

GOT ARSENIC?

By John DeAngelis

Is shot OK for making cast bullets? In *TFS 251-22* Paul Fitzgerald states he used soft chilled shot for CBs. That is good to know. I hope I can add something to the discussion because using shot for CBs is an issue near and dear to my heart since I have over 500 lbs of it, and while some will continued to be used for shotshell reloading (1) I would like to possibly use some of it for handgun and rifle bullets, if it's safe and makes acceptable bullets.

My initial thought was to blend the shot with solder to get a tin concentration of 1% and see how the bullets turned out. More solder could be added if necessary until I reached a desirable outcome. Unlike Paul however, I think my situation is a little more complicated because all of mine is reclaimed shot, so I have no idea who or where it was made, or what the mix of drop, chill or high-antimony magnum is, hence am clueless of the tin and antimony concentrations. I was still uncomfortable in moving forward with melting the shot (winter time is a good excuse to stay indoors since I do all my casting outdoors and it is still too cold here in Littleton, CO). So instead I did some research in my gun library and found some very good information.

Veral Smith mentions in his book, *Jacketed Performance With Cast Bullets*, concerns of toxic fumes and shrinkage cracks when using shot for cast bullets because of the high arsenic content. He states, "...no more than 10% shot should be used for casting..." This info is on page 54 of my second edition, copyright 1984 (a newer 4th edition is pending-contact Veral at LBT). In an email I received from Veral in 1/2018, he suggested that with 2% tin in the alloy and a mix of 50/50 shot/pure lead will do a good job, but "cast with good strong ventilation". However, as you read on I will probably stick to around 10% shot, or less, or maybe not even use it at all for casting.

One Q&A write-up I found was in the March 1981 issue of *The American Rifleman*. Below is the Q&A, **Effect of Arsenic**, exactly as written in the magazine.

The question: "I recently started casting my own pistol bullets. The only readily available source of lead to me is shot. I cast some bullets from a mixture of 9-lbs Lawrence brand high antimony magnum #6 and 1-lb of 50-50 solder. Inspecting the bullets revealed each to have a crack in the bottom groove about 1/3 the way around. What is the cause of this?"

The answer: "The cracks near the base of your bullets are caused by shrinkage porosity, which is the result of an excessively high arsenic content in the alloy. The source of arsenic in this case is the lead shot."

"High levels of arsenic, as much as 1% by weight, are important to shot manufacture. When droplets of arsenic containing molten lead are allowed to fall through air, the arsenic in the alloy is oxidized as As_2O_3 . The As_2O_3 melts at 549 degrees F and forms a thin liquid film which acts like a dross solvent and continuously fluxes the surface of the alloy droplet. Without the constraint of the solid oxide film, the inherent surface tension of the alloy is able to shape the droplet into a sphere which subsequently solidifies."

“As indicated in Col. Harrison’s book (2), *Cast Bullets*, arsenic is also a benefit in cast bullets where it improves the hardness of antimonial alloys; an optimum concentration ranges for arsenic is 0.10% to 0.15%. At these levels, arsenic increases the as-cast hardness of most antimonial leads and also provides the capability to heat treat alloys like wheel weight metal to 30 BHN or more. However, excessive amounts of arsenic can prove to be a detriment. A little-known fact about elemental arsenic is that it contracts 10% (!) on solidification compared to 3.4% for lead, 2.8% for tin and 0.8% for antimony. Since it tends to concentrate in the grain boundaries with antimony during solidification, excess arsenic contributes to the generation of shrinkage voids and cracks between the grains which opens when subjected to a small stress. In addition, excessive amounts of arsenic can actually hinder the hardening process in alloys containing low percentages of antimony.”

“It is not recommended to make a habit of melting shot. As_2O_3 is sufficiently volatile in liquid form that arsenic fumes can represent an extreme health hazard. Arsenic fumes are immediately noticeable as a garlic-like odor. For whatever reason, if it is desired to melt shot for casting bullets, it is best utilized as small additions, e.g., 10% or less, to other alloys. Melt the other alloy first, then add the shot a little at a time and stir into the melt. At low concentrations and in the presence of tin, the arsenic fume problem is negligible. You should always cast with good cross ventilation, outdoors, or under a fume hood.” -- **D. L.M.**

Please note the initials of the author who provided the answer, DLM. If you have been in the CBA since the '70s, 80' or 90's, or have read *TFS* from that era you will recognize that DLM are the initials of the late Dennis L. Marshall, who had numerous articles in *TFS*. If my memory is still slightly intact, I believe Dennis was an engineer/metallurgist for a large lead-acid battery manufacturer (someone please correct me if I'm wrong). I highly recommend his writings. He was an NRA Contributing Editor for *The American Rifleman*. I have several personal letters from him. In my opinion you can take Dennis's answer "to the bank" and his information in his writings on lead and cast bullets as "gospel". The man knew his stuff.

To shot, or not to shot? That is the question. It seems DLM wasn't enthusiastic about using shot, but he did provide acceptable warnings and guidance. For me, I'll save a few bags for more shotgun reloads, sell the rest, and get good metal from Roto Metals. Anyone in the Denver, CO area want some reclaimed shot? Jrdeangelis78@gmail.com

(1) For you shotshell reloaders, using reclaimed shot might save you a few bucks over new stuff, but it could potentially present a problem in some reloading machines, which it did in mine. I use a MEC Grabber for my 12 gauge reloads and sometimes the reclaimed shot bridges in the shot drop tube and doesn't fill the cup in the wad as the press handle is raised. If I'm paying attention and see this I simply tap the drop tube with the handle of a long, small screwdriver and the shot drops into the cup (as long as the end of the tube is still close to the wad guide). When I'm not paying attention or going too fast the shot will drop when the press hits the top of the stroke, and shot drops everywhere. The reason for the bridging is reclaimed shot has endured the rigors of being fired and passing down barrels and

through chokes, and it is not round anymore. It has dents and flat spots so doesn't flow smoothly through my drop tube and jams up. The good news is that it doesn't roll as far when it drops onto my reloading bench so cleanup is easier. LOL

(2) *Cast Bullets*, by Col. E.H. Harrison (ret.), was published by the NRA, Copyright 1979. I don't know if it's still in publication. I acquired my copy in 1980. It's an excellent resource for bullets casters, but keep in mind that some of the material was reprinted from issues of *The American Rifleman* which appeared in 1957 through 1979, so some of the information might be a little outdated.