

US EPA ARCHIVE DOCUMENT

DRAFT:

Overview of Five Data Sets Submitted in
Response to Phase IV Proposed Rule:

Re: Treatment of Metals

December 199~~8~~.

2. The Agency has not evaluated sufficient data to support that the proposed UTS are achievable using stabilization technologies.
3. Inadequate data exist to determine an appropriate UTS for metals and multiple metal waste streams.

DATA SUBMITTALS

- Five data sets were submitted.
- All five data sets were based on the use of stabilization techniques, with the goal of treatment being to remove the characteristic rather than to meet the proposed UTS levels.

DATA ANALYSIS

Data Set 1 - Association of Battery Recyclers/Battery Council International

- Data were obtained from seven secondary lead smelters "chemically fixating" D008 waste.

Number of Data Points Meeting Proposed TC Metal Treatment Standards							
Company	Treatment	Barium (7.6 mg/l)		Lead (.37 mg/l)		Selenium (.16mg/l)	
A	Portland Cement	13/13	100%	28/46 ^①	60.9%	2/13	15.4%
B	Portland Cement	9/9	100%	13/57 ^②	22.8%	1/9	11.1%
C	PC + Silicates	28/33	84.9%	9/33 ^③	27.3%	31/33	93.9%
D	Phosphates	100/102	98%	90/113 ^④	79.6%	46/101	45.5%
E	PC + Phosphate	2/2	100%	14/43	32.6%	0/2	0%
G	Portland Cement	1/1	100%	1/1	100%	1/1	100%
	Totals	153/160	95.6%	155/293 206/293	52.9% 70.3%	81/159	51%

- ① 35/46 (76%) data points were no higher than 0.48 mg/l
- ② 56/57 (98.2%) data points were no higher than 0.48 mg/l.
- ③ 25/33 (75.8%) data points were no higher than 0.48 mg/l.
- ④ 98/113 (86.7%) data points were no higher than 0.48 mg/l.

- Those "treated" lead values that were also above the characteristic level (5.0 mg/l) were probably retreated to "decharacterize" the waste. This accounted for 15 of the 293 data points or 5.1%.

Data Set 2 - American Foundrymen's Society

- Submitted data on lead in foundry sand waste. Data indicate that 0.37 mg/l for lead was achievable with the addition of iron filings.

Data Set 3 - Rollins Environmental Services

- Submitted eight data points showing that the treatment of moderately high amounts of Selenium (based on a composite sample of F039, K061, and various D-coded wastes), renders other metals soluble in TCLP leachate, hence failing UTS. The study concludes that the most effective pH for stabilization of Selenium is between 6.5 and 7.5; whereas optimum pH for other metals (i.e., Cadmium, Lead, Zinc, and Nickel) is between 9.5 and 11.5.

Data Set 4 - Environmental Treatment Council

- Submitted data on the stabilization of slag generated from battery recycling operations at one ETC member facility. Data was collected in 1995 and 1996 and consisted of 36 data points, 29 of which (80.6%) achieved a TCLP of below 0.37 mg/l for Lead.
- UTS levels for all Arsenic (9/9), Barium (3/3) and Nickel (3/3) values were met. Eight of the nine (88.9%) Cadmium values and 6 of the 7 (85.7%) Selenium values also met UTS.
- Submitted data relating to the treatment of foundry sand from each of 21 full-scale production runs (189 data points) from January 12, 1996 through May 15, 1996. Data shows that UTS can be met 100% of the time for lead and the following UHCs: Arsenic, Barium, Cadmium, Chromium, Mercury, Nickel, Selenium and Silver.

Data Set 5 - Chemical Waste Management

- Submitted data from a wide variety of D008 wastes generated from different sources, including battery slags and foundry sands.

Number of Data Points Meeting the Proposed UTS for TC Metal Wastes			
Constituent	No. of Data Points	No. Meeting UTS	%
Barium	1	0	00.0
Cadmium	1200	1190	99.2
Chromium	1300	1220	93.8
Lead	1550	1250	80.6
Selenium	1	0	00.0
Zinc	3	0	00.0

DATA DEFICIENCIES

- Four (BCI, AFS, ETC, and CWM) of the five data sets lacked sufficient information to develop a revised treatment standard for any of the measured constituents.
- Acceptable criteria for BDAT data sets can be found in the following document, "Quality Assurance and Quality Control Methodology for BDAT Program" June 1991.
- The following table identifies those data elements which were included in each data set.

BDAT Data Elements Identified in the Five Data Sets					
Data Information Needed	BCI	AFS	RES	ETC	CWM
Testing dates		●	●	●	
Full-scale	●			●	●
Grab sampling					
Waste characterization	●		●	●	●
Total analysis, waste in	●				
TCLP analysis, waste in			●		
In verses out data points			●		
TCLP analysis, waste out	●		●	●	●
EP analysis, waste out		●			
QA/QC			●	●	
Design/operating parameters	●	●	●	●	
Binders used	●	●	●		
Binder to waste ratio			●		
Type of mixing					
Cure time			●		
Other treatment information					

- On July 22, 1996, the WTB sent registered letters to BCI, AFS, ETC and CWM requesting that the deficiencies in their data sets be addressed and responded to by August 1996.
- As of November 4, 1996, only CWM had provided additional information.

