C25 Automobile Shredder Residue: Waste or Wasted Resource?

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The goal of this presentation is to demonstrate a custom sampling and analytical approach designed to ensure representative results for an extremely heterogeneous matrix.

This presentation will impact the forensic science community by demonstrating how improved sampling and analytical techniques for ASR will positively impact the forensic science community's ability to determine the most appropriate final disposition of this material, including its potential for use as an alternative fuel source.

Automobile Shredder Residue (ASR) is made up of all the non-ferrous material obtained from shredding old automobiles at a recycling facility. ASR contains rubber, plastics, wire, seat foam, etc. Batteries, gasoline, crank case oil, and coolant are all removed before the automobile enters the shredder. The ASR material is a sampling nightmare due to the various den- sities and sizes of the residue as well as the ever-changing composition of the recycled automobiles.

There are two regulatory roads to cross for the determination of the regulatory status of ASR for disposal purposes. First, there is the Toxic Substances Control Act (TSCA). ASR generally contains polychlorinated biphenyls (PCBs) in a non-liquid form. The PCBs come from electronic components, such as dry capacitors and condensers containing Aroclor 1242, hydraulic fluid, and plasticizers in wire insulation and other plastic parts con- taining Aroclors 1254, 1260, and/or 1262. EPA regulations under TSCA pro- vide that ASR may be disposed in a municipal landfill as long as PCB small capacitors1 have been removed from the shredder infeed, or, alternatively, as long as the ASR leaches less than 10 µg/L (ppb) of PCBs. Second, there is the Resource Conservation and Recovery Act (RCRA), which specifies that the TCLP leachate of ASR may not contain more than 5 mg/L (ppm) of lead and 1 mg/L of cadmium. Lead in ASR is most frequently associated with bat- teries, but may also be related to the presence of PVC-containing materials, solder, and wheel weights, among other sources.

Obviously, valid analytical data are necessary in order to make these regulatory determinations. Equally important is the need to collect valid samples for analysis – not a trivial task for this matrix.

A sampling protocol has been designed to obtain representative samples of ASR. First, representative portions (based on overall volume generated) of the five separate waste fractions that exit the shredder on the selected sam- pling day are composited to form a single pile. The subsequent sampling approach is based on the specifications of EPA's SW846 Chapter 9, and starts with thorough mixing of the combined pile with heavy equipment. The pile is then flattened into a (roughly) rectangular pile that is approximately one foot deep and 400 square feet. This flattened pile is repeatedly quartered until each subsection approximates five to 20 gallons. Using a random num- ber table, eight subsections are selected and removed from the large pile. These eight subsamples are then thoroughly mixed using heavy equipment, and the smaller pile is flattened to approximately one foot in depth and quar- tered twice to generate eight subsections. Using a random number table, one of the eight subsections is selected and becomes the sample that is sent to the laboratory in a five-gallon bucket.

Methods of analysis have also been modified to facilitate generation of representative results. The samples that are received from the field are first size-reduced by whatever means are necessary (cutting, chopping, etc.). Al- though the TCLP method specifies a 100 gram sample aliquot, a much larger aliquot (2 kilograms) of these samples is leached. To maintain the proper ratio of sample to leaching solution, this required construction of a shaker that could accommodate 40-liter containers instead of the normal 2-liter jars.

The success of these sampling and analytical methods is demonstrated in Figures 1and 2. Figure 1 compares results for Total lead and TCLP lead analyzed using routine-size (1 gram for Total and 100 grams for TCLP) aliquots of ASR collected as simple grab samples from large piles. No cor- relation is observed. In contrast, Figure 2 illustrates the much improved re- lationship between Total and TCLP lead analyzed using the customized large aliquots (100 grams for Total and 2 kilograms for TCLP) of ASR collected by the procedure described above.

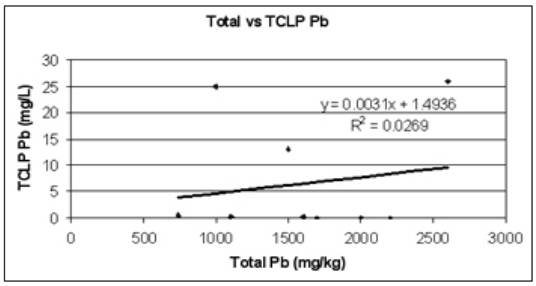

Figure 1: Total Pb versus TCLP Pb using routine analytical procedures.

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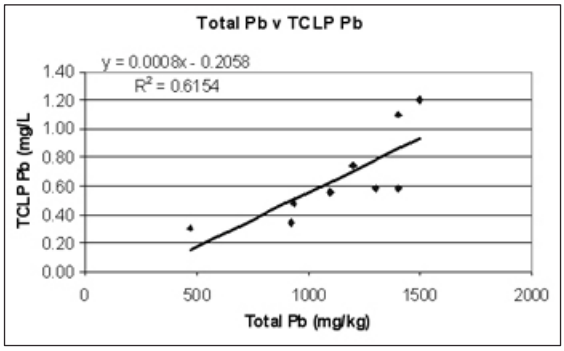

Figure 2: Total Pb versus TCLP Pb using customized (large aliquot) analyt- ical procedures.

Reference:

[1] PCB Small Capacitors are capacitors containing less than 3 lbs of dielectric fluid containing PCBs at concentrations of 500 ppm PCBs or greater. Dry capacitors are not regulated as "capacitors." "The definition of 'capacitor' refers only to devices that contain dielectric fluid." EPA's *PCB Q&A Manual September 2001 Version* at p. 12 section 761.2(a)(4).

Automobile Shredder Residue, TCLP, Representative

