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Tech Tips

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Hardwood Cuttings Saw and Clamping System

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Nurseries propagate certain species of trees such as cottonwood, willow, and poplar by planting cuttings with viable buds directly into the ground. The Charles E. Bessey Nursery in Halsey, NE, asked the Missoula Technology and Development Center (MTDC) to investigate a safe method of sawing hardwood whips. The whips are 3/16 to 3/4 inch in diameter and about 4 feet long. The nursery currently uses a table saw to cut bundles (about 3 inches in diameter) of whips into 6-inch lengths.

The Bessey Nursery was established in 1902 as part of the Dismal River Forest Preserve. It is now administered by the U.S. Department of Agriculture, Forest Service, Nebraska National Forest.

In the past, when nursery workers sawed whips, they had to keep the top (bud end) pointing up (so the cuttings could be planted right-side up). The operator held one end of the whips in each hand as the cuttings were sawed, keeping them oriented properly. Because most bundles are about 3 inches in diameter, the table saw blade extended about 3½ inches above the table. This setting was very dangerous because the operator's hands were within a few inches of the raised, rotating blade. The new hardwood cuttings saw and clamp designed by MTDC allow nursery personnel to cut hardwood whips safely into 6-inch-long cuttings.

Power Miter Saw and Clamp

MTDC selected a power miter saw as the most practical tool for this application. The saw is used with a clamp that holds one end of the bundle of whips. Several models of miter saws were evaluated to ensure that they had enough clearance between the saw and the clamp. The DeWALT DW705 miter saw with a 12-inch, 60-tooth carbide blade fit the requirements of the project (figure 1).

Several different clamping designs were evaluated. A pneumatically actuated clamping system was used (figure 2). The 1½-inch pneumatic cylinder that powers the clamp is rated for about 200 pounds of force, at 100 pounds per square inch of air pressure. An air filter, pressure regulator, and lubricator ensure that air powering the cylinder is clean, is at the desired pressure, and provides lubricant to the cylinder (figure 3). A foot-operated control valve (figure 4) activates the cylinder. The pressure regulator

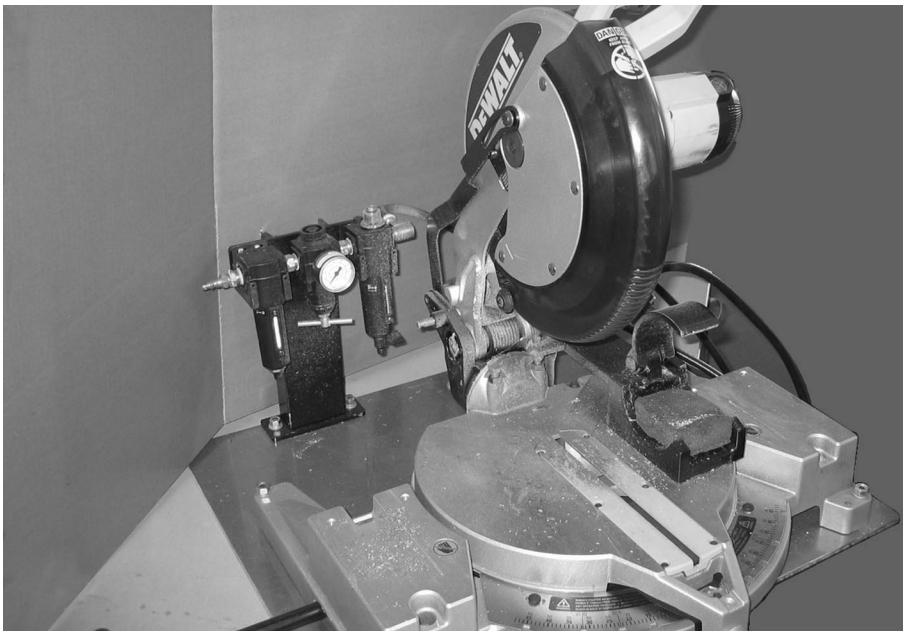

Figure 1—The power miter saw (DeWALT DW705) was modified to cut hardwood whips for planting.

