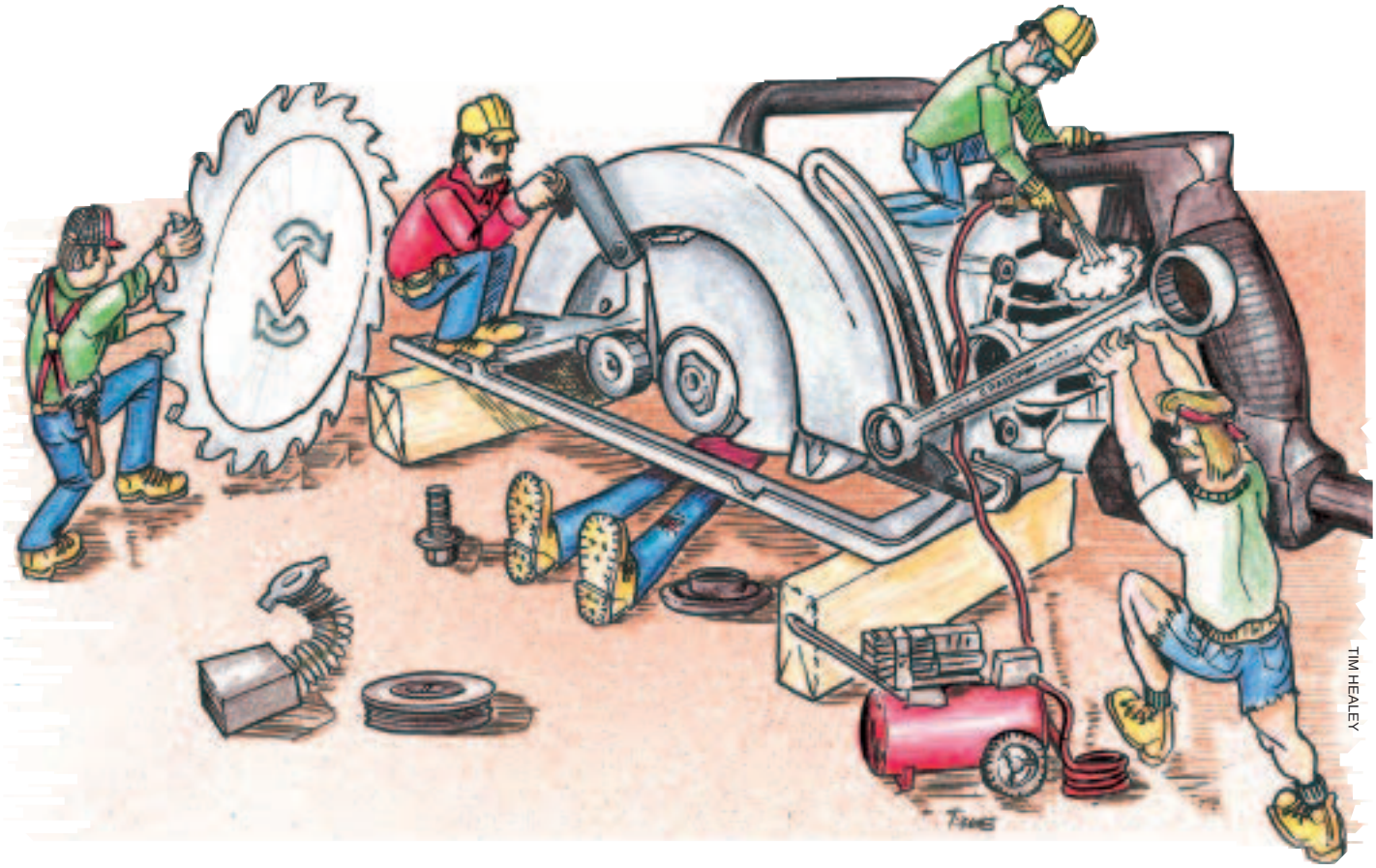
Maintaining Your Tools

by Bill Brockway



These tips will help extend the life of your electrical, cordless, and pneumatic tools

