

Column Study Services

for Heavy Metals Remediation

Batch versus Column Testing

Treatability studies for stabilization of metals have traditionally focused on batch testing where soil/waste is combined with a leaching solution and allowed to react for a specified period of time. Liquid to solid (L/S) ratios, stirring methods, and reaction times are specified for a given set of tests. This approach is required for hazardous waste characterization (e.g., TCLP) and can provide approximations for the conditions of *in situ* stabilization remedies with the Synthetic Precipitation Leaching Procedure (SPLP) or comparable groundwater leaching procedures. Batch procedures use relatively small volumes of soil/waste and leaching solutions and can be completed within days.

Column studies can address a number of issues that cannot be addressed with batch tests, or are better controlled within a column, such as:

- kinetic effects related to contaminant release as a function of particle size,
- the effect of competing ions present in the porous media, especially in the early stages of the testing,
- better implementation and maintenance of anaerobic conditions,
- more realistic estimate of full-scale performance, and
- validation of batch test results for future remedy evaluations.



Column Study Approach

Column studies pass leaching solutions through a soil/waste to evaluate the dissolution of contaminants from the sample and to evaluate the reaction of contaminants in the solution entering the column with the soil. Samples can be collected from the end of the column or from multiple ports within the column if greater resolution of reaction trends is desired.



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Leachate collection may occur over days, weeks, or even months to assess the long-term response between the solution and the solids. Solids are not mixed or stirred; therefore, the column better resembles natural environments. Anaerobic conditions are also more easily established and maintained both in the influent water and in the column when such conditions are relevant to the problem being evaluated.



Selecting the Appropriate Column Size

The column procedures require more soil/waste to pack the columns. Because of concerns with “edge effects” the diameter of the column may need to be greater for larger particle size test media, for example a fine gravel that may be specified for a permeable reactive barrier or *in situ* stabilization of coarse-textured waste.

Nominal 5-cm diameter columns are generally applicable for material on the order of 2 mm in size, while nominal 10-cm diameter columns are appropriate for material on the order of 5 mm in size. Also, significantly more leaching solution is required, often in the 10 to 100 litre range.

This can be significant when site groundwater is used as the leaching solution.

Additional Consideration

The procedures for column studies are more time-consuming and labor intensive than batch leaching. An appropriate approach to control the effort and cost of these studies is often to begin with batch testing procedures to focus the testing on a limited number or best performing remedy which are carried forward into the column studies.

Porosity and permeability also influence the column design.

ReSolution Partners Services

ReSolution Partners can perform batch and column studies in our treatability study laboratory. We also assist in the design process for these studies, and can provide sample containers and processing techniques to maintain site conditions to the extent practical.

For more information regarding column studies, please contact Bernd Rehm at 608.669.1249 or by email at brehm@resolutionpartnersllc.net.