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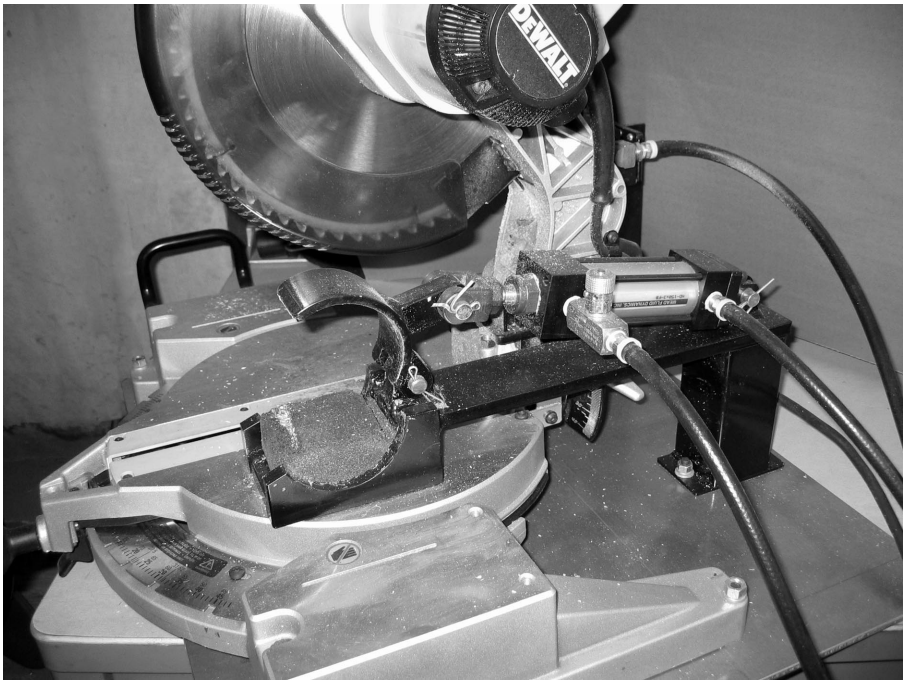

Figure 2—This pneumatic clamp secures the whips so they can be cut safely.

Figure 4—A foot-operated pneumatic valve activates the clamp.

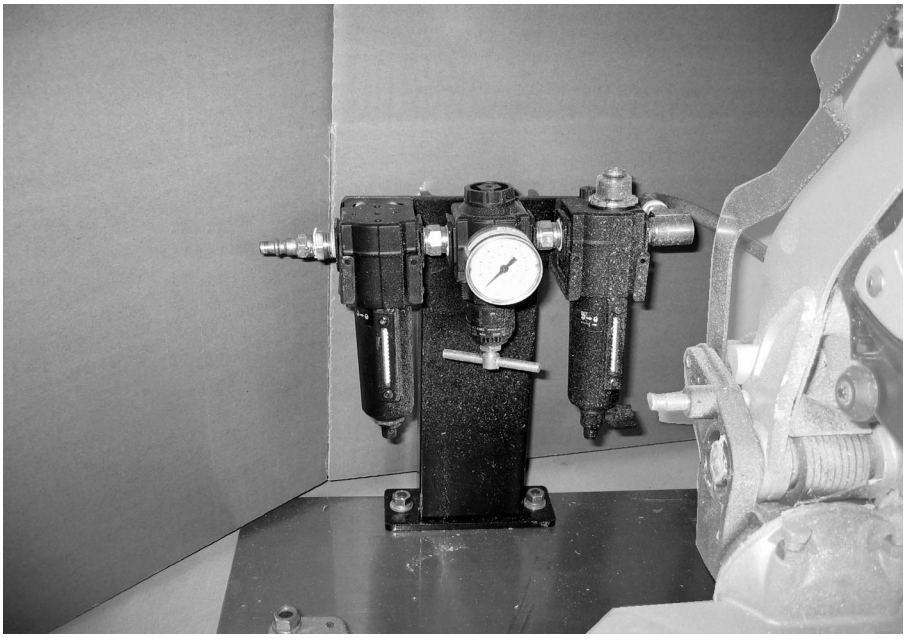

Figure 3—The source of compressed air includes a filter, pressure regulator, and lubricator.

and flow control needle valve allow the operator to control clamping pressure and the speed with which the clamp closes. All components mount to an aluminum base plate, allowing the unit to be clamped or fastened to any table or bench.

Materials for the clamp cost about $600. The saw cost $300.

Operation and Maintenance

Before operating the clamping device, the operator should ensure that the air supply filter is clean and that the lubricator has sufficient oil. The foot-operated control valve should be placed where the operator can reach it easily. A guard on the foot-operated control valve prevents it from being activated accidentally. Make sure that the guard is in place before using the saw.

An air compressor supplies air to the inlet port at a maximum pressure of 150 pounds per square inch. The initial air pressure regulator setting is about 40 pounds per square inch. The pressure regulator should be set high enough to ensure that the cuttings stay in place when they are cut, but not so high that they are crushed or damaged. A needle valve limits airflow to the cylinder, keeping the cylinder from closing too quickly. Operators can loosen the set screw on the needle valve to adjust how

quickly the clamp closes. Turning the valve clockwise (closing the valve) slows the clamping; turning it counterclockwise (opening the valve) speeds the clamping. Do not open the needle valve too far (turn it too far counterclockwise), because the clamp will close too quickly.

Before operating the saw, the operator should read and follow all DeWALT operating instructions. Follow all safety precautions. Use safety glasses or a shield, wear ear protection, and keep your hands a safe distance from the rotating blade.

