

the range of pH 2 to 10. However, when exposed to very alkaline conditions of pH 12, the waste leached 0.111 to 0.157 mg/L in the pellet form and 0.136 to 0.781 mg/L in the crushed form. Vendor B's and Vendor C's stabilized wastes leached increasingly higher levels of mercury at the acidic conditions of pH 4 and lower. Vendor B's stabilized waste achieved 0.025 mg/L only at pH greater

than 10. Vendor C's stabilized waste achieved 0.025 mg/L only at pH greater than 6 in one of the two batches. Vendor D's stabilized waste achieved 0.025 mg/L only at pH greater than 10.

2. What Were the Study Results for Elemental Mercury?

Presented in Table 4 and discussed below are the constant pH leaching

results for the bulk elemental mercury study. Additional testing results (raw data, tables and graphs) are presented in the report "Technical Background Document: Mercury Wastes—Evaluation of Treatment of Bulk Elemental Mercury," available in the docket for today's notice.

TABLE 4.—BULK ELEMENTAL MERCURY TREATMENT STUDY—CONSTANT LEACHING RESULTS (mg/L MERCURY)

pH	Vendor A		Vendor B	Vendor C
	Pellets	Crushed		
2*	0.00542/ 0.0137	0.00658/ 0.0132	0.00105/ 0.00156	29.7/ 27.9
4	0.984	0.0621	0.00186	0.315
6	0.0835	16.7	0.00484	0.0323
8*	44.9/ 24.3	30.8/ 53.5	0.011/ 0.00832	0.0494/ 0.368
9	13.7	NA	NA	NA
10	0.0742	0.0839	0.0118	0.139
11	0.00951/ 0.0177	NA	NA	NA
12*	127/ 155	74.6/ 23.5	0.143/ 0.0672	0.0251/ 0.0249

*Duplicate analyses were performed at pH levels 2, 8 and 12.

NA—Not Analyzed.

Significant differences were observed between vendors in the treatment of elemental mercury. Vendor A's stabilized elemental mercury exhibited highly variable leaching as a function of pH. The variability observed prompted additional testing at pH 9 and pH 11 to verify and better characterize the significant swings in leachate mercury concentration. Leaching increased from less than 0.01 mg/L at pH 2 to over 24 mg/L at pH 8, reached a minimum of 0.009 mg/L at pH 11, then increased significantly as it approached pH 12 (to greater than 127 mg/L). Vendor B's stabilized elemental mercury shows a gradual increase in mercury leaching (from levels of 0.001mg/L to 0.15 mg/L) with the increasing pH of the leachate fluid. Vendor C's stabilized elemental mercury showed a pattern of decreased leaching with increasing pH, approaching the level of 0.025 mg/L only at a pH of 12. These results clearly show that there are significant differences in the effectiveness of the various treatment technologies. More importantly, the results show that leaching of mercury from the stabilized elemental mercury is pH dependent.

One treatment vendor in Europe, Bjästa Återvinning, has developed a mercury treatment process that results in the formation of mercuric selenide.

This vendor was one of the treatment vendors that submitted proposals to the Department of Defense's Defense Logistic Agency (DLA), expressing interest in treating their stockpile of elemental mercury. Mercuric selenide is indicated by solubility calculations to be one of the more insoluble mercury salts. Even though our study was underway, when we learned of Bjästa Återvinning's proposal to treat the DLA stockpile, we were very interested in including their treated waste form in our study. Due to logistical difficulties, we were unable to obtain a treated waste form from this vendor. We were, however, able to obtain laboratory-grade mercuric selenide and conduct limited leachate studies at pH 7 and 10 which bracket the conditions found at many landfills.¹⁴ We also assessed the effects of the addition of 500 ppm of chloride at pH 7 and 10. Unlike the other treated waste forms formed from treatment using a variety of reagents, the final waste form in this case was a known compound: Mercury selenide. Thus, there was readily available information on mercuric selenide solubility and the potential significant effects of chloride on that solubility. Geochemical solubility calculations for the mercuric selenide compound indicated that chloride ions would promote the

solubility of mercury. Chloride ions tend to form strong soluble complexes with mercury, greatly increasing mercury's mobility. While mean groundwater chloride concentrations are approximately 160 mg/L, landfill leachates range from 59 to 6,560 mg/L in industrial landfills and 96 to 31,100 mg/L in hazardous waste landfills.¹⁵ In our study, more than a three-fold increase in solubility was observed at both pH conditions with the addition of 500 ppm of chloride. At pH 7, the leachate concentration of mercury increased with the addition of chloride from 0.006 mg/L to 0.021 mg/L; at a pH of 10, the concentration of mercury increased from 0.028 mg/L to 0.11 mg/L. This indicates that major ions present in a given disposal environment may significantly impact the release of mercury from the treated waste form.

I. What Were the Peer Review Results?

The complete results of the Peer Review are provided in the docket to today's notice (Docket Number: RCRA-2002-0029), along with EPA's responses to the Peer Review comments.

retorting is 0.025 mg/L mercury, as measured by the TCLP. Treatment results are presented relative to this numerical benchmark for comparison purposes.

¹⁴ Characterization and Evaluation of Landfill Leachate (Draft), SAIC, September 2000.

¹⁵ Ibid.