

Technology Profile: MARCOR's PSU Turns Bullets into CASH



MARCOR's PSU (Pneumatic Separation Unit)

It has been said that necessity is the mother of invention.

In this case, the M stands for MARCOR, a nationwide, full-service environmental contractor. When one phase of a project called for removal of a massive amount of lead bullet fragments, a new invention ultimately turned a problem into an asset. The purity of the recovered metal was of sufficient clarity for recycling – and financial gain to the client.

Over a span of 40 years, a New York small arms range used for police training had accumulated dangerous concentrations of lead. About 180,000 cubic yards of soil were contaminated with the heavy metal. The soil at the heavily used training range was contaminated to a level of more than 70,000 mg/kg (ppm) total lead. Toxicity Characteristic Leaching Procedure (TCLP) lead was as high as 2,200 mg/l (ppm), or 440 times the recognized hazardous level.

The project called for use of large earth-moving equipment, power screens, pugmills, chemical fixation reagents, and some means for separating lead bullet fragments from soil, rocks, and debris. It was the need to efficiently and cost-effectively recover and separate the lead fragments that put the "necessity leads to invention" premise to the test.



Pugmill

MARCOR's design and fabrication specialists devised the Pneumatic Separation Unit, or PSU (now patented), to quickly separate lead fragments from soil and other matter to a clarity of greater than 90% – allowing them to be accepted at a local smelter for processing and recycling (and financial gain to the client). This invention successfully recovered over 700 tons of lead from the site.

Before the invention of the PSU, bullets were separated by one of two methods. One was very labor intensive; the other produced a hazardous waste stream and added significant cost.

Method 1: Mechanical Screening Followed by Selective Removal of Fragments

The contaminated soil would first be mechanically sifted through screens. For this particular NY project, a 1/4" size would have been needed to capture the smallest fragments. Workers would then pick out the lead fragments by hand (usually from a conveyor) to separate them from other 1/4" materials, which would also have sifted through the screens. This time-consuming method was obviously labor intensive.

Method 2: Utilization of Mineral Jig Separator Combined with Soil Washing

Mineral jig separators, typically used in the mining industry, work on the principle of specific gravity. A continuous stream of water is supplied as the spinning mineral jig separator flings the heavy metal toward the outer perimeter. Although the lead is 4 to 5 times heavier than stone and dirt, some extraneous materials typically separate along with the lead, reducing clarity. In addition, the water used in the process becomes contaminated; therefore, it must be treated to meet compliance standards before it can be safely discharged or transported to an approved municipal treatment facility. This additional step adds significantly to the cost of the project.

MARCOR's cost-effective PSU offers exceptional speed, superior clarity of the recovered lead, and does not produce a waste stream. In fact, the only cost associated with its use is that of the electricity. [Several PSU sizes are now available to suit the volume of the project.]

Ultimately, MARCOR's complete site remediation system for the NY small arms range resulted in soil test results surpassing the TCLP 5 mg/l standard. With production rates as high as 250 tons per hour, MARCOR safely and efficiently rehabilitated the highly contaminated site. The post treatment soil retained its soil-like consistency, allowing it to absorb new bullets. The treated soil also retained its original pH of 7.8, which was conducive to supporting vegetation for erosion control. Finally, innovative grading provided improved access for future bullet recovery and other maintenance efforts.

To learn more about bullet recovery, other MARCOR inventions, site remediation, or our full range of industrial and environmental services, call David A. Jungers in our national headquarters at 800-547-0128.