After plugging the power miter saw into a 120-volt electrical supply, lay a bundle of whips in the saddle of the clamping device. A 6-inch-long cutting will require that the end of the whips hang about ¼ inch over the right side of the clamp's lower cradle. When the bundle is in position, depress the foot-operated control valve to clamp the bundle in place.

Ensure that the bundle of whips is held tightly in the clamp. If they are not, use the air regulator to increase the pressure. The Bessey Nursey inserted a 1-inch-thick pad of dense foam rubber in the lower clamp, which helped compensate for different sizes and shapes of bundles (figure 5). Once the bundle is tightly clamped, hold on to the other end of the bundle and start the miter saw. Slowly lower the arm to cut the bundle (figure 6). After making the cut, return the saw to the raised position. Make sure that the blade stops before releasing the foot-operated control valve and clamp. Remove the cuttings from the lower clamp cradle.

Do not cut whips without the clamping device. ***If the miter saw is to be used for other cutting operations, its original fence must be installed.***

Figure 5—A rigid foam pad inside the clamp helps secure different sizes and shapes of whip bundles.

Figure 6—Whips are cut into 6-inch-long cuttings.

Testing

The cuttings saw and clamp were tested at the MTDC shop using whips supplied by the Bessey Nursery. After initial testing, the unit was sent to Jay Dunbar at the Bessey Nursery for field testing. The nursery completed several weeks of testing in February 2003. Although the 60-tooth carbide saw blade was covered with sap after 2 weeks of use, it made smooth, clean cuts and held a sharp edge (figure 7). Operators found they were able to cut whips just as quickly using the new, safer technique as when using the old technique.

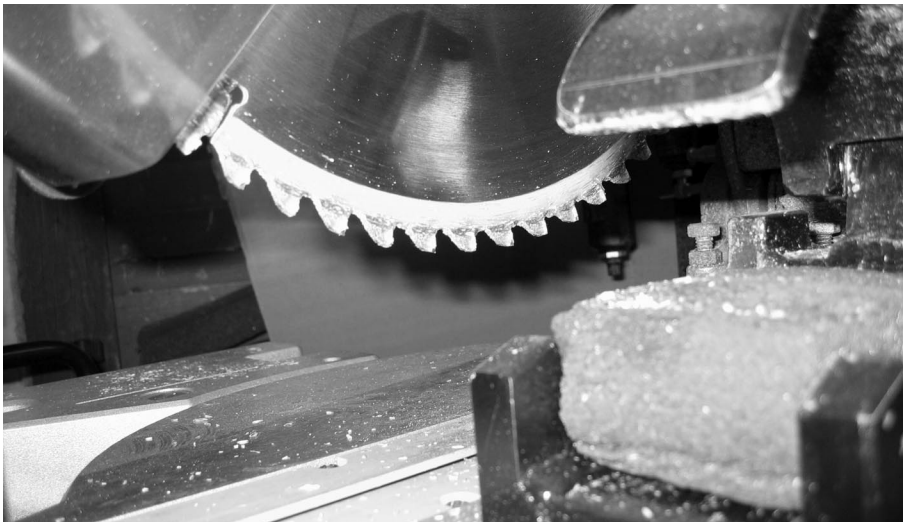

Figure 7—The 60-tooth saw blade was covered with sap after 2 weeks of use, but it still worked well.

Drawings

MTDC Drawing No. 1008, Hardwood Cutting Clamp and Saw, can be ordered from MTDC at the address below.

Acknowledgments

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About the Author

Gary Kees joined MTDC in 2002 as a project engineer. Gary will be working in the reforestation and nurseries program. His current projects involve economic fence enclosures, saws to cut hardwood, soil fumigation, remote weather stations, and copper coatings for seedling containers. Gary, who has a degree in mechanical engineering from the University of Idaho, worked for 10 years as a mechanical and structural engineer, project manager, and engineering group leader for Monsanto Co. in Soda Springs, ID.

Library Card

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Describes modification of a power miter saw for cutting 6-inch lengths of hardwood whips for planting. The whips are about 3⁄16 to 3⁄4 inch in diameter and about 4 feet long. Nurseries use the cuttings to plant certain species of trees, such as cottonwood, willow, and poplar. Workers at the Forest Service's Bessey Nursery in Halsey, NE, formerly cut 3-inch bundles of whips with a table saw. This practice required setting the blade about 3½ inches above the table. Workers held both ends of the whips to make sure they didn't swap the cuttings end for end. Otherwise, the cuttings could have been planted upside down. The Missoula Technology and Development Center designed a pneumatically controlled clamp to hold the bundles of whips. The clamp was mounted alongside a DeWALT DW705 miter saw with a 12-inch, 60-tooth carbide blade. The clamp allowed workers to secure one end of a bundle of whips without using their hand. The miter saw and clamp improved safety without reducing productivity, based on 2 weeks of testing during February 2003 at the Bessey Nursery.

Keywords: clamps, custom-made equipment, Bessey Nursery, nurseries, safety at work, tools

Additional single copies of this document may be ordered from:

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