- Only one data set (submitted by RES) could be used to calculate a new treatment standard.

DATA CONCLUSIONS

- The data does indicate to the Agency that for battery slags and foundry sands the treatment standards for TC metals and underlying metal constituents can be except for Selenium.

Number of Data Points Meeting the Proposed UTS for TC Metal Wastes			
Constituent	No. of Data Points	No. Meeting UTS	%
Barium	185	177	95.7
Cadmium	1230	1219	99.1
Chromium	1321	1241	93.9
Lead	1882	1437 (1509)	76.3 80.2
Selenium	196	108	55.1
Totals	4814	4182	86.9

SITE VISITS

- During August and September 1996, site visits were conducted at three facilities representing one large off-site commercial treater, one small off-site commercial treater and one medium-sized generator/on-site treater.
- Each facility treated inorganic metal wastes using a variety of stabilization techniques; portland cement + additives; portland cement + TSP + MgO, and TSP.
- Treatment data sets were collected at two of the facilities.
 - Data from Facility 1 shows that for a wide variety of TC metal wastes, listed wastes and Superfund wastes, (including mineral processing) wastes UTS can be consistently achieved, except for Selenium (using portland cement and other additives (data set complete with grab samples)).
 - Data from Facility 2 shows that treated slag (six sample sets, 48 data points) can meet UTS for the following constituents: Arsenic, Barium, Cadmium, Chromium, Lead, Mercury, Selenium and Silver (using portland cement + TSP + MgO (data set complete using grab samples)).

- Anecdotal information from Facility 3 shows that over the past 3 years UTS can be met for all metals, except for Beryllium, over 80% of the time, this information was based on composite sampling, using TSP as the stabilizing agent.
- If facilities treat and fail to go below TC, then "retreatment" is necessary. One facility identified a retreatment rate of 10% for the month of July 1996.

SITE VISIT CONCLUSIONS

- Information and data obtained during these site visits indicate that stabilization techniques can treat TC metals and underlying hazardous metal constituents to below the characteristic level. In most instances, treatment to below UTS can also be achieved.
- Selenium and Beryllium are two constituents that may pose difficulty for commercial treaters, however no data was provided during the site visits on Beryllium.
- Stabilization is not a "formula treatment technology". The equipment and techniques vary as well as the binders, reagents and additives. Some facilities use large amounts of water, other facilities none at all, some measure and mix precisely, while others use backhoes filled with reagents. However, all these facilities have demonstrated that they can meet UTS levels.

STABILIZATION TECHNOLOGY

- For the majority of TC metal wastes with metal concentrations 5% or less, the treatment technology of choice is stabilization.
- Stabilization is not a "formula" treatment technology. The equipment and techniques vary as well as the binders, reagents and additives. Some facilities use large amounts of water, other none at all, some measure and mix precisely, while others use backhoes filled with reagents. However, all these facilities have demonstrated that they can meet UTS.
- EPA has defined stabilization as the use of portland cement or pozzolonic lime (cement kiln dust, etc) as the basis for stabilization. Site visits have demonstrated this practice as well as showing us a facility using only trisodium phosphate (TSP) for the "stabilization of metal wastes. (Superfund has indicated that TSP only treatment has occurred at some Superfund sites.)
- Concerns have been raised as to the long-term stability of stabilized decharacterized wastes. A study is suggested to look at the long-term effects of stabilizing agents on wastes.

STABILIZING AGENTS

- EPA has identified a number of stabilizing agents that pose concerns with respect to their long-term ability to keep certain metals in an insoluble form or their toxicity.

Iron Filings

- Region 6 is currently in litigation over the use of iron filings for the treatment of Lead in foundry wastes.
- Studies on the treatment of Lead using iron filings have been conducted by EPA's National Enforcement Investigations Center (NEIC) and the University of Colorado. They both have concluded that the addition of iron filings does not constitute treatment.
- These studies have been peer reviewed by three independent reviewers.
- A NODA is being prepared to release the studies and peer review. The NODA will also discuss EPA's intention of banning iron filings addition as treatment for lead-bearing TC wastes.

Dithiocarbamates

- Sodium dimethyldithiocarbamate has been reported to be used to precipitate nickel and selenium from wastewaters and to decrease leachability from solids by a major waste treatment facility.
- While initial leachability is reduced, the dithiocarbamate degrades under acidic conditions to yield back the mobile metal, carbon disulfide (a potent reproductive and neurological toxicant), and dimethylamine which may form carcinogenic nitrosodimethylamine under the acidic conditions.
- Sodium dimethyldithiocarbamate is listed as U382 because of its acute toxicity to aquatic organisms. Its addition to the treated waste would impart additional aquatic toxicity concerns.

	U382		NICKEL SALTS	
	LC50		LC50	
	mg/l	days	mg/l	days
Trout	1.7-6.7	4	-----	-----
Bluegill	.0064	60	5.3-39/6	4
Fathead	3.4-38.5	4	2.9-17	4

- Selenium dimethyldithiocarbamate is reported to be a tumorigen (RTECS). Zinc dimethyldithiocarbamate has been found to be carcinogenic for male F344/N rats (NIH). Increased C-cell carcinomas of the thyroid gland were noted in the study.

- The addition of dithiocarbamate results in additional hazards when used for the stabilization of "decharacterized" wastes, rather than a minimization of the existing hazard.