

The Origin of the Rotavap

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Question

What is the origin of the laboratory rotary vacuum evaporator or rotavap?

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Answer

The modern laboratory rotary vacuum evaporator (figure 1) was first proposed in 1950 by the American biochemist, Lyman C. Craig, who is perhaps best known for his earlier invention (1949) of the Craig counter-current extractor (1). Variations and improvements were quick to follow, most notably those of Volk (2-5). A commercial version was first manufactured and sold by Walter Büchi of Basel Switzerland in 1957, and by the early 1960s the device had become a standard fixture of the organic and biochemical laboratory (6).

Craig rather unimaginatively referred to his apparatus as a "laboratory condensation device," whereas both Partridge and Volk used the term "rotary film evaporator." Büchi named his commercial product the "Rotavapor" and other manufacturers have adopted similar names, such as "Flash Evaporator," "Power-vap," "Pilotvap," etc. Most commonly, however, they are referred to simply as rotary evaporators or "rotavaps" for short, an obvious contraction of Büchi's original name (though there are some who advocate the alternative spelling "rotovap" instead).

The purpose of the device is to allow for rapid and efficient evaporation of solutions containing thermally sensitive organic and biochemical solutes by combining large surface areas for evaporation, produced by the solution film on the inside of the rotating flask, with low ambient vapor pressures, produced by the vacuum pump, and supplemented, when necessary, by moderate heating provided by a water bath. The rotation also keeps the solution mixed, thereby leading to more uniform crystal growth. Both massive rotating drum evaporators and vacuum evaporators were used by chemical engineers long before Craig proposed his apparatus, but it was his genius to combine both principles into a single, scaled-down, compact, laboratory device (7).

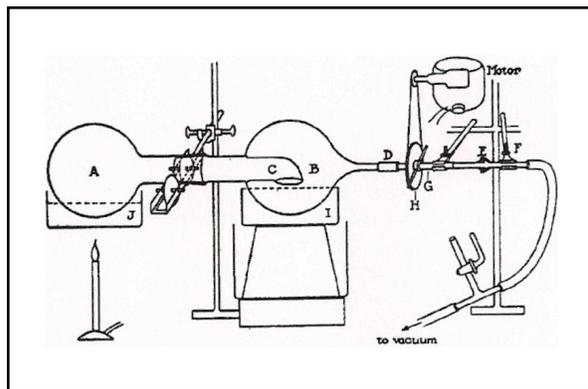


Figure 1. Craig's original rotary evaporator (1).

Literature Cited

1. L. C. Craig, J. D. Gregory, W. Hausmann, "Versatile Laboratory Condensation Device," *Anal. Chem.*, **1950**, 22, 1462.
2. S. M. Partridge, "Rotary Film Evaporator," *J. Sci. Instr.*, **1951**, 28, 28-29.
3. P. Numerof, K. Reinhardt, "Simple Laboratory Evaporator," *Anal. Chem.*, **1953**, 25, 364.
4. M. E. Volk, "An All Glass Rotary Film Evaporator," *Anal. Chem.*, **1955**, 27, 1207.
5. B. B. Marsh, P. M. Nottingham, "A Simple Rotary Film Evaporator," *J. Sci. Instr.*, **1956**, 33, 446-447.
6. K. B. Wiberg, *Laboratory Techniques in Organic Chemistry*, McGraw-Hill: New York, NY, 1960, pp. 22-24.
7. See, for example, A. Parnicke, *Die maschinellen Hilfsmittel der chemischen Technik*, 3rd ed., Nachfolger: Leipzig, 1905, Chapter 7; and E. R. Riegel, *Chemical Machinery*, Reinhold: New York, NY, 1944, pp. 361-366.

Do you have a question about the historical origins of a symbol, name, concept or experimental procedure used in your teaching? Address them to Dr. William B. Jensen, Oesper Collections in the History of Chemistry, Department of Chemistry, University of Cincinnati, Cincinnati, OH 45221-0172 or e-mail them to jensenwb@ucmail.uc.edu

2010 Update

Though the books on chemical engineering which I consulted in writing the original column discussed both rotary drum evaporators and vacuum evaporators, they made no mention of techniques which combined both approaches in a single device. However, more recently, on perusing the 1931 edition of Charles Dull's high school chemistry textbook, *Modern Chemistry*, I stumbled upon a diagram for such a machine used in the production of dried milk, parts of which are reproduced in the illustration at the right.

C. E. Dull, *Modern Chemistry*, Henry Holt: New York, NY, 1931, p. 101.

