Purdue Northwest Team #46

Crimping Identification

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OBJECTIVE

Gathering usable data off the tool marks of remanufactured bullet casings using florescent identifiers, and different imaging for the purpose of cataloging and categorizing the information to find similarities and comparable data. This data will help to identify organized groups that commit crimes using the same remanufactured ammunition. This new forensic technique will provide useful information to the law enforcement community.

CUSTOMER PROBLEM AND BACKGROUND

Customer Description

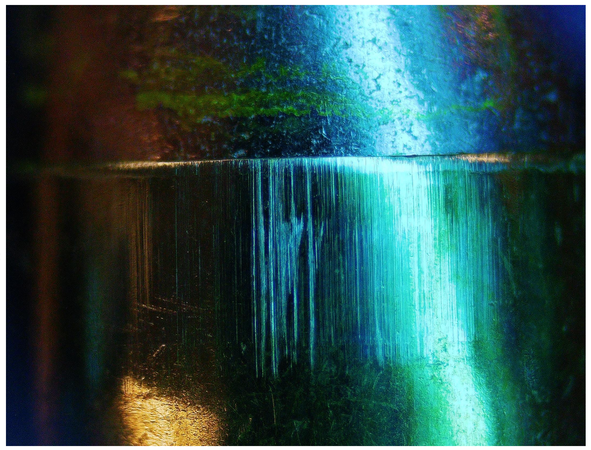
Our customer is Charles Steele. He is a lecturer of Physical Science and Forensic Science Coordinator at Purdue Northwest.

Problem/Background

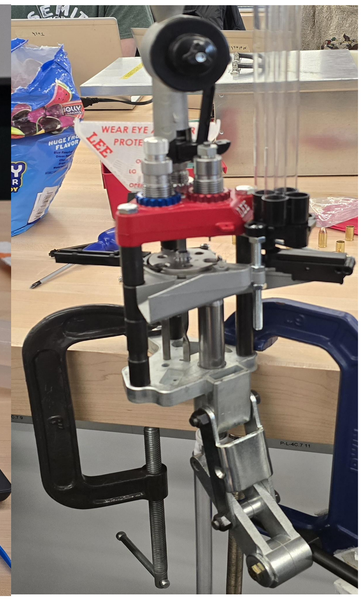
The project is developing a means of identifying the tool used to crimp bullet casings. The main goal was to come up with a way to image bullet casings that had been reloaded to see if we could find identifiable tool marks that we could trace beck to a reloader. The big picture was to eventually be able to catalog the tool marks we found on the casings so that we could link different crimes to each other. The hope was that once a casing was found at a crime scene, the catalog could be used to see what reloader it was from and also if other crimes had casings with the same marks. We tried several methods but settled on a digital microscope and comparative software. This Worked well and gave us detailed photos to show any differences. Ultimately, Brand new casings were non identifiable however the ability to link damaged casings back to old or damaged loading dies satisfied the customer and opened the way to farther development.

CONCEPTS AND EXPERIMENTATION

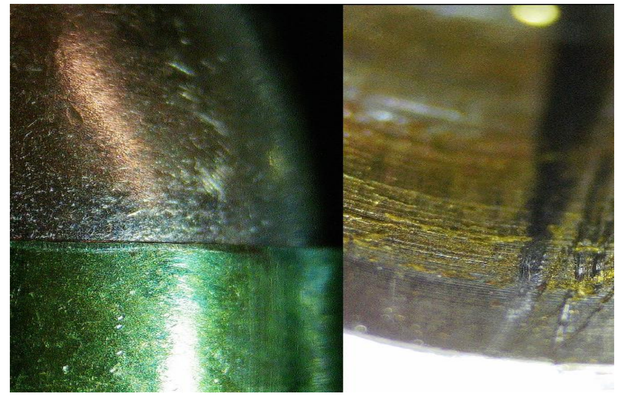
We started with three main concepts; Using cameras to image the casings, using thermal imaging to see the marks, and finally using a microscope. When testing these options, the microscope was the best choice. We stuck with the microscope as it showed a great amount of detail. We bought a reloader so that we could control the reloads to give us the best results. We put sharpie marks on the casings and reloader so that we could line everything up and take images of the same spot on the casing each time to compare. We used a comparing software and were not able to see many tool marks because the reloaders was brand new. We then used a file to act as a wear mark. The image to the right show the marks the reloader left after it was filed. The image also uses a UV light to show glowing after the casings was soaked in a fluorescent liquid.



REQUIREMENTS AND FINAL DESIGN



TESTING RESULTS



CONCLUSION AND RECOMMENDATIONS

We were able to prove a few different things regarding this project. The first thing we proved is that with a brand-new die, this is not possible. We started off crimping casings with a brand-new die that we bought. When looking at the casing under the microscope, there were no distinct tool marks that we could see. We could tell that the crimping area had been crimped because the edge was messed up, but there was no mark that we could prove came from the die.

The second thing we proved is that a scuffed-up die can show up on a casing. We used a small file to put scratches onto the inside of the die to make it more like it was worn because ours is brand new. When we looked at these under the microscope, we were able to tell that the marks transferred. Every casing that was crimped with the scuffed die would have wear marks. We were also able to take images of the inside of the die to see the exact lines we created on the inside. We put those images together and you could clearly see that the casings almost perfectly resembled the scratches on the inside of the die. This is the best result we have had as this proves it could be possible to link casings back to reloaders if you can get an image of the inside of the die.