HOW TO SIZE LIQUID MOTIVE EDUCTORS FOR EVACUATING GASES

The times given in the ML, MLE evacuation charts below are the time in minutes to evacuate 1 Ft 3 to the pressure (vacuum) listed, from atmospheric pressure.

Step 1

Before beginning to do the actual sizing, convert all pressures and flows to the units used in the sizing table. (If sizing is being done regularly with other input units, request a special sizing table from your representative.)

Step 2

Divide the desired time to evacuate the volume by the number of Ft' to be evacuated.

Desired evacuation Time / Ft' to be Evacuated	**= Desired Time per Ft3**

Step 3

Locate the value equal to or less than the available flowing pressure for W your system in the Motive Pressure (Pm) column. If your available system motive pressure is between the listed pressures, you may interpolate between them. Choosing a lower pressure will yield a more conservative estimate.

Step 4

Locate the Suction Pressure (Ps) row that corresponds to the suction pressure that you need. If your desired suction pressure is between the listed pressures, you can interpolate between them. This will result in a more accurate sizing. At the intersection of the row you have located and the column from Step 3 is the time per Ft3 for a 1-1/2" unit.

Step 5

Choose a S.F. that when divided into the time/Ft' from Step 4 will yield a time/Ft 3 equal or lower than the Desired time/Ft' from Step 2.

Step 6

To determine the time required, multiply the Ft 3 of the suction vessel by the time per Ft 3 determined from the table in Step 5. This will give the time required to evacuate the vessel under actual conditions.

Step 7

To determine the motive water required, refer to the same column in the row labeled Motive Flow(Qm). Multiply this number times the Sizing Factor (S.F.) for the unit selected. The result will be the GPM of motive water required to operate the selected unit.

Note: Eductors for evacuations are sized at atmospheric outlet pressure. For liquid motives, these values calculated can be used with higher outlet pressures provided they do not exceed 5% of the motive pressure or 5 PSIG, which ever is lower. If higher outlet pressure is being used, consult the factory or your representative.

Adjusting Formulas for Priming

Step 1

Multiply the Ft3 to be evacuated by 2, then go to Step 1 under Evacuation and proceed through the procedure described above.

Example:

Required Time to Evacuate Vessel	**4 Minutes**
Motive Pressure, (Pm)	**60 PSIG**
Size of Vessel to be Evacuated	**45 Ft 3**
Outlet Pressure, (Po)	**1 PSIG**
Desired Final Suction Pressure, (Ps)	**10 In Hg Abs**

Step 1

All units are in pressures and flows used in charts.

Step 2

4 minute desired evacuation time/45 Ft 3 = .089 minute/Ft3

Step 4

Go to the ML and MLE table to find an MLE operated at 60 PSIG and pulling down to 10 In Hg Abs will evacuate each Ft 3 in 0.14 minutes.

Step 5

The S.F. for a 2" MLE gives. 14/1.82 = .077 minutes per Ft 3 , the first number below .089, the desired time from Step 2.

Step 6

Continued on next page ....

The actual time to evacuate will be 45 Ft 3 x .077 minutes = 3.47

Step 7

The motive flow (Qm) required will be 26.2 gal. x 1.82 S.F. 47.7 GPM.

Will the outlet pressure effect the unit" 60 x .05 = 3 PSIG.

Therefore, as the outlet pressure (Po) does not exceed 5% of the motive pressure or 5 PSIG it should have little effect on the performance of the unit.

Liquid Motive Evacuating Gases in Times

ML, MLE	Motive Press, Pm (psig)				Minutes per cubic foot						1-1/2" Unit	
Suction Press	20		40		60		80		100		140	
Ps, (In Hg Abs)	ML	MLE	ML	MLE	ML	MLE	ML	MLE	ML	MLE	ML	MLE
30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.07	0.14	0.02	0.02	0.01	0.01	0.01	0.01	0.06	0.01	0.01	0.01
20	0.25	0.14	0.10	0.06	0.05	0.04	0.03	0.03	0.02	0.03	0.01	0.02
15	0.51	0.30	0.24	0.14	0.01	0.08	0.07	0.06	0.06	0.05	0.03	0.04
10	0.95	N/A	0.45	0.26	0.28	0.14	0.17	0.10	0.11	0.08	0.07	0.06
S	N/A	N/A	0.91	0.47	0.59	0.25	0.41	0.17	0.29	0.14	0.13	0.11
Motive Flow, Qm (GPM)	18.9	16.3	25.3	21.8	30.4	26.2	34.8	30	38.7	33.3	45.4	39.2