

## EFFICIENCY TESTS OF THE NEW CENCO-HYVAC OIL VACUUM PUMPS

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The Department of Physics at the University of Illinois has been interested in high vacuum work for a number of years. The new types of mercury vapor condensation pumps that are now generally used in the production of exceedingly high vacua require supporting pumps that will draw a fairly high vacuum of, say, .01 to .001 mm. of mercury, and maintain it after weeks and months of continued use. Such pumps, if moderately priced, are much in demand at the present time.

Last December, at our request, the Central Scientific Company of Chicago sent one of their new design Cenco-

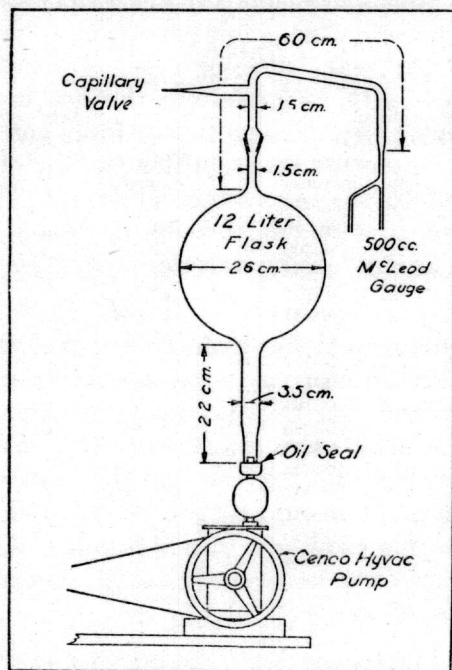


FIG. 1.

Hyvac oil pumps to our laboratory. We wished to test it for speed and endurance. It was inconvenient at the time

to make the speed tests since a pump was sorely needed as a fore pump in the junior electrical measurements work, and later also in research. The pump was put to work at once and has been in almost continuous use three days per week ever since.

Just recently (in April) it was arranged to try it out quantitatively. To this end the pump was connected directly through a short large diameter tube to a 12 liter flask which had attached to it a 500 cc. McLeod gauge for measuring the pressure, making with the connecting tubes 13 liters as the total volume to be exhausted. The connections and dimensions of the various parts are shown in Fig. 1. In a test like this it is necessary that all connecting joints be absolutely tight. The only two in this set-up, the one connecting to the pump, and the other to the McLeod gauge, were protected by heavy oil seals. The test consisted in noting the time and reading the corresponding pressure.

TABLE I.  
Cenco-Hyvac Oil Pump No. A112

13 liter volume RPM Equals 225		1.3 liter volume RPM Equals 225	
Time in minutes	Pressure in mm. mercury	Time in minutes	Pressure in mm. mercury
30.....	.00786	4.....	.01152
35.....	.00340	6.....	.00234
40.....	.00200	8.....	.00133
45.....	.00158	10.....	.00105
50.....	.00139	12.....	.00103
55.....	.00131	17.....	.00092
60.....	.00119	27.....	.00090
65.....	.00117		
70.....	.00115		
80.....	.00109		
90.....	.00100		
100.....	.00098		
110.....	.00094		
120.....	.00092		
130.....	.000911		
140.....	.00090		
170.....	.00084		

TABLE II.  
Cenco-Hyvac Oil Pump No. A186

13 liter volume RPM Equals 224		6 liter volume RPM Equals 214		1.3 liter volume RPM Equals 230	
Time in Minutes	Pressure in mm. Mercury	Time in Minutes	Pressure in mm. Mercury	Time in Minutes	Pressure in mm. Mercury
25.....	.01260	15.....	.00564	4.....	.00832
30.....	.00480	17.5.....	.00210	6.....	.00279
35.....	.00154	20.....	.00132	8.....	.00165
40.....	.00084	22.5.....	.00093	10.....	.00124
45.....	.00065	25.....	.00076	12.....	.00095
50.....	.00060	27.5.....	.00073	17.....	.00079
55.....	.00057	30.....	.00070	22.....	.00062
65.....	.00056	35.....	.00067	27.....	.00051
85.....	.00056	40.....	.00065		
105.....	.00055	45.....	.00062		
505.....	.00037	55.....	.00058		
		65.....	.00053		
		75.....	.00051		
		85.....	.00050		

Readings were taken at five or ten minute intervals over a period of several hours. The revolutions per minute of the pump were also noted from time to time.

