



Skid Steer Torch Developed To Burn Juniper

Andy Trent and Wes Throop, Project Leaders; Chuck Harding, Mechanical Engineering Technician

The Klamath National Forest's Goosenest Ranger District uses an ASV Posi-Track Compact Track Loader for many tasks, including timber stand improvement projects across the district (figure 1). These projects include thinning, mowing, and removing brush.



Figure 1—The ASV Posi-Track Compact Track Loader (a skid steer) is used by the Klamath National Forest's Goosenest Ranger District for many timber stand improvement projects. Because skid steers are supported by tracks, they cause very little soil compaction.

Juniper is an invasive species that threatens natural regeneration of ponderosa pine and other species of pine at the Goosenest Ranger District. Cutting down juniper is costly because each tree needs to be cut at, or very close to, ground level. Another method of removing juniper is by burning the trees when they dry out during the winter. District employees feel that juniper can be killed if half of the tree is burned when the moisture content is the lowest. Juniper could be burned during winter with no fire danger and little ground disturbance using a skid steer equipped with a fire-starting device.

David Ross, a forestry technician working at the Goosenest Ranger District, submitted a project proposal to the Technology and Development Reforestation and Nurseries Program for developing a fire-starting device that could be attached to a skid steer. The device could be similar to a drip torch used with an all-terrain vehicle, spraying a controlled stream of ignited fuel mixture.

Other forests may not need to burn juniper, but might use such a device for timber stand improvement projects or projects to reduce invasive plants such as salt cedar.

Highlights...

- The invasion of juniper on the Klamath National Forest poses a threat to the natural regeneration of ponderosa pine and other species of pine.
- Juniper trees can be burned during the winter when they have dried out.
- The Missoula Technology and Development Center developed the skid steer torch, a ground ignition device that can spray a controlled stream of burning diesel-gasoline fuel. The torch, which is mounted on a standard skid steer universal attachment plate, can be used to burn juniper.



ASV Skid Steer Torch

The Missoula Technology and Development Center (MTDC) developed a torch for the ASV skid steer (figure 2). The torch is a ground ignition device that mounts on a standard skid steer universal attachment plate. The torch's basic components are a 20-gallon stainless steel fuel tank, a 97-gallon-per-hour automotive fuel pump, and an electric ignition system. The torch uses a mixture of diesel and gasoline. A pump delivers fuel from the tank through a discharge nozzle where the fuel is ignited by an electric spark. The skid steer (figure 3) can be maneuvered to direct the stream of burning fuel at its intended target. The skid steer torch uses standard ASV electrical connections, allowing the ASV operator to control the torch with the skid steer's joystick.



Figure 2—MTDC developed a torch that attaches to an ASV skid steer. The torch, which mounts on a standard skid steer universal attachment plate, burns a mixture of diesel and gasoline. Many safety features have been incorporated into the torch.



Figure 3—The skid steer can be easily maneuvered to spray the stream of ignited fuel at its intended target.

The torch's fuel, diesel and gasoline, can be mixed at ratios from 3:1 to 5:1 (U.S. Department of Agriculture, Forest Service, Health and Safety Code Handbook (FSH 6709.11), chapter 20, section 25.14c).

The torch's design incorporates the following safety features:

- **Check Valve**—A 2 pounds-per-square inch, one-way check valve near the tip of the device ensures complete fuel shutoff. The check valve prevents fuel from dribbling out when the pump is not running.
- **Pressure/Vacuum Relief Vent**—A pressure/vacuum relief vent from Justrite Manufacturing Co., LLC, prevents pressure from building up in the tank and relieves vacuum when fuel is being pumped or drained (figure 4). The vent also includes a flame arrester for added safety.

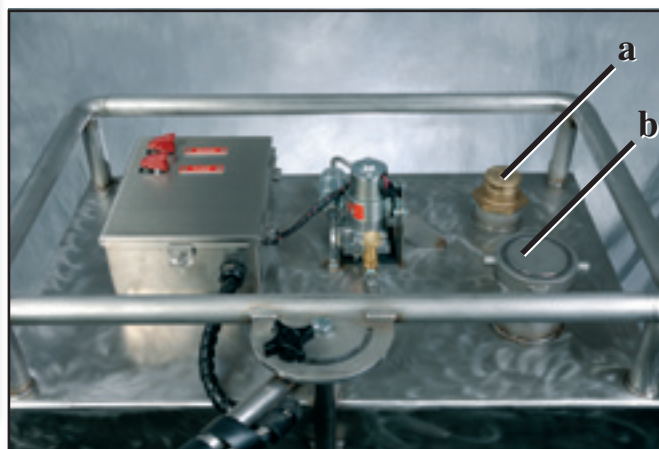


Figure 4—MTDC incorporated many safety features into the design of the skid steer torch, including a pressure relief vent (a) and a fusible fill cap (b). A check valve near the ignition tip prevents excess fuel from dribbling out.