You probably already carry a first-aid kit for your employees, but are you equally well prepared to repair damage to your power tools? A small toolbox can hold everything you need to perform most routine maintenance tasks. A typical kit might contain a couple of small screwdrivers, a tube of red Loctite, some 400-grit sandpaper, a pencil eraser, a small vial of oil, a few hex wrenches, a blow gun, and a narrow paintbrush (for removing dust), plus an extra pair of brushes and a switch for each tool. You might also carry a multimeter and some male and female plug ends for checking and repairing extension cords. This kit, along with the tools you normally carry in your belt, will equip you to keep your tools running well and to make a few common repairs if they should break down.

Electric Hand Tools

Most of the portable power tools we use in a day's work are plugged into 120-volt house current and have universal motors. To operate at its best, a universal motor needs three things: sufficient voltage, ample airflow, and a good electrical connection through the brushes to the commutator.

All the volts. When an electric motor fails, the source of the problem is usually heat. And the main factor that contributes to heat buildup is running the tool with insufficient voltage. Voltage drop usually occurs at the tool end of an extension cord that is too long or has undersized wires (the gauge is too small to carry the current). A motor laboring to run without enough voltage works harder and tries to pull more juice from the cord. This internal

Figure 1. *Brush inspection.* *The used brushes, at right, are clearly shorter than the new ones. A general rule is to replace brushes when they wear down to 1/4 inch. However, the ones shown here should be replaced because of the damaged spring on the brush on the far right.*

Figure 2. *Wormdrive brush replacement.* *Remove the brush holder covers to access the spring-loaded brushes (left). Check both brushes during maintenance, because they may wear at uneven rates. Always replace both at the same time. When inserting the new brushes (below), be careful not to get any oil or dirt on the brush, spring, or housing.*

stress heats up the insulation between the windings, and as this insulation degrades, the windings can short out, burning out the motor.

If you're using a long cord (more than 50 feet) with a wire gauge smaller than 12 — remember, higher numbers denote smaller wires — check the tool end of the cord with a multimeter set on the alternating current scale. Any reading between 110 and 130 volts is acceptable. A lower voltage will shorten the life of your tools.

Clear the air. A universal motor has a fan that pulls air through the tool to draw heat away. Unfortunately, that air is often full of dust, which can build up on the moving parts inside a motor and increase the friction. Dust in the air can also clog up the vents and prevent the motor from cooling itself. The best protection against this is to blow compressed air through the vents to clear them out. Figure out which direction air flows through the tool, then blow clean air in the *same* direction. In other words, "blow with the flow." Always remove the dust bag and switch the tool on before shooting air through it so the fan can help push the dust out.

Brushes. Excessive sparking indicates that it's time to change the brushes in your universal motor. The "brushes" are actually solid blocks of carbonized graphite on the end of a spring (see Figure 1). These blocks, located on opposite sides of the commutator, conduct incoming current to the spinning armature. On some tools, like the wormdrive saw in Figure 2, you can get to the brushes by removing covers on the outside of the housing. For other tools, you may have to take the housing apart. Because the brushes are spring-loaded, they should pop out easily. When replacing them, keep in mind that you're making an electrical connection between the brush and the holder, so you need a clean metal-to-metal contact. Once everything is reassembled, run the tool with no load on it for 60 to 90 seconds to seat the brushes properly.

Remember to check *both* brushes during maintenance: It's normal for one brush to wear faster than the other. Replace *both* when one gets down to about 1/4 inch long, whether or not the commutator is oversparking.

Good sources for brushes are the Ohio Carbon Company (705 Route 224, Nova, OH 44859; 419/736-3610) and Parts Company of America (1657 Shermer Rd., Northbrook, IL 60062; 800/323-0620).

Commutator. Commutators get dirty after a few dozen hours of use. The wearing away of the brushes contributes to this, as does dirt and moisture from the air flowing through the motor. The best thing to use to clean off the buildup is fine-grit sandpaper (400 or 600 grit). Never use emery paper — it cuts small pieces of magnetized metal off of the commutator, which float around inside the housing, stick to everything, and can short out the motor.

