A High-Efficiency Rotary-Evaporation Unit

A high-efficiency, high-capacity, multiposition rotary-evaporation unit utilizing all metal traps is described, including a detailed description of the metal traps and complete system.

Rapid vacuum removal of solvents from labile and reactive substances has been accepted widely as a useful technique in the biochemistry and residue analytical laboratory. However, construction of systems employing rotary evaporators and conventional glass traps has led to frequent breakage and time consuming shut-down for solvent removal or deplugging of frozen traps. These disadvantages have been overcome by all-metal traps. Two of these traps, a 26- and 12-liter connected in series, provided sufficient vacuum ballast for rapid removal of solvents using as many as six rotary-evaporation units with little loss of vacuum at the flasks.

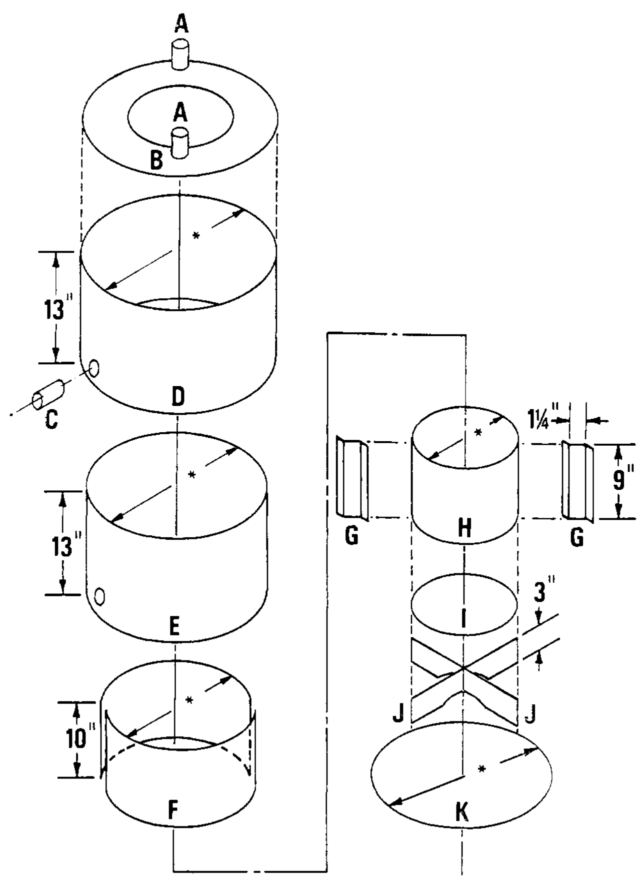

Figure 1. Vacuum solvent traps for rotary-evaporation unit 304 Stainless Steel, Sides, 16 Gauge, Bottom, 14 Gauge; ¾ Galvanized Steel, Pipes

***Approximate Diameters**

Part	Large Trap, Inches	Small Trap, Inches
D	17	12½
E	15	10½
F	11	8½
H	8½	6
K	17	12½

Advantages of this unit to the analyst stem from its large capacity traps, its less frequent draining, and its faster evaporation time than can be obtained with either a water aspirator or a piped-in vacuum source. This unit, for example, can evaporate 200 ml. of 7:3 methanol-water in 35 to 40 minutes at a relatively low temperature, *i.e.*, 45° C.

CONSTRUCTION DETAILS

Trap. Starting with top (*B*), after all holes are cut out, weld the inlet and outlet pipes (*A*) in place. Both pipes are short and should extend into the trap 1 inch. Next, weld wall (*H*) of the center dry ice bucket to bottom (*I*) and then to top (*B*). Bend each baffle plate (*G*) to form two right angle tabs on each of the two vertical edges as shown (Figure 1). Place each baffle plate up against top (*B*) with the tab in contact with the dry ice bucket (*H*) and weld it in place at the side and top. These tabs provide a large surface for the weld. Next, assemble the inner cylindrical baffle (*F*) by bending the two halves so that its edges are in juxtaposition on the tabs of the baffle plate (*G*) and in contact with top (*B*). Weld at the seams and to the top. This cylinder has no bottom. Assemble the grid support (*J*) and tack-weld it to the center of bucket bottom (*I*). First construct the cylindrical wall (*E*) with pipe (*C*) welded to it, then weld (*E*) to top (*B*) followed by outer jacket (*D*). Finally weld bottom (*K*) to the bottom of (*E*).

This construction provides access to the space between the outer walls for placement of the insulation material (poured urethane foam).

Rotary Evaporator. The rotary evaporation system (Figure 2) consists of 4 or 5 Rinco units mounted on a 0.5-inch flexaframe rod to support the rotating flasks. Each Rinco is connected through a 0.375-inch Jamesbury ball valve to a 1-inch galvanized pipe manifold. A large primary trap is connected directly to the manifold and a small reserve trap is installed between the primary trap and the vacuum pump. A commercially available water bath (28¾ × 12¼ × 13 inches, Sero Utility Bath, Precision Scientific Co.) is used to heat as many as five 1-liter round bottomed flasks when they are staggered.

