

Lesson 1: Sharpening and Reconditioning a Twist Drill, Lawn Mower Blade, and Chain Saw Chain

Sharpening a Twist Drill

Objective: Students will observe how to sharpen a twist drill.

Directions: Use a bench grinder to sharpen a twist drill.

Materials and Equipment:

Bench grinder with appropriate grinding wheel

Twist drill that needs sharpening

Face shield or other approved face and eye protection*

Leather apron or any other protective clothing recommended by instructor

Tool gauge

Container of water for cooling the drill

Correctly sharpened twist drill of the same size, or approximately the same size, as the drill being sharpened (optional)

Piece of scrap wood (optional)

Portable drill (optional)

Chuck key (optional)

* Everyone participating in or observing the demonstration should wear appropriate protective eyewear and any other protective clothing as needed.

Procedure:

1. (Optional) Have students examine the sharp and dull twist drills and compare the two. This can be done by examining the drills visually and also by checking them with the tool gauge. Discuss the appearance of a properly sharpened drill. The instructor can refer to PPt 3 Placement of the Drill for Sharpening, PPt 4 Judging Lip Clearance, and PPt 5 Using a Gauge to Check the Shape and Clearance of a Twist Drill, if desired. Points covered could include the following.
 - a. Dead center should appear as a small straight line in the exact center of the drill.
 - b. The cutting lips should be at a 59-degree angle to the centerline of the drill.
 - c. From dead center to the heel, the cutting lips should drop slightly to give the bit clearance. On a properly sharpened bit, the angle formed between dead center and the heel should be 12 degrees for each cutting lip.
 - d. The angle formed by the cutting lip and the outside edge of the drill should be 118 degrees.

- e. Check to see if the drill is bent. If it is, it should be straightened before being sharpened. If the drill cannot be straightened, it should be replaced.
2. (Optional) Demonstrate the value of keeping drills sharp by using the portable drill to make a hole in the scrap wood, first using the dull twist drill, then using the sharp one. Observe all safety procedures for using the portable drill. These can be reviewed, if desired. Discuss differences between the performance of the dull drill and the sharp one.
3. Wear appropriate safety equipment.
4. Follow the correct procedure for setting up the grinding wheel.
 - a. Inspect equipment, materials, and work area to ensure safe and correct operation.
 - b. With the power disconnected, adjust the tool rest and make sure all guards are in place. The tool rest should be horizontal to the center of the wheel. There should be a 1/16-in. space between the tool rest and the face of the wheel.
 - c. When all adjustments are made, plug in the grinder.
 - d. Stand to the side of the grinder and turn it on. Let the grinder run before using.
5. Demonstrate the correct procedure for sharpening the twist drill. (Steps a. through e. explain the positioning of the twist drill.)

CAUTION: The operator should not touch the drill to the grinding wheel before the drill is in the proper position.

- a. Hold the drill perpendicular to the face of the wheel.
 - b. Swing the drill around to the left so that it is at a 59-degree angle to the face of the wheel.
 - c. Rotate the drill until one cutting lip is horizontal to the center of the wheel.
 - d. Hold the drill between the thumb and index finger of the left hand with approximately 1 in. of the drill exposed. Use the right hand to hold the shank of the drill.
 - e. Place the back of the left index finger on the tool rest. Be careful to not let the fingers touch the grinding wheel.
 - f. Touch the cutting lip to the face of the grinding wheel and slowly elevate the cutting tip by lowering the back end of the drill. At the same time, give the drill a slight clockwise turn.
 - g. Dip the drill in water frequently to avoid overheating it.
 - h. Use the tool gauge to check the lip angle and heel clearance.
 - i. Make additional passes as needed to restore the cutting edge.
 - j. When one lip is properly sharpened, turn the drill half a turn and repeat the procedure for the other lip.
6. Perform shutdown and cleanup procedures.
 7. Assign the student version of AS 2 to be performed by the students.