To clean the commutator, remove the screws holding the rear housing of the tool and pull it off (Figure 3). The other end of the shaft is still attached to the gears and a bearing, so it should be stable. To back up the sandpaper, use a wooden block shaped to the curve of the commutator; second best is a flexible foam block that will conform to the shape. Holding the paper with your fingers will also work, but that might result in a surface that's a tiny bit out of round. Even a thousandth of an inch can make a difference in performance. Hold the paper in one spot and spin the armature with your other hand. Don't use any solvent or lubricant — it will interfere with the flow of electricity later. After the commutator is

shiny again, use a blow gun on your air hose to blow the sanding dust out of the tool before reassembly.

The brushes might dig a shallow trough where they ride on the commutator. This is not a problem as long as the segments of the commutator are still separated by a tiny air space. If they wear down enough that the insulation between the segments is interfering with the brush travel, you can have the commutator reground on a lathe and the insulation cut down. This doesn't cost much, but you can only have it done two or three times before the commutator gets too thin.

A monthly tool inspection should include a look at the large screws that hold the housings on. Apply a few drops of Loctite if the screws seem to be working themselves loose over time.

Inside the gearbox. The gear cases of most tools are sealed and contain enough lubricant to last indefinitely under normal conditions. If you badly overheat a tool, the grease can break down and need replacing, but these mechanisms are mostly maintenance-free.

Wormdrive circular saws are unique in that they have an oil bath that lubricates the gears. With the saw set at maximum cutting depth and sitting with the shoe flat on a benchtop, remove the oil plug (Figure 4). The oil reservoir should be full almost to the point of overflowing. Sawdust and dirt will eventually work their way into the gearbox and clog up the works, so you need to change the oil when it starts to look thick — maybe twice a year with average use. First, run the saw for a few minutes to warm up the oil, then remove the plug and drain the gearbox. Refill the reservoir with kerosene, put the cap back on, and run the saw for about 20 seconds to clean the gears. Finally, drain the kerosene and refill with the appropriate oil (check with the manufacturer). Be sure to dry any kerosene that spills on the tool before you start it up (universal motors normally spark a little when running).

