

Better Performance of Aerial Ignition Spheres Through Proper Storage and Handling

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Inadequately or improperly stored and handled aerial ignition (plastic) spheres can have performance problems. Spheres should be thoroughly inspected before use and removed from service if damaged. Spheres that are not thoroughly inspected may have negative effects on the performance of plastic sphere dispenser (PSD) machines. Improperly stored and handled spheres also can ignite inconsistently. Following some simple guidelines will enhance the performance of both spheres and PSD machines, resulting in improved and safer operations, lower costs, and less intensive PSD machine cleanings.

Highlights...

- Aerial ignition spheres that are inadequately or improperly handled and stored may have performance problems.
- Spheres with performance problems may not ignite properly and also may jam plastic sphere dispenser (PSD) machines.
- Following a few guidelines for proper storage and handling of plastic spheres will result in better performance, safer operations, lower costs, and easier PSD machine maintenance.

Sphere Inspections

Inspect the boxes for damage whenever a shipment of plastic spheres is delivered. Boxes should only be opened if there are signs of damage or if spheres will be used immediately. When repackaging them, reseal the boxes to prevent contamination from moisture and debris. Any box with cracked or broken spheres or excessive potassium permanganate at the bottom of the plastic bag (figure 1) should be removed from service until inspected further. Spheres that do not pass inspection should be removed from service, following hazardous materials disposal regulations. If a visual inspection reveals a large number of defective spheres, remove them from service and report the problem to the vendor or cache. The problem also should be reported to the Interagency Aerial Ignition Working Group.



Figure 1—Potassium permanganate staining indicates these plastic spheres may be leaking.

Some recent problems experienced with plastic spheres include misaligned sphere halves, clumped potassium permanganate (figure 2), excess plastic protrusions near the seam (figures 2 and 3), and misshaped spheres (figure 4). Spheres with these problems may malfunction and are not recommended for use because they are more likely to jam the PSD machine or to ignite unreliably.

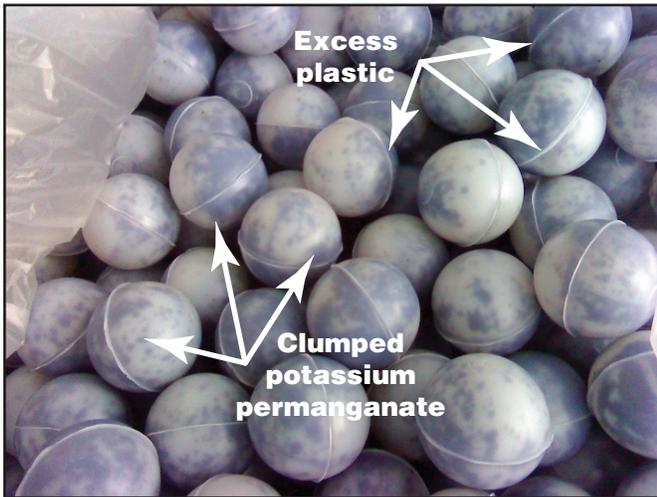


Figure 2—Plastic spheres with excess plastic at the seam and clumped potassium permanganate. These spheres may ignite reliably, but they could also cause the PSD machine to malfunction.

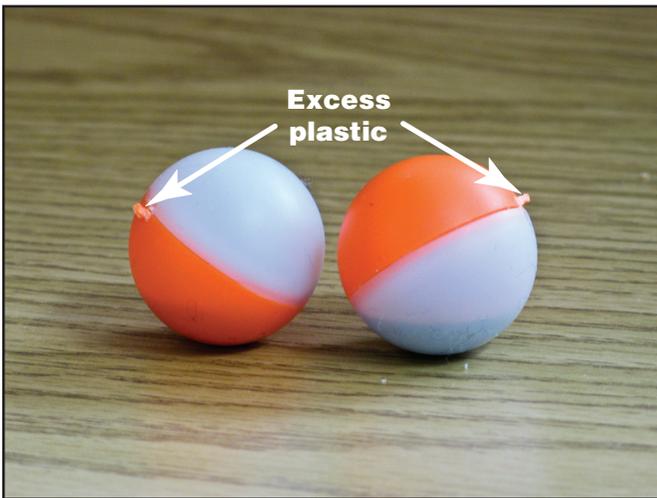


Figure 3—Plastic spheres with excess plastic protrusions. These spheres caused a plastic sphere dispenser (PSD) machine to jam.



Figure 4—The misshaped plastic sphere (left) may not feed well and could jam the PSD machine. Plastic spheres should be round (right). The misshaped sphere (left) was marked “keep” to save as an example and was not used in a PSD machine. Remove plastic spheres from service as necessary, following hazardous materials disposal regulations.

Sphere Selection

Plastic spheres have a long shelf life. Many units report no problems using spheres more than 5 years old. When choosing spheres for a burn site, use older plastic spheres before new spheres. Older spheres can become brittle. Generally, brittle spheres are acceptable for use but are more likely to cause the PSD machine to become dirty and jam. Write the date of receipt on each box to help maintain the rotation order.

Be sure to use the correct plastic sphere designed for your specific PSD machine. A 1.25-inch-diameter plastic sphere (white/clear in color) is available from both Premo Plastics, Ltd. (now owned by SEI Industries), and Aerostat, Inc. This size of sphere can be used in the Premo Mark III PSD machine. Aerostat, Inc. has developed a PSD machine that was evaluated by the Missoula Technology and Development Center (MTDC) of the U.S. Department of Agriculture, Forest Service, and the Interagency Aerial Ignition Working Group approved the machine. This PSD machine also uses 1.25-inch spheres. However, be aware of the PSD machine manufacturer’s requirements—using spheres produced by another company may void warranty service. A 1-inch diameter sphere (orange/black or orange/white in color) is available from SEI Industries. This sphere can only be used in the SEI Red Dragon PSD machine.

