INSTRUCTIONS

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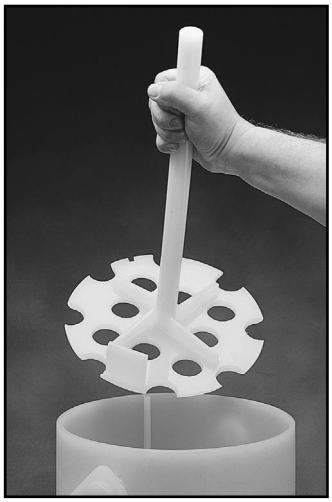
Churn Sample Splitter

Catalog No. 37805-0004, 37805-0008, 37805-0014

The water-quality laboratory requires subsamples of a representative cross-section sample of rivers and streams for water-quality analysis. The cross-section sample is collected in 1-liter bottles or 1- or 8-liter bags using isokinetic samplers (for streamflow velocities >1.5 feet per second) at four to nine verticals using the Equal Discharge Increment (EDI) technique or a minimum of 10 verticals using the Equal Width Increment (EWI) method (Edwards and Glysson, 1999). These samples are composited into one single representative cross-section sample of the streamflow. This composited sample can then be split, using the churn splitter, into the required representative subsamples as explained in the following procedure.

Procedure:

This procedure is for the 14 liter Churn Sample Splitter. For smaller units, use fewer or smaller samples. This size sample splitter does not reliably produce representative water-sediment mixture subsamples when it contains less than 4 liters. The total sample volume is 8 to 14 liters, of which 4 to 10 liters are suitable for water-sediment mixture (unfiltered) subsamples. The remaining 4 or more liters may be used for filtered subsamples. Before starting to collect the representative sample of the streamflow, label all the subsample containers to be used and determine the total sample volume needed. Add an additional 10% to this sample volume to cover filter losses and spillage. Collect 2 to 4 liters of water and thoroughly rinse the churn splitter by swirling it and emptying the water out through the valve spigot. Determine the correct transit rate for the sampler being used and the volume of water to be collected at each vertical (U.S. Geological Survey, variously dated). Collect samples at a predetermined number of verticals. Only one sampler bottle or bag is used over and over again in collecting the cross-section samples in order to minimize the amount of sediment lost in transferring samples from the bottles to the churn splitter. Each time the bottle or bag is filled, the sample is poured into the splitter and the bottle is used again so that each succeeding sample washes the sediment left from the previous one into the splitter. Remember that the volume to be used for water-sediment mixture (unfiltered) subsamples must be "on top of" the 4 liters of sample in the tank from which representative water-sediment mixture subsamples cannot be obtained. When the required volume, plus 10% for waste, is in the churn splitter, move to a clean sample processing area and place all water-sediment mixture subsample containers within easy reach so that, once started, the stirring can be continuous. The largest volume subsample should be withdrawn first. The sample should be stirred at a uniform rate of approximately 9 inches per second by raising or lowering the churn paddle. As the volume in the tank decreases by withdrawing subsamples, the round-trip frequency should increase so that the churning disc velocity remains the same. The disc should touch the bottom of the tank on every stroke, and the stroke length should be as long as possible without breaking the water surface. Before using the churn sample splitter for the first time, practice this stroke using tap water. Observe as the stroke length and/or disc velocity is increased beyond the recommended rate, there is a sudden change of sound and churning effort which is accompanied by the introduction of excessive air into the mixture. The introduction of excessive air into the sample is undesirable because it may change the dissolved gases, bicarbonate, pH, and other characteristics. On the other hand, inadequate stirring may result in non-representative subsamples. The sample in the churn splitter should be stirred at the uniform churning rate for about 10 strokes prior to the first withdrawal to establish the desired stirring rate of 9 inches per second and to assure uniform dispersion of the suspended matter. The churning must be continuous during the withdrawals. If a break in withdrawals is necessary, the stirring rate must be reestablished before continuing the withdrawals. The valve spigot should always be operated in the **full open** position. The operating lever is equipped with a positive stop when fully open. When all of the required water-sediment mixture (unfiltered) subsamples have been obtained, the remaining portion of the sample is used, as necessary, for the filtered samples. It will be advantageous to allow the sediment to settle out in the mixing tank for a few minutes before processing the filtered subsamples. When all the necessary filtered subsamples have been obtained, all parts of the churn splitter should be cleaned thoroughly.



Cleaning

Cleaning in the laboratory includes the following steps: 1) soak for 30 minutes in a 0.1 to 2 percent non-phosphate, laboratory-grade detergent solution; 2) scrub with a non-metallic brush; 3) rinse well with tap water, passing some through the spigot; 4) (for trace-element samples) soak for 30 minutes in a 5 percent (by volume) trace-element grade hydrochloric acid solution; 5) rinse well with deionized water, passing some through the spigot; 6) place in doubled plastic bags.

Cleaning in the field between sites includes the following steps: 1) Rinse all surfaces with a 0.1 to 0.2 percent non-phosphate, laboratory grade detergent solution and allow to soak for about 10 minutes; 2) scrub with a non-metallic brush; 3) rinse well with tap water; 4) (for trace-element samples) using a wash bottle, rinse all surfaces with a 5 percent (by volume) trace-element grade hydrochloric acid solution; 5) rinse well with deionized water; 6) place in doubled plastic bags (U.S. Geological Survey, variously dated).

References:

Edwards, T.K. and Glysson, G. D., 1999, Field methods for measurement of fluvial sediment: U.S. Geological Survey Techniques of Water-Resources Investigations, book 3, chapter C2, available online at http://water.usgs.gov/pubs/twri/twri3-c2/

U.S. Geological Survey, variously dated, National field manual for the collection of water-quality data: U.S. Geological Survey Techniques of Water-Resources Investigations, book 9, chaps. A1-A9, available online at http://pubs.water.usgs.gov/twri9A.

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