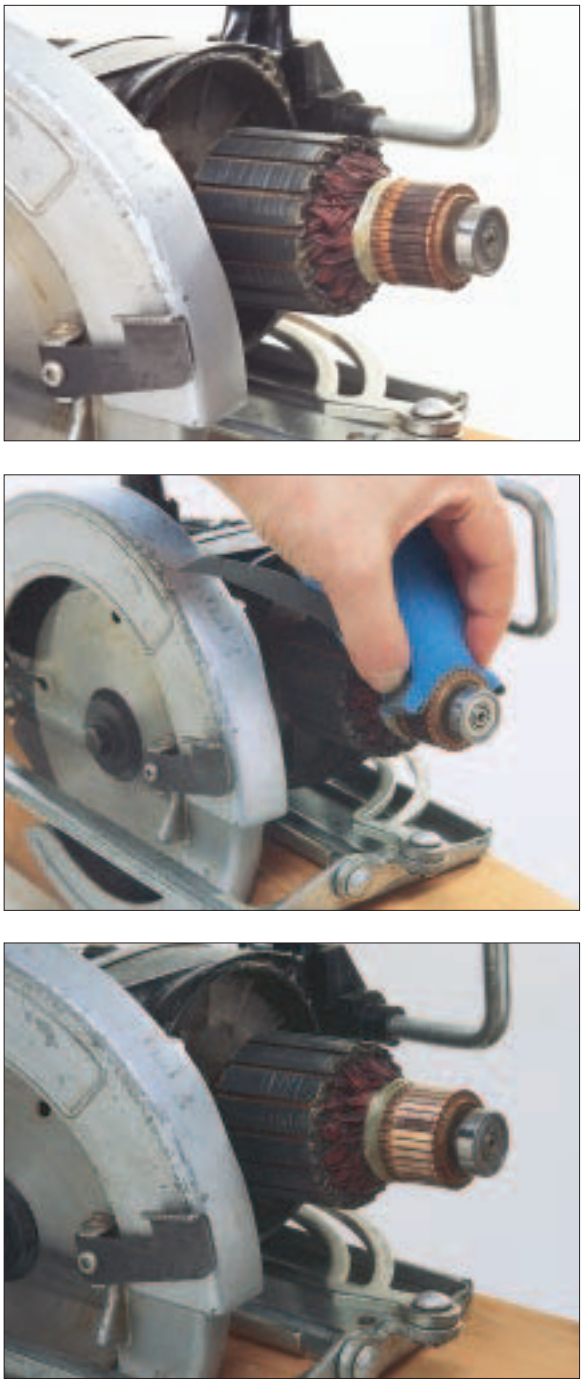


Figure 3. *Cleaning the commutator.* *Remove the rear housing of the tool to expose the armature and the commutator (left). Hold a strip of 400- or 600-grit wet/dry sandpaper, backed with a curved wood or foam sanding block, tight against the commutator and turn the armature with your other hand (middle). After only a few minutes of sanding, the old commutator shines like new (bottom).*

Cordless Tools

According to Dave Noggle, the cordless tool product manager at S-B Power Tools, running a battery down completely before recharging it isn't really necessary. The dreaded "memory effect" doesn't occur in batteries that are 7.2 volts and higher. Of course, a lot of other things can lower the amount of charge a battery will hold: The number of charging cycles (age) and charging when the battery is hot are two important ones.

The most critical thing you can do to prevent your charger from failing is to keep its cooling slots clear of dust. Heat is the enemy of all electric motor systems, including the batteries and charger. If a battery has been

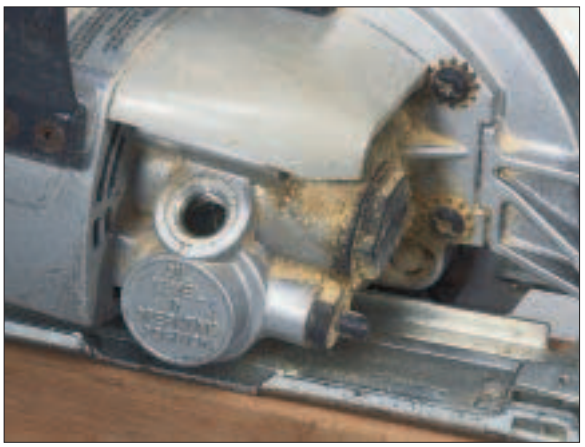


Figure 4. *Wormdrive oil check.* *Wormdrive circular saws have an oil bath that lubricates the gears. To check the oil level, set the saw at maximum cutting depth and put the shoe flat on a benchtop. Remove the oil filler cap. The oil should be right up to the edge of the opening.*

Figure 5. *Battery cleaning.* *The metal contacts on the batteries of cordless tool systems need to be clean to transfer electricity efficiently. A pencil eraser works well to rub off any gunk that has built up. If they are accessible, clean the contacts inside the drill handle and the charger as well.*

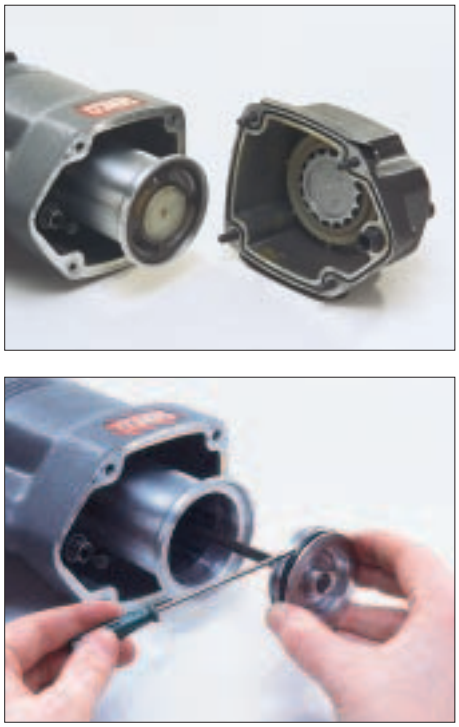


Figure 6. *Nail gun inspection.* *Removing the bolts allows you to pull off the head assembly, revealing the cylinder (top). Pull the piston out of the cylinder to expose the O-ring and the driver blade (above). These are among the most frequently replaced parts on a nail gun.*