Sphere Storage

Plastic spheres contain potassium permanganate (an oxidizer). Because this ingredient is classified as a hazardous material, spheres must be stored accordingly in an inside or outside storage area. No more than 250 pounds of potassium permanganate (about 35,000 spheres) can be stored in one control area unless a proper storage cabinet is used or automatic sprinklers are installed.

- An indoor storage control area is a room separated from other areas by a “1-hour” firewall. Indoor storage is recommended.
- An outdoor storage control area is a confined space where weeds and combustibles are removed within 15 feet, and no public road, commercial or private property line, or other building is closer than 20 feet. If spheres are stored outdoors, extra care must be taken to maintain quality.

Keep containers in good condition and protect them from moisture, extreme temperature changes, and ultraviolet light. Humidity or other moisture can cause potassium permanganate to clump to the sides of the spheres and may make the spheres function improperly. Shake the boxes once or twice a year to agitate the spheres and break the potassium permanganate free. Rotate the boxes 90 degrees and place them back on the shelf.

Sphere Transportation

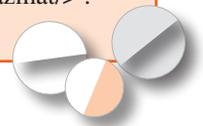
Transport plastic spheres separately from any fuels and other hazardous materials that may cause potential reaction or contamination. If fuels or hazardous materials must be transported with plastic spheres, place the fuels or hazardous materials in a separate compartment or secure them so they can't move.

Plastic Sphere Precautions

Do not store plastic spheres in the same storage room, cabinet, or area as other hazardous materials. Known compounds that react with potassium permanganate are:

- Aluminum carbide
- Antimony
- Arsenic
- Ethylene glycol
- Glycerol
- Hydrogen peroxide
- Hydrogen trisulphide
- Phosphorous
- Sulphur
- Sulphuric acid
- Titanium

Refer to the “Everyday Hazmat User’s Training Guide” (0471–2810–MTDC) and the “Everyday Hazmat Designer’s Training Guide” (0471–2812–MTDC) for the specific storage and disposal requirements of oxidizers and other hazardous materials. These guides are available to Forest Service and U.S. Department of the Interior, Bureau of Land Management (U.S. DOI, BLM) employees on the MTDC Everyday Hazmat Web site at http://fsweb.mtdc.wo.fs.fed.us/everyday_hazmat/.



PSD Maintenance

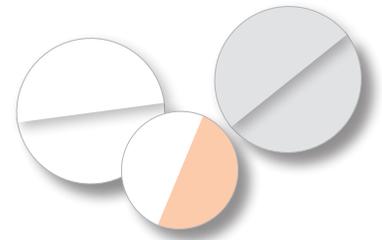
Clean and lubricate PSD machines after every use (figure 5). Machines that have been stored for extended periods of time, such as when ordered from a cache or returned to service when a burn program restarts, should be thoroughly inspected before use. Ensure the needles are sharp and that no parts of the machine have stopped working. Replace any worn parts. Keep a maintenance record with the machine to document the cleaning history and repairs performed. A record can be analyzed to determine trends and to create specific maintenance and repair schedules. In this way, a machine can be ready for use as needed.



Figure 5—Defective spheres may have caused this PSD machine to become very dirty. The machine must be thoroughly cleaned before being stored.

Conclusions

The Interagency Aerial Ignition Working Group should be notified when a credible quality issue is found with either plastic spheres or a PSD machine. The group also should be notified if a SAFECOM (safety alert) is issued regarding aerial ignition. The group can help determine the cause of the problem and can assist with corrective actions. A list of group members and contact information is available on the National Interagency Fire Center (NIFC) Web site at <http://www.nifc.gov/aviation/av_helicopters.html>. Other sources of information for PSD operations are the MTDC Aerial Ignition Web site at <http://fsweb.mtdc.wo.fs.fed.us/aerial_ign/> and the U.S. DOI, BLM Interagency Aerial Ignition Guide Web site at <<http://www.blm.gov/nifc/st/en/prog/fire/Aviation/Airops/iaig.html>>.



About the Authors

Shawn Steber is a project leader at MTDC. He received his bachelor's degree in general engineering with a mechanical engineering option from Montana Tech in 2006. Before coming to MTDC in 2010, Steber worked as a civilian nuclear engineer for the U.S. Department of the Navy. Steber has worked as an engine boss and a wildland firefighter for the Montana Department of Natural Resources and Conservation.

Cory Waters is a lead forestry technician at Alligator River National Wildlife Refuge in Manteo, NC. He works primarily in aviation, in fire as an engine boss, and in radio communications, but also performs maintenance on equipment and roads used to support the refuge. Waters began his career with the U.S. Fish and Wildlife Service in 1994 as a seasonal firefighter. He is qualified as a plastic sphere dispenser operator (PLDO) and is certified as an "Exclusive Use Helicopter" contract manager. Waters has worked with helicopters and on fires throughout the Southeast and in many Western States. He is trained to use the helitorch and has been a PLDO instructor since 2000.

Library Card

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Aerial ignition spheres that are handled or stored improperly can have performance problems. Spheres with performance problems may not ignite properly and also may cause plastic sphere dispenser (PSD) machines to become dirty and jam. Following a few simple guidelines for inspecting, storing, and transporting plastic spheres will result in improved and safer operations, lower costs, and easier PSD machine maintenance.

Keywords: aerial ignition, controlled burning, hazardous materials, plastic spheres, plastic sphere dispenser, potassium permanganate, prescribed burning, safety at work



For additional information about proper storage and handling of aerial ignition spheres, contact MTDC:

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