

-----Original Message-----

From: Forensic_SEM@yahoogroups.com [mailto:Forensic_SEM@yahoogroups.com] **On Behalf Of** Lindsay, Elspeth (JUS)

Sent: Tuesday, June 23, 2009 5:58 AM

To: Forensic_SEM@yahoogroups.com

Subject: RE: [Forensic_SEM] Regarding nail guns

We did a nail gun project a couple of years ago. The results were presented at Scanning 2007. To summarize -

A variety of hardware stores, including national chain and local stores, catering to both consumer and contractor sales in Ontario were visited to purchase as wide a range of tool cartridges as possible. A total of 17 types of blank cartridges from three different manufacturers were available: Winchester, Remington, and Ramset. Each manufacturer produced rimfire cartridges in .22, .25, and .27 calibers and offered a range of power loads. Samples of each were purchased for testing. All these cartridges are manufactured in the United States and distributed throughout both the U.S. and Canada.

To avoid any possible carryover from one cartridge firing to the next, a custom firing device was created. It consisted of a simplified chamber and breech, with interchangeable inserts to fit the different calibers, and was designed for ease of disassembly and cleaning. During test firing, the blank cartridges were discharged without a projectile present. As is routinely done at the Centre of Forensic Sciences in the examination of fired cartridge cases, residues were collected from the interior of the cartridge case and transferred onto carbon tape mounted on a ½-inch diameter SEM stub. Each stub was examined by SEM/EDS using automated GSR analysis. One thousand particles per stub were analyzed.

For each of the 17 types of cartridge examined, the residues consisted primarily of lead-barium particles, as are commonly seen with some types of .22 caliber ammunitions. One of the 17 cartridges, a Winchester .27 'red', produced one particle containing all of the three elements lead, barium, and antimony out of a total of 1000 particles, 754 of which were PbBa particles. Follow-up testing of this cartridge type was done and two additional Winchester .27 'red' cartridges were discharged and their residues were examined. Each of these was subjected to a more extended analysis, analyzing as large an area of the stub as possible. Again, the residues consisted primarily of PbBa particles (14,773 out of 18,376). Only a single additional particle containing all of the three elements lead, barium, and antimony was identified. No tri-component PbBaSb GSR particles were found among the residues from the other 16 types of blank cartridges.

The results of this study indicate that the residues produced by cartridge tools include a very high proportion of PbBa particles. These are typical of the particles produced by the primers of some types of .22 caliber ammunition. However, all of the blank cartridges examined produced either no tri-component PbBaSb particles or produced them in very small numbers. This finding is in striking contrast with the analysis of gunshot residues collected from fired cartridge cases where tri-component particles are typically produced in large numbers, and may represent the majority of the particles detected.

What caliber cartridges did you test, and from what manufacturers? Were the cartridges rimfire or centre fire? What was the design of your nail gun? Was it a piston

type or one where there is direct contact between the cartridge discharge and the firing pin?

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-----Original Message-----

From: Forensic_SEM@yahoogroups.com
[mailto:Forensic_SEM@yahoogroups.com]**On Behalf Of** bpnys
Sent: Tuesday, June 23, 2009 7:31 AM
To: Forensic_SEM@yahoogroups.com
Subject: [Forensic_SEM] Regarding nail guns

Hello all,

Life has indeed become a bit slower in this group, so maybe let me start something off to get us through this vacation season (not that I am against anything holiday-related ...):

We have had a case here recently where the suspect might have used a nail gun. We found characteristic particles including tin on him. On the other hand we tested four types of nail gun cartridges and three of them produced pure and nice characteristic particles (the fourth one produced PbBaSiCa).

So, what is the general concensus about this subject? We are a bit reluctant to put nail guns as a source of characteristic particles in our standard reports (in this case we reported the possibility of contamination for three-component particles, but with the comment about the extra element tin). Have there been many cases where nail guns are involved? Is there an extensive study of nail gun (and related type of equipment) cartridges available?

It certainly looks like we are going to do some extra work on this so we can put it in the GSR database at least! It seems that nail guns are now in wide-spread use in Belgium (a fact of which I was not aware), so we need to do a study of the prevalent cartridge types on the Belgian market.

Hi Elspeth,

Good work. I realize you did not use a projectile in your study, but can you also provide comment on the supporting population of Pb only particles? There are likely strong contrasts in the supporting populations when substituting a bullet (Pb, Pb/Cu/Zn or lead free etc) with a nail, rivet or staple (Fe or Fe/Sn, Fe/Zn).

Your findings are consistent with the original Aerospace report (but much more thorough) which originally lead many to adopt the Zn rules, Cu/Zn ratio criteria, and the Pb/Ba/Ca/Si or Ba/Ca/Si classes which can also found nail guns(as your study indicates).

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>>> "Lindsay, Elspeth (JUS)" <elspeth.lindsay@ontario.ca> 6/23/2009

Sorry - I forgot to mention that we did use projectiles. We purchased drive pins from different manufacturers. The drive pins consisted of a steel core with galvanized coating (Zn/Sn; Zn/Cu; Zn/Sn/P). We also purchased Ramset Cobra .27 calibre and Ramset HD .22 calibre tools. We then fired drive pins into steel plates mounted on wood. Each tool was thoroughly cleaned after each series of shots.

For the Cobra: No PbBaSb particles (with or without Zn) were identified and no other Sb-containing particles were identified. •The majority of the particles produced were PbBa. •Other single component particles containing Pb, Ba, or Zn were identified. It was observed that •Zn does not incorporate into the particles produced by the cartridges. The results are •Independent of brand and power load.

For the HD: •No PbBaSb particles (with or without Zn) were identified. •No other Sb-containing particles were identified. The majority of the particles produced were single component Pb. •Other single component particles containing Ba or Zn were identified. •PbBa particles were also produced. It was observed that •Zn does not incorporate into the particles produced by the cartridges.

A large number of Zn particles were observed on the hands of a person who handled the drive pins but had no contact with the tool.

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