



Off-Highway Vehicle Spark Arrestors

SPARK ARRESTERS AND THE PREVENTION OF WILDLAND FIRES

Ralph H. Gonzales, Mechanical Engineer

HISTORY

Off-highway vehicle (OHV) use continues to be a popular recreational activity. It includes family-oriented trips, recreational trail riding, competitive dirt bike racing, and the use of vehicles to gain access to remote locations. Fires are often caused by recreational activity.

For a vast majority of users, part of the enjoyable experience is being in the outdoors while operating an OHV. Because this activity commonly takes place in areas that are in close proximity to fuel sources, spark arresters are required on OHVs where fire is a threat.

The term “passenger vehicle” can encompass a wide range of motor vehicles. Most State vehicle codes differentiate between vehicles used for transportation and those used for recreation purposes. Dune buggies, motorcycles, and all-terrain vehicles (ATVs) are required to meet spark arrester regulations because they are not considered passenger vehicles.

Spark arrester laws vary from State to State. OHV operators should consult their State’s policy.

The following are some of the most commonly used OHVs that require spark arresters.

ATVs: They are usually less than 54-in wide and weigh less than 650 lb. They have three or more flotation tires, are steered with handlebars, and are operated in a straddled riding position.

Motocross Bikes: These are designed for closed course competition. Generally, they come equipped with a muffler/silencer, which is not a spark arrester. They do not have a headlight or a taillight. Clues to defining a motocross bike are numbered plates, radiators on later models, two-stroke engines, and travel in the suspension that causes them to sit high.

It should be noted that motocross motorcycles are very popular among competitors and serious trail riders. This is an acceptable bike on many public jurisdictions providing it is equipped with an approved spark arrester and silencer/muffler.

Enduro Motorcycles: These motorcycles come factory equipped with a spark arrester. They are legal for use on public lands and are easier to inspect than motocross motorcycles. Enduro motorcycles are designed for OHV routes, desert riding, trail riding, and general off-road use. Most come equipped with approved spark arresters and small headlights and taillights.

Dual-Purpose Motorcycles: These are designed for on- and off-highway use, but must also meet all requirements for public highways. Headlights, taillights, brake lights, and turn signals are required.

Volkswagen (VW) Dune Buggies: The VWs are required to have a qualified spark arrester for off-highway use. Some dune buggies are street legal, have a license plate, and usually have a muffler. Mufflers are legal for street use, but do not qualify as a spark arrester for off-road use.

Dune Buggies: Dune buggies are built for off-road use only. While some are equipped with spark arresters, many can be identified by a straight exhaust that is very noisy and lacks a spark arrester.

HOW SPARK ARRESTERS WORK

Spark arresters work on the principle of trapping or pulverizing carbon particles with a diameter greater than 0.023 in. The centrifugal trap-type arrester is by far the most common design used by OHV enthusiasts. In addition to the requirement of certain efficiency levels, a trap unit must have a clean-out device.

Various methods are used to clean accumulated carbon particles out of a spark arrester. Some include a cleanout plug, end cap, cleanout plate, inserts, snap rings, cleanout bands, and Allen bolts. The spark arrester must be serviceable without removing the complete exhaust system.

The cleanout requirement is one of the most critical elements of the trap arrester. It is also one of the most often ignored. During inspections, owners must be reminded that this type of arrester requires regular and timely maintenance, a critical element of spark arrester effectiveness.

Some models of spark arresters/mufflers require fiberglass packing. This packing should be replaced every 30 hours. Evidence of exhausted packing includes oil dripping from the exhaust tail pipe and/or excessive noise. Fiberglass is the only approved qualified packing.

QUALIFICATIONS FOR OHV SPARK ARRESTERS

The qualification standard requires spark arresters to be permanently marked with the model number and manufacturer's name or trademark. Whenever contact is made with an OHV, regardless of what type of machine is used, a spark arrester inspection should be made.

Many people think that a muffler/silencer is also a spark arrester. Mufflers and silencers are only designed for noise control. Only an inspection can determine whether this is a spark arrester or a muffler/silencer.

If the OHV has been operating, beware of very hot metal in and around the exhaust system. The arrester will be a chamber-like device located somewhere along the exhaust discharge. Find the manufacturer's name or logo and the model number located on the spark arrester. It may be necessary to clean a portion of the arrester to reveal that information. It can usually be found on an attached metal plate. The words "USDA Forest Service Qualified," "Spark Arrester," or "Qualified" stamped on a piece of equipment does not guarantee that it is a tested and qualified arrester.

