. They're located in a bike's airbox, a chamber connected to the carburetors. When a filter becomes clogged, you have to replace it (if it is a paper type) or clean it (if it is made of foam).

First, you need to remove the filter. On modern bikes, the airbox is usually located under the gas tank or under the seat. See your owner's manual for the removal procedure because it varies with each model of bike.

Next, replace a paper filter, or clean and re-oil a foam filter according to your owner's manual's instructions. Afterward, replace the filter.



Motorcycology

Replacing a stock paper air filter with a quality aftermarket filter can noticeably improve your bike's performance if it has a fuel-injection system that can compensate for the increased airflow. If your bike has carbs, though, a freer-flowing aftermarket filter can cause some problems. To meet EPA emissions requirements, many bikes have carburetors that mix more air with the fuel charge than is optimal for combustion. This reduces emissions, but it also decreases performance and causes the engine to run hotter than before. By using an aftermarket filter, you increase the airflow even more, which can raise engine temperatures to dangerous levels, especially on an air-cooled bike. Because of this, it might be a good idea to have a qualified mechanic rejet (insert new parts that increase the flow of gasoline) your carburetors if you install an aftermarket air filter.

Batteries: An Electrifying Experience

Batteries are one area in which motorcycle technology has more than kept pace with automotive technology. Motorcycle batteries need far less attention. Indeed, many bikes these days come with sealed batteries that need no—as in none, zero—maintenance.

Now, locating the battery might very well be a problem. Batteries used to be located under a bike's seat, but now you can find them anywhere, from up by the headlight to back by the swingarm. Consult your manual.

Once you've found the battery, check the electrolyte level by looking at the side of the battery. The battery case is made of translucent plastic, allowing you to see the level of the fluid inside. If the level is slightly low, add distilled water.

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Several things can cause extremely low electrolyte levels. Your battery may have cracked or in some way come apart and is leaking, in which case you'll need to replace it immediately. Or you may have tipped the bike over or leaned it far enough for the electrolyte to drip out the overflow tube at the top of the battery. Or your charging system may be malfunctioning, overcharging your battery and evaporating the fluid. If you suspect charging-system problems and you're not a skilled mechanic, it's probably time to take the bike in for professional help.

Keeping Cool

Today most bikes use some sort of supplemental cooling system. Some bikes spray cooling oil from the engine's sump on internal hot spots. Other bikes use a liquid-cooling system similar to that found in most cars. The liquid-cooling system is the most common on today's streetbikes and requires some maintenance on your part.

At least once a week, you should check your coolant level. Usually, you do this by checking your overflow tank, a white plastic tank located in a position remote from the radiator. When you do this, you should also give your radiator hoses a visual inspection, looking for cracks and leaks. If you need to fill the system with coolant, use a mixture of motorcycle-specific antifreeze and distilled water, as recommended in your owner's manual. Every couple of years, you should replace the coolant.



Steer Clear

Be extra careful about what kind of antifreeze you use in your motorcycle. Automotive antifreeze contains silica, an abrasive designed to keep the cooling system polished inside. This abrasive can damage a motorcycle's water pump, leading to engine failure and expensive repairs.

Chain Maintenance

If you have a chain-driven motorcycle, maintaining your chain will become your most frequently performed chore. You'll probably need to adjust the tension of the chain, clean it, and lubricate it roughly twice a month (more often if you put a lot of miles on your bike).

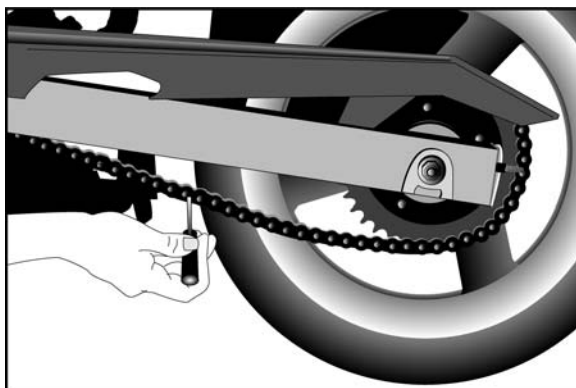
Checking the Tension

To check the tension, grasp the chain on the underside of the swingarm, about halfway between the front and rear chain sprockets, and move the chain up and down. Check several spots on the chain by rolling the bike ahead and rechecking the

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tension. If the chain moves up and down more than about an inch, it needs to be tightened. If the amount the chain moves varies from spot to spot, the chain may have a tight spot. If the tight spot is severe enough, you may need to replace the chain. I'll tell you how to do that in Chapter 17.

Check the tension along the chain's lower run, about halfway between the front and rear sprockets.



