



Interagency Aviation Information Bulletin



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Subject: Aerial Ignition Spheres

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Discussion: Plastic spheres used for aerial ignition have gone through several phases of development over the past few years. Plastic spheres with differing characteristics are currently in the field and have raised concerns on their use and safety. This bulletin is intended to discuss those concerns and give guidance for using them.

Two manufacturers are making plastic spheres: Aerostat, Inc. in Leesburg, Florida and SEI Industries (SEI) in British Columbia, Canada.

SEI purchased the PremoFire product line from Vanguard Plastics Ltd. (VPL) in 2011. VPL made some process changes in their plastic sphere production which resulted in additional changes by SEI. Excess plastic around the sphere seam, brittle plastic, a spotted appearance on the inside sphere surface, and fast, energetic reactions have been reported with these spheres.

Aerostat (PSDS) has been manufacturing plastic spheres since 2009. Loose sphere halves which can cause jams in the machine have been reported with some Aerostat spheres.

Excess and Brittle Plastic

Spheres with ridged plastic around the seam (figure 1) were sold by VPL from about 2009-2010. These spheres have a greater tendency to jam in the machine. Many have also broken within the machine because of the brittle plastic. The combination of jamming and breaking causes the machines to quickly become dirty. When using the plastic sphere dispenser with these spheres, monitor the dispenser carefully and clean it often.

The spheres with excess and brittle plastic may also be used for ground ignition in accordance with the Interagency Ground Ignition Guide (PMS 443) Chapter 7. This includes being hand-injected and thrown or launched with a slingshot or used to enhance pile burning. If used for pile burning, consult your local hazardous materials coordinator for acceptable methods of use. For example, plastic spheres cannot be dumped on a pile just to avoid generating hazardous waste; they have to be used in a beneficial manner. They cannot be returned to the manufacturer for disposal, consult your local hazardous materials coordinator for disposal.



Figure 1. VPL's Premo plastic spheres with excess plastic around the seam.

Spotted Appearance

VPL tried to combat dirty plastic sphere dispensers by mixing a clumping additive with the potassium permanganate. This additive, introduced in 2010, caused the interior surface of the plastic to stain and appear spotted (figure 2). SEI continued to produce spheres with a clumping additive in 2012, but stopped using the additive in 2013. These spheres have been successfully used in the field with normal ignition performance.

Fast, Energetic Reactions

SEI introduced a different grade of potassium permanganate in their Premo spheres in 2013. This grade of potassium permanganate has the potential for very short ignition delays (8 seconds) and energetic reactions that can cause the spheres to jump several yards after landing or to pop apart at the seam. These characteristics have been observed in temperatures above 70° F. The only spheres affected are the high visibility pink and white spheres (figure 3), which were introduced at the same time as the different potassium permanganate.



Figure 2. SEI's Premo spheres with a spotted appearance on the internal surface. Some of VPL's Premo spheres also have a spotted appearance (figure 1).



Figure 3. SEI's high visibility Premo Spheres.

The reactions with these spheres can be calmed by using ethylene glycol mixed with water in a 50/50 ratio, or using commercially available mixes with that ratio, when temperatures are above 70° F. Careful calibration and bench testing in the temperature range expected during burning is required to get adequate results. Test the calibration on both the fast and slow speeds.

The temperature of the spheres and the ethylene glycol also has an effect on ignition. Lower temperatures give a wider range of calibration. Keep spheres and ethylene glycol stored in a cool place before ignition operations if possible.

SEI is continuing to test for long-term solutions for these reactions. Everyone who has purchased the affected spheres should have received a technical bulletin from Fire and Aviation Resource Services (SEI's Premo service center) describing recommended corrective actions (available at <http://www.sei-ind.com/news-events/news/remedying-early-ignition-premo-fireballs>). SEI's recommendations have been verified by the Missoula Technology and Development Center (MTDC). Ignition delays of 20 seconds are possible but are difficult to achieve.

The potassium permanganate in SEI's Dragon Eggs (smaller diameter, orange and white spheres) has not changed and therefore, they are not exhibiting these reactions.

Loose Sphere Halves

Some Aerostat (PSDS) sphere halves (figure 4) have been found loose in the box or attached to other fully assembled spheres. These have either separated at the seam or remained attached to other spheres during manufacturing. Sphere halves attached to other spheres are oblong and larger and can jam in the hopper, become stuck in a chute, or bend a needle. These spheres might also break inside the machine, causing potassium permanganate to spill and dirty the machine. Loose sphere halves may be present in boxes of Aerostat spheres purchased before July 2012. The problem has not been isolated to certain lot numbers.



Figure 4. Loose Aerostat (PSDS) sphere halves. Potassium permanganate residue is visible on the sphere surfaces.

If broken spheres are present in a box, there may be residue spots on the exterior surface of the spheres (visible in figure 4). Residue will not be visible in all cases, but if it is, check the spheres carefully for loose halves. Monitor the spheres as they are poured into the hopper and remove any halves if found. Follow the emergency procedures if a jam occurs.

Aerostat has said they will replace unused boxes of plastic spheres if loose sphere halves, or other problems, are present.

Recommendations

Plastic spheres with any of these conditions are acceptable to use if precautions are taken when performance may be affected. Do not use plastic spheres that have excess plastic around the seam or give fast, energetic reactions if the pilot, operator, or other personnel are not comfortable using them. Spending extra time to inspect spheres, and calibrate and clean the plastic sphere dispenser will help ensure a safe and successful burn operation.

SEI has changed the Premo manufacturing process so excess plastic around the seam and brittle spheres should no longer be in supply after the 2010 stock is used. Their potassium permanganate changed in 2013 so spotted spheres are not being produced at this time. SEI is researching additional solutions to the current problem with fast, energetic reactions and will distribute updated information if changes are made.

Aerostat modified their manufacturing process and included extra quality control measures in June 2012 to help prevent loose or broken sphere halves from being included in their boxes. A quick inspection of each opened box and continued checks while feeding the machine is still recommended.

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