SPARK ARRESTER INSPECTION

Check to see if the entire exhaust system is sound and the arrester has been maintained. Also make sure that the spark arrester is mounted securely in the qualified position. In OHV use, this is usually the horizontal position. Proceed with a thorough inspection of the entire exhaust system.

With the engine off, and using a penlight, look into the spark arrester to visually ensure that the interior has not been removed or altered. You may be able to see the interior section that deflects the exhaust. Use a narrow rod, such as a 1/8-in wooden dowel, to gently feel for the internal parts of the arrester. Check how far you are able to insert the wooden dowel internally and cross check this measurement with the outside of the spark arrester/muffler. This will indicate whether you are able to pass the dowel the length of the arrester/muffler. If you are able to pass the dowel the total length, it is not a qualified arrester.

All trap spark arresters have internal fins or louvers that deflect the exhaust. If you suspect that an arrester may be altered, have the owner take the arrester apart for further inspection. Although the arrester/muffler may have the approved model number and the manufacturer information stamped on the shell, the inside components of the spark arrester mechanism may have been removed. Only through a thorough inspection can this type of modification be noted.

Arresters can be modified to avoid routine maintenance or to give the false perception of improved engine performance. Some modifications that have been detected include complete or partial removal of the spark arrester component parts,

perforation of an arrester part, and installation of foreign objects into a muffler silencer, “mocking” spark arrester parts when a wooden dowel probe is used. Examples of these foreign objects are washers, bottle caps, and steel wool.

EXHAUST SYSTEM MAINTENANCE

The next step is to check the exhaust system for maintenance. The exhaust system must be without holes, gaps, loose connections, or any areas that exhaust can escape without passing through the spark arrester. If the integrity of the whole system is not complete, the piece of equipment cannot pass the inspection regardless of whether it has a qualified arrester or not.

Owners must be aware that spark arrester laws include the term “in effective working order.” Spark arresters need to be periodically cleaned to eliminate the trapped particles of carbon. The same conditions that cause spark plugs to foul can also cause a spark arrester to become inefficient. If it is not maintained, then its performance is hampered and it is not considered a legal spark arrester.

SUMMARY

As you become more informed about spark arrester inspections, you will look forward to educating OHV enthusiasts about the proper use and maintenance of spark arresters. The use and maintenance of spark arresters can contribute to the effort of preventing unwanted wildland fires.

SPARK ARRESTER GUIDE

The Spark Arrester Guide is the only authoritative industry source for information on qualified spark arresters for use on internal combustion engines. Use the guide when identifying qualified spark arresters. If the spark arrester number appears in the guide, SDTDC has evaluated the arrester.

There are two volumes of the guide: General Purpose and Locomotive, Volume 1, and Multiposition Small Engine, Volume 2. A revision of the guide is published every year. Therefore, each volume is published every 2 years. An online guide, updated every quarter, is available on the USDA Forest Service Intranet at <http://www.fsweb.sdtc.wo.fs.fed.us>. It is a searchable database that allows the user to make powerful searches.

ADDITIONAL INFORMATION

This Tech Tip offers a broad introduction on OHV spark arresters. There are four other Tech Tips in the series. For more information on spark arresters, or to receive copies of other related Tech Tips, contact:

USDA Forest Service
San Dimas Technology and
Development Center
444 East Bonita Ave.
San Dimas, CA 91773

Attn: Spark Arrester Program Leader
or
<http://www.fsweb.sdtc.wo.fs.fed.us>

**Approximate English to Metric System
Conversion Factors**

To Change	To	Multiply by
inches	millimeters	25.4
pounds	kilograms	0.454

Information contained in this document has been developed for the guidance of employees of the U.S. Department of Agriculture (USDA) Forest Service, its contractors, and cooperating Federal and State agencies. The USDA Forest Service assumes no responsibility for the interpretation or use of this information by other than its own employees. The use of trade, firm, or corporation names is for the information and convenience of the reader. Such use does not constitute an official evaluation, conclusion, recommendation, endorsement, or approval of any product or service to the exclusion of others that may be suitable.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities



on the basis of race, color, national origin, sex, religion, age, disability, political beliefs, sexual orientation, or marital or family status. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, Room 326-W, Whitten Building, 1400 Independence Avenue, SW, Washington, D.C. 20250-9410 or call (202) 720-5964 (voice and TDD). USDA is an equal opportunity provider and employer.