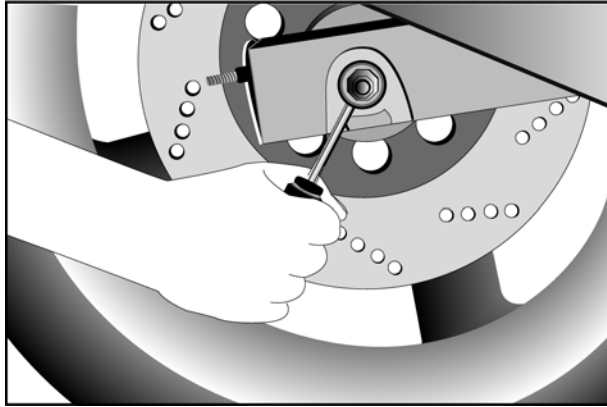
Adjusting the Chain

To adjust the chain, place the bike on the centerstand, or rest it on its side stand if you have no centerstand, and recheck the chain's tension. On the centerstand, your chain's tension may vary from when you first checked it because the distance between the sprockets may differ slightly. On the centerstand, the swingarm hangs lower than when the bike is resting on the wheels, arcing the rear sprocket closer to the front and making the chain feel looser. Take this difference into account when adjusting the chain. If you adjust the chain to its proper tension on the centerstand, it may become too tight when off the centerstand, and a too-tight chain can break and shoot off your bike like a missile.

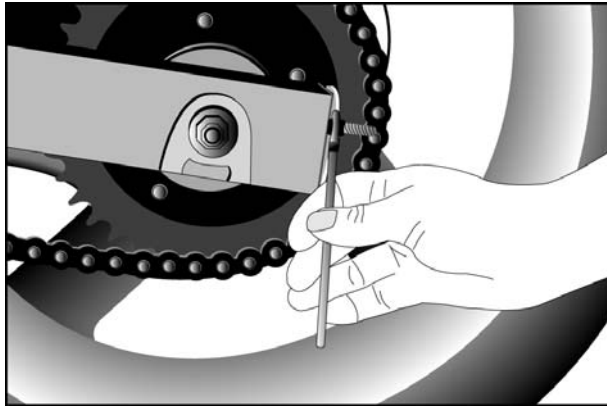
Loosen the axle nut(s). You will have to remove a security pin on most bikes when undoing the axle nut(s). Once the nut(s) are loose, you can adjust the chain. You do this by adjusting bolts on the end of the swingarm on either side of the wheel. Usually, there will be hex-head nuts on each bolt—an inner nut to move the axle, and an outer nut to lock the other in place when finished. Loosen the outer nut and then carefully adjust the inner nut, moving the nut on one side of the wheel a small amount and then moving the other nut an equal amount.

When you have tightened your chain by the desired amount, tighten down the outside nuts. Retighten the axle, and insert a new security pin. When you adjust axle bolts, make certain that you adjust the bolts on either side of the wheel evenly, or you will cause your back wheel to become misaligned with your front wheel.

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Loosen but don't remove the axle bolt.



Make certain to adjust the bolts on each side of the wheel the exact same amount. Don't overtighten the chain.

The procedure for adjusting your chain varies from bike to bike, but most bikes use some form of this method. Some bikes have a bolt on the back of the swingarm, with the locking nut between the bolt and the swingarm. A few bikes, especially modern sportbikes with single-sided swingarms, use an eccentric cam on the axles to adjust chain tension. See your owner's manual for the procedure for adjusting these types of chains.

Cleaning and Lubricating Your Chain

To get the most use out of a chain, you'll need to keep it clean and lubricated. Most bikes now use longer-lasting O-ring chains (chains with internal lubricant kept in place by rubber seals), but these still need surface lubrication. The problem with O-ring chains is that many substances degrade rubber O-rings, including common lubricants and cleaning solvents. Use only cleaners and lubricants approved for use on O-ring chains.

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To clean a chain, place an O-ring-approved cleaner on a soft brush, and use that to clean the grime off the chain. When you get all the crud off, wipe the chain dry before applying fresh lubricant. This is a messy, dirty, frustrating job, but it greatly increases chain life, and chains and sprockets are extremely expensive.

To lubricate your chain, aim the spray from the can of lubricant at the inside of the chain while rotating the wheel to evenly coat the chain. Like all motorcycle maintenance, this is infinitely easier if you have a centerstand. Clean off excess lubricant from the wheels and tires.