worked hard and feels hot to the touch, let it cool off before popping it in the charger. The same is true when the battery comes out of the charger — don't run it if it's hot. Some manufacturers have designed chargers that will fill a battery up in nine minutes, but they then recommend that you let the battery sit and cool off for 20 to 30 minutes before use! That's a half-hour charging cycle in my book.

The positive and negative contacts on the battery can get dirty over time, and the dirt can interfere with the flow of electricity to the tool. The best thing to use to clean these contacts off is a pencil eraser (Figure 5). Don't use any solvent (like WD40), because it can damage the plastic housing of the battery. Also clean the contacts in the charger and up inside the drill handle.

A few drops of oil on a keyed drill chuck will help protect against rust and keep the parts moving smoothly. Most keyless chucks have plastic sleeves that you need to grab to tighten and loosen the chuck, so keep the lube away from them. The internal works of a keyless chuck are metal, though, and these will benefit from lubrication.

Some cordless tools have carbon brushes that need checking and changing. Several manufacturers, however, still use "canned" motors that are simply tossed and replaced if they break down.

Air Tools and Compressors

Pneumatic systems need to be protected from dirt and moisture. The first line of defense is an intake filter on the compressor. These are usually either pleated paper (like a truck engine's air filter) or foam. Clean the paper type by blowing air through it in the *opposite* direction it usually flows; rinse the foam type out in a solvent like kerosene. Check this filter daily during heavy use, especially if the compressor has been running anywhere near drywall dust.

To protect against moisture damage, drain the air tank every day during normal use, and every few hours in very humid weather. Use the drain valve on the bottom of the tank and tilt the tank so all the water runs out.

Compressed air leaving the tank and entering the air hose can have a lot of moisture in it. A self-draining inline filter downstream of the regulator will remove most of it.

Most air guns require oil to keep the moving parts slicked up, but be careful what kind of oil you use. Marvel Mystery Oil and WD40 will destroy the rubber O-rings on the piston. First check to see if the manufacturer of your gun recommends an oil specifically for your system. If not, your best bet is a generic air-tool oil or a nondetergent 10W engine oil with no additives.

Even well-lubricated parts wear out eventually, so you'll do well to have a few extras on hand. The most frequently replaced parts are the O-rings in the main valve (Figure 6), the piston (or driver blade), the trigger valve, and the bumper that absorbs that impact of the drive stroke. Many manufacturers sell kits for replacing these parts and offer tech support via an 800 number. Kits usually run $15 to $30, and the procedure will take you from 10 to 30 minutes.

If the manufacturer of your gun doesn't sell kits, you may need to order by part number, so save those schematic exploded diagrams that come with your new gun. And don't wait until the gun breaks down to start pursuing parts — keep a rebuild kit on hand in your truck. It's cheap insurance.

In very cold weather, any moisture in the gun will freeze and the gun won't fire. The solution to this problem is to get some antifreeze into the system. Either add about three ounces directly to the air tank or a few drops into the nipple of the gun along with the regular oil. Use an ethylene-glycol antifreeze. Avoid any kind of alcohol-based mixture — it will damage the O-rings. Look for a no-frills mix without any additives, and never use the stuff that's supposed to patch up leaky radiators. You can also use a cold-weather oil that contains an appropriate antifreeze. These are available from many gun manufacturers and also from Interchange (P.O. Box 3543, Omaha, NE 68103; 800/458-6635).

The pounds-per-square-inch (psi) rating stamped on the side of most guns is usually preceded by the word "max." It's often about 120 psi. This doesn't mean that this is the optimal pressure for the gun, just the maximum. If your gun will sink the nails running at, say, 105 psi, run it at this level. Your tool will last longer between rebuilds if you don't push it to run at maximum pressure. ■

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