- **Fusible Fill Cap**—A fusible fill cap from Gits Manufacturing is used on the tank. At 250 degrees Fahrenheit, a seal on the cap melts, allowing the top portion of the cap to detach, preventing the tank from exploding.
- **Braided Stainless Steel Fuel Hose**—This type of hose was selected for its resistance to abrasion and flame.
- **Quick Release Universal Mount**—The torch is mounted on a standard skid steer universal attachment plate. During emergencies, the operator can detach the skid steer torch by lowering it to the ground. The torch

will release from the plate, and the operator can back the skid steer away from trouble.

- **Straight-Pin Electrical Connectors**—Straight-pin electrical connectors ensure that the torch will detach fully and quickly from the skid steer.
- **Heavy Duty Construction**—The tank is fabricated using 1/8-inch, 304 stainless steel for durability and corrosion resistance.

Field Testing

Employees from the Klamath and Modoc National Forests and MTDC conducted the November 2008 field tests at the Goosenest Ranger District. Field testers first made sure that the torch was attached properly to the ASV skid steer and that the electrical connections for the joystick controller were working properly. Then they used the torch to burn several trees (figure 5) at a site with juniper of various sizes.



Figure 5—High relative humidity made it difficult to burn juniper during the November 2008 field tests, but the tests were successful.

The conditions at the site were not ideal for burning because of high relative humidity, occasional snow, and wind. Even under these conditions, the torch burned the trees. The torch should be more effective during drier conditions.

Overall, the torch performed adequately. The fuel flow had to be adjusted slightly to atomize the fuel properly for dependable ignition. The ASV operator was able to maneuver the ASV skid steer torch to burn the juniper trees. The operator also had adequate visibility.

The electrical wire from the joystick to the torch was too short, requiring the torch to be raised and angled to spray ignited fuel in certain directions. The cable has been lengthened.

Conclusions

MTDC has developed an attachment for the ASV Posi-Track Compact Track Loader that will allow Goosenest Ranger District employees to burn juniper for timber stand improvement projects. The skid steer torch will be used in the winter when fire danger is low, juniper is dry, and the skid steer will not compact frozen soil. The skid steer torch, which uses a diesel and gasoline mixture, incorporates many safety features. The Klamath and Modoc National Forests will conduct additional operational testing.

The skid steer torch can be used for other types of prescribed burning. Although the skid steer torch is configured for the ASV Posi-Track Compact Track Loader, the torch is mounted on a standard skid steer universal attachment plate that works with other skid steer tractors.

A smaller version of this torch is available for all-terrain vehicles. A version that can be mounted in utility terrain vehicles is being developed by MTDC and will be tested during 2010.

About the Authors

Andy Trent is a project engineer at MTDC. He received a bachelor's degree in mechanical engineering from Montana State University in 1989. Before coming to MTDC in 1996, Trent worked as a civilian engineer for the U.S. Department of the Navy.

Wes Throop is the program leader for wildland fire chemical systems at MTDC. He received a bachelor's degree in mechanical engineering from the University of Idaho in 1983. Throop has worked as a smokechaser, a hotshot firefighter, and an engine foreman for the Forest Service and as a civilian mechanical engineer for the U.S. Department of the Navy. Before coming to MTDC in 1999, Throop worked as a mechanical engineer at the test reactor area of the Idaho National Engineering and Environmental Laboratory near Idaho Falls, ID.

Chuck Harding is a mechanical engineering technician in MTDC's equipment fabrication shop. He came to the center from the U.S. Air Force Reserve where he worked as a metals technology technician. He has worked at MTDC since 2000.

Library Card

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The rapid invasion of juniper trees on the Klamath National Forest poses a threat to the natural regeneration of ponderosa pine and other species of pine. Cutting the trees down is costly and time consuming. It would be easier to burn the trees during winter when they have dried out. The Missoula Technology and Development Center developed a skid steer torch, a ground ignition device used for prescribed burning. Although the skid steer torch is configured for the ASV Posi-Track Compact Track Loader, it is mounted on a standard skid steer universal attachment plate that can be used with other skid steers. The torch sprays a controlled stream of ignited diesel-gasoline fuel at juniper trees or other vegetation that is being burned.

Keywords: ASV Posi-Track, controlled burning, ground ignition, invasive species, juniper, prescribed burning, safety at work, torches

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USDA Forest Service, Missoula Technology and
Development Center
5785 Hwy. 10 West
Missoula, MT 59808-9361
Phone: 406-329-3978
Fax: 406-329-3719
Email: wo_mtdc_pubs@fs.fed.us

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For additional information about skid steer torches, contact Andy Trent at MTDC:

Phone: 406-329-3912
Fax: 406-329-3719
Email: atrent@fs.fed.us

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