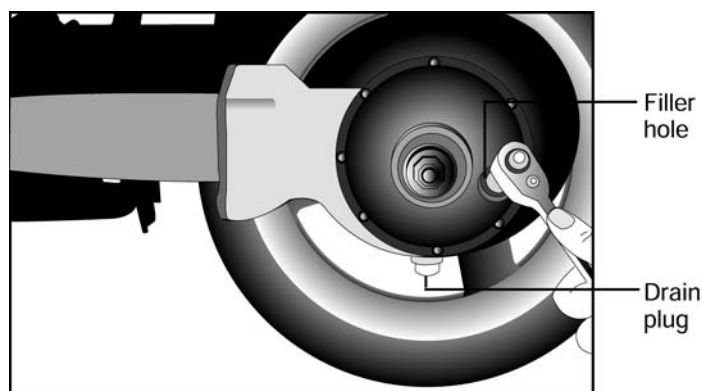
Motorcycle drive chains now last much longer than they did just a few years ago, but they also cost a lot more than they used to. And they still wear out. Add in the cost of replacing drive sprockets (which are usually replaced at the same time as the chain), and you're looking at spending \$200 to \$300.

You can minimize wear on your chain by not beating on your bike. The harder you accelerate, the more you stretch your chain.

Shaft Maintenance

Although shaft drive systems require much less maintenance than chain drives, you will need to change the oil in the rear gearcase assembly on the back wheel once or twice a year. This is a simple process. Drain the old oil by removing the drain plug at the bottom of the housing, replace the plug, and refill the housing back to the recommended level by removing a plug at the top of the housing and pouring the gear oil in there. Gear oil is extremely heavy oil (usually 80W) that you can buy at nearly all motorcycle dealerships. To check the oil level, remove the filler plug and visually check the level.

Filling oil in the gearcase a couple of times a year is far easier than cleaning, lubing, and adjusting your chain.



Cleaning Up

Some of us clean our bikes obsessively, while others prefer to let the grime accumulate. Sooner or later, though, even the grubbier motorcycle needs a bath. Even if you like your bike grubby, it's a good idea to clean your bike once in a while, if for no other reason than that cleaning allows you to inspect the bike thoroughly, checking for fluid leaks, loose bolts, and other problems.

Don't use pressure washers on your bike because many delicate parts are more exposed on a motorcycle than on a car. A pressure washer can force dirt and grime between seals, causing bearing failures and other problems. Instead, get a large bucket of warm, soapy water; a sponge; a soft brush; a chamois, and a bunch of soft towels and rags, and wash your bike by hand. It's not that hard if you follow the proper procedure:

1. Degrease the bike. Apply degreaser to the grimmest parts of the bike, such as the engine, wheels, and swingarm, with a soft brush. A hard brush may scratch painted surfaces.
2. Wash the bike with soap and water. Wash the bike from top to bottom with the sponge, making certain that you wash off all the degreaser. Use a small brush (such as a toothbrush) to get in those hard-to-reach places. Wipe the bike dry with the chamois cloth.
3. Polish the bike. Use chrome polish on chromed metal surfaces (but not chromed plastic surfaces because the polish may melt the plastic). Every so often, use a light polish to buff out the paint, but don't use this every time you wash because it takes off a thin layer of paint with every use.
4. When you are done, apply a hard wax to the painted bodywork and buff it out until it shines. This is especially important after polishing the paint because the polish softens the paint and the wax protects it. Apply a light coat of lubricant, like WD-40, to unpainted metal surfaces to prevent erosion.



Steer Clear

When washing your bike, use a special low-salt detergent. Normal household detergents have a high alkali content and can cause erosion.

On Ice: Storing Your Bike

Winter storage is the worst part of owning a bike. It's not difficult, but it means you won't be able to ride until spring. First, clean the bike so that it doesn't corrode over the winter. Make certain that the bike is dry before storing it. Change the engine oil and replace the oil filter just as you normally would.

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Drain the carburetor float bowls by turning off the fuel petcock and running the bike until the engine dies. You can also drain the float bowls by opening their drain screws, which are located at the bottom of each carb's float bowl, but be careful not to let gas drip onto hot surfaces. Fill the fuel tank to the very top; this prevents corrosion from forming on the inner surfaces of the gas tank. Finally, add a fuel-stabilizing additive to the tank. Alternatively, you could completely empty the fuel tank and then spray the inside of the fuel tank with a rust inhibitor.

Unscrew the spark plugs and pour in a single tablespoon of clean engine oil. Using either the electric starter or the kick starter, spin the engine over a few times to spread the oil around. Inflate the tires to their recommended pressures, and, if possible, place the motorcycle on blocks so the tires are off the ground. Finally, remove the battery and store it in a warm place, and your bike is ready for winter.

In the spring, you'll need to replace the battery, refill the float bowls by turning the fuel petcock to the Prime position, and again change the oil. If you've done everything right, your bike should start right up.

The Least You Need to Know

- ◆ Buy quality tools—it's less expensive in the long run than buying cheap tools.
- ◆ Before working on your bike, make certain it's properly supported so that it doesn't fall on you.
- ◆ Don't use automotive antifreeze in a motorcycle.
- ◆ Overtightening your chain can cause as many problems as not tightening it at all.
- ◆ Clean your bike regularly and store it carefully.