

A System for Vacuuming Ash from Elemental Analyzers

The center for stable isotope biogeochemistry at the University of California Berkeley uses ash suction (vacuum) to remove ash from our elemental analyzer used for C/N analysis. We find we can get longer runs using ash suction than using an insert to remove ash. Our standard runs are up to 170 each 9x5 tin capsules dropped into the furnace. This produces a few cm of ash, presumably mostly tin oxide. We can run up to 4,000 mg (4 g) of soil before having to vacuum out the ash. We generally suck out the ash each morning before starting the next run. Normal tin oxide ash can be left over a weekend and vacuumed out the following Monday morning, but ash from soil samples must be vacuumed immediately after the sample run or first thing the next morning or it will form a solid plug that is virtually impossible to get out.

Fig. 1 shows the basic system of:

1. A Fisher Sci Gast Lubricated Rotary Vane-Type Vacuum Pumps (<https://www1.fishersci.com/>) high volume vacuum pump (not a high vacuum pump). This pump only produces a vacuum of 27 inches of mercury (92 kPag) but 128 liters of air per minute. It has 10uM inlet and exhaust filters.
2. A Erlenmeyer flask attached to a stainless steel tube 34cm long, 9.4 mm OD, 7.9 mm ID (3/8" OD, 5/16" ID) suction rod. The stainless steel tube is used for vacuuming out the ash. The first flask catches any large particles from the suction device and has notches files in the end to help grind out the ash (see figure 3). They are connected with a thick walled tubing of larger inner diameter (ID) than the stainless steel tube.
3. A second Erlenmeyer flask stuffed with glass wool to help contain smaller particles of dust.
4. Both of these are container in a metal pale. The sides and bottom of the pale are sealed with tape so that any dust that escapes will not fall out onto the floor.
5. A long tin can attached to the side of the pale so that the red hot vacuum tube can be put in the can.



Fig 1.



Fig. 2 shows the notches being cut in the end of the vacuum tube.



Fig. 3 shows the finished notches at the end of the vacuum tube.

Procedure:

The exhaust tube is put in the hood and the metal pale is out on a small set of steps in front of the EA (Fig. 4). The autosampler is removed, the vacuum pump turned on, and then the suction tube inserted into the combustion tube and raised up and down and twisted back and forth to remove the ash (Fig. 5). Care is taken not to go below the line marked on the suction tube. The autosampler is then replaced and the system is leak checked.



Fig. 4 shows the metal pale and suction device in place in front of the elemental analyzer.

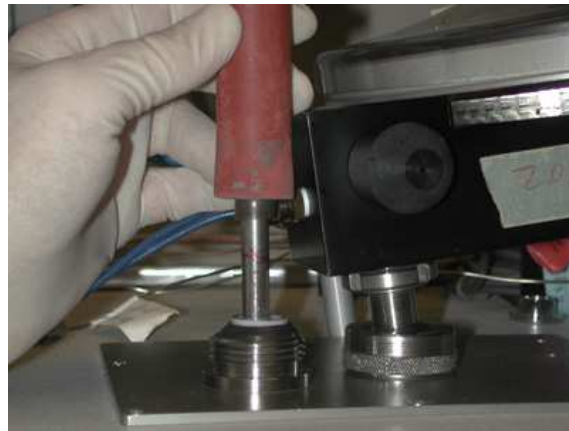


Fig. 5 shows the suction device in use. Note the line marked on the tube tells the level that the ash should be sucked down too. Below this would suck out the quartz wool and then the chromium oxide, which is very hazardous and should not be sucked through the vacuum system.