DISCUSSION

Both traps were of the same height and design, differing only in their diameters (Figure 1). Short inlet and outlet pipes were connected to opposite sides of the same cylindrical compartment but separated by the baffle plates welded between them. This forced incoming solvent vapors under the dry ice trap or through the cold condensed liquid, once the system was in operation. This was believed to account for the efficient condensation obtained from this design. The perforated metal grid (*J*) under the dry ice trap prevented the collapse of the metal bottoms from the reduced pressure during operation. Poured urethane foam is recommended to insulate the cold compartment from the outer wall. Use of a 1-inch diameter pipe had adequate cross sectional area to

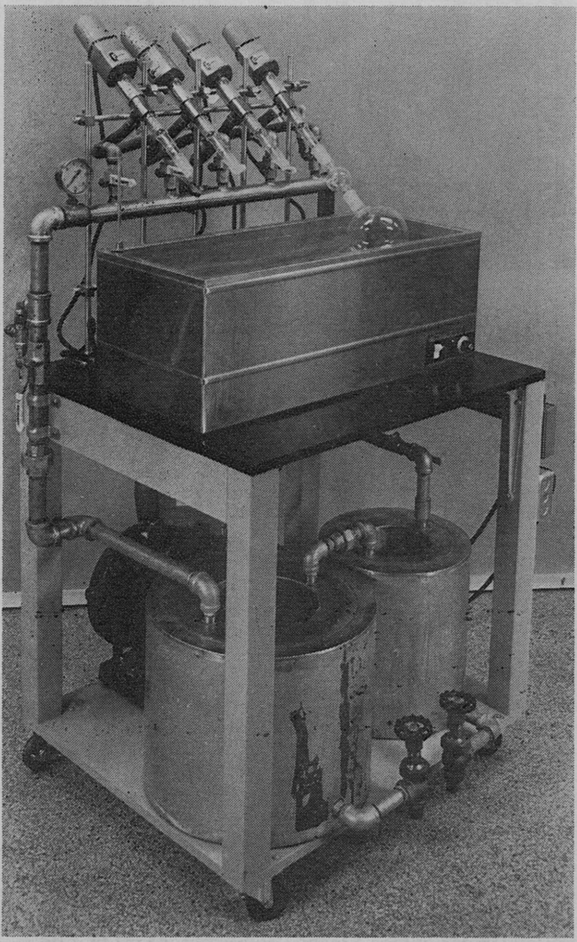

Figure 2. Complete portable rotary-evaporation unit

provide for efficient flow of the evaporated solvents from the drying flask to the traps. Pump oil was changed every two weeks during heavy use while the rotary parts of the rotary evaporators were cleaned and greased at 4- to 6-month intervals to ensure adequate pressure in the system. Dirty or loose fitting parts in the Rinco will cause serious leaks in the system. Pump pressure measured at the flasks (dry) was less than 2.0 mm of Hg.

Contamination of the samples from the downward flow of grease and condensate from the Rinco was prevented by a specially constructed glass adapter (Figure 3), since it was not commercially available. With daily use, it was necessary to remove and clean these traps once a week. From the

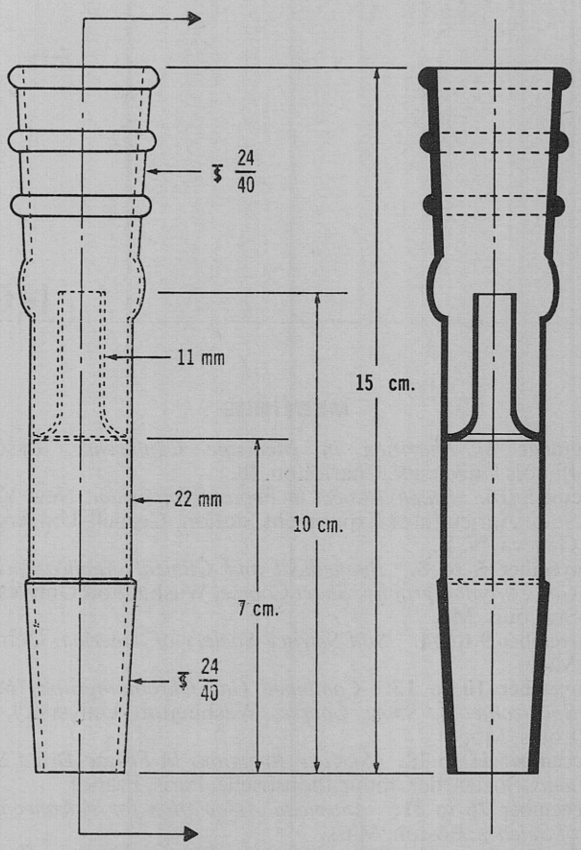

Figure 3. Glass trap for trapping downward flow of materials

accumulation of residue in these traps at the end of one week's use, it became apparent that they did serve a useful function.

ACKNOWLEDGMENT

The authors extend their appreciation to the Upjohn sheet metal shop for its cooperation and technical assistance in the fabrication of the metal traps and to the glass blowing shop for the construction of the special glass trap.

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Received for review February 20, 1969. Accepted May 26, 1969