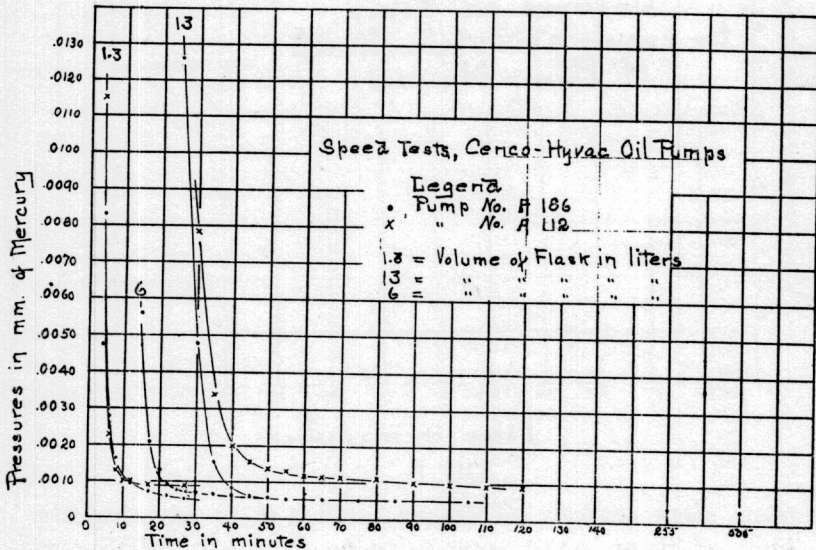


FIG. 2.

After completing the run with the 13 liter volume it was replaced by a glass tube of about 3.5 cm. diameter, making the total volume now to be exhausted but 1.3 liters,—

exactly one-tenth the former volume. Readings at 5-minute intervals were again taken. The data relative to this pump with these two volumes are contained in Table I.

Just recently (April 11) the department purchased a second Cenco-Hyvac oil pump. This was at once connected up as shown in Fig. 1, first with the 13 liter volume, then with a 6 liter volume, and finally with the 1.3 liter volume. The running conditions, etc., were exactly the same as in the first pump. The data relative to these three volumes are contained in Table II.

The data in Tables I and II are plotted in Fig. 2, in which the crosses represent pump No. A112, received in December, 1920, and the dots pump No. A186, purchased recently. A careful study of the tables and curves makes further com-

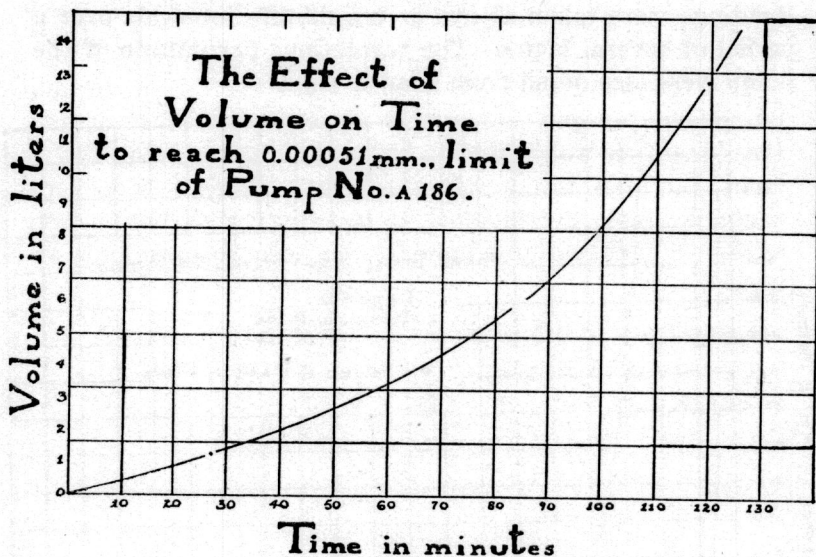


FIG. 3.

ment seem scarcely necessary; suffice it to say that the limit of pump A112 appears to be at about .00085 mm. mercury, while that of pump A186 is about .0050 mm. mercury. Tags attached to the pumps indicated .001 mm. mercury for A112, and .00055 mm. for A186. Thus the data obtained in our laboratory place the respective limits at

pressures that are lower than those claimed by the company. Furthermore, it appears that pump A112 has improved with use.

The relative speed of exhaustion of the two pumps is also shown by the curves. In general the speed is a complex function of the volume exhausted, the time, and the pressure at the beginning and at the end, and need not be considered here. It should be noted, however, that it required about 27 minutes to reach the limit (.00051 mm. of mercury) in exhausting the 1.3 liter volume, while approximately 85 minutes were required to reach the same limit in the case of the 6 liter volume, and 120 minutes to reach the above limit when the 13 liter volume was exhausted. This relation is best shown by the curve in Fig. 3, where volume in liters is plotted against time in minutes required to reach the limit .00051 mm. This curve is for pump No. A186.

The foregoing data show that this type of oil vacuum pump is quite rapid, and reaches a surprisingly high vacuum. It is therefore well suited to be used as a fore pump to any large throated rapid acting mercury vapor pump, since there is ample overlapping—a necessary condition in any system of exhaustion where fore or supporting pumps are used.

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