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If you want vacuum, why buy a compressor?

The packaging industry today relies heavily on medium vacuum to form fill and create packaging for various applications. The term "medium vacuum" is generally classified as being from 760 to 1 mm hg. abs. (0-29.9).



The most widely accepted vacuum sources in this range are rotary vane vacuum pumps, regenerative blowers, liquid ring pumps, piston type vacuum pumps and ejectors. In the packaging industry, the rotary vane or sliding vane is most common. Life expectancy ranges from 4 -7 years, at which time a major factory overhaul is usually required. A quick-fix overhaul - offering quick turnaround and less down time - often results in shortened failure intervals of two weeks to six months.

This has been unsatisfactory in the long run, and as a result, the door has been opened for other vacuum producers to enter the market.

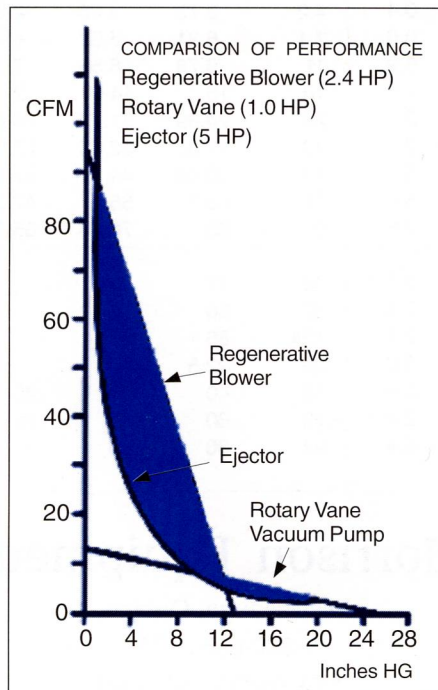
The ejector (venturi), for example, is a vacuum producing device using nozzles to direct a flow of compressed air in such a way as to create a negative pressure. At first glance, this is attractive due to the low initial cost. Some even tout the ejector as a "free" source of vacuum. In reality, however, the ejector suffers from two major drawbacks:

First, the capacity drops off dramatically as the vacuum levels increase. This leaves only small quantities of flow volume at lower pressure (Fig. 1).

Secondly, the power consumption is high in comparison to other

vacuum units because the ejector requires a source of compressed air to operate. That means you must consider not only the inefficiency of the ejector itself, but also the compressor and any line losses in piping to the ejector. Since, in most cases, plant air is used to power the ejector, this adds demand to the compressed air service in order to produce vacuum.

Fig. 1



Typical application cuts costs by 80%

To produce 1.76 CFM at 21" Hg using an ejector would require 58 PSI at 17.5 CFM.

The compressor demand is 5.0 HP, this will cost approximately \$2,500 per year (2 shifts).

A comparable Rotary Vane Vacuum Pump produces 2.43 CFM at 21" Hg requiring 1.0 HP. The cost to operate a 1 HP motor is approximately \$500, a savings of \$2,000 per year, every year.

Figure 2 shows a comparison of three vacuum principles and the power requirements for each. It seems apparent at lower vacuum levels (0-9" hg.), that the regenerative blower is the logical choice. Above 9" hg., however, the rotary vane is most efficient. For the ejector to work, each air line required a prefilter dryer and regulator, thus increasing the cost. The ejector requires clean, dry oil free air which increases the cost of maintaining the compressor.

Essentially, what happens is a transfer at maintenance cost from the sliding vane pump to the plant air compressor, dryer and air distribution system.

Naturally, if plant air fails, the packing machine, using an ejector, is rendered inoperable. But the equipment using a sliding vane type pump is a complete unit unaffected by fluctuations in the plant air supply. Routine preventative maintenance on the sliding vane vacuum producers prevent costly repairs and down time.

A trend toward using dry (oil-less) vane pumps has made simple in-house maintenance possible and cost effective. Oil-free pumps can operate up to 27" Hg.

For multiple pump applications an efficient central system can be created with the distribution pipe simply following the compressed air layout.

Fig. 2

ITEM	Compressed Air Consumption (SCFM)	HP	Flow (SCFM)								
			0'	3'	6'	9'	15'	18'	21'	24'	
EJECTOR	6.2 @ 87 psig	1.5	22.6	12.8	7.8	5	2.6	1.76	1.06		
	12.4	3	61.88	24.7	15.6	9.9	5.3	3.55	2.1		
	24.8	6	123.8	49.4	31.1	19.8	10.6	7.1	4.2		
	4.4 @ 58 psig	1	14	6.34	3.74	1.76	0.9	0.66	0.44	0.2	
	8.8	2	50	17.65	8.82	3.88	1.94	1.41	0.88	0.46	
	17.5	5	100	35.3	17.65	7.06	3.88	2.82	1.75	0.88	
	4.4 @ 72 psig	1	6	2.1	1.8	1.4	0.9	0.7	1.45	0.28	
	8.8	2	12	4.2	3.6	2.8	1.8	1.4	0.9	0.56	
	17.65	5	24	8.4	7.2	5.6	3.6	2.8	1.8	1.1	
ROTARY VANE VACUUM	N / A	0.4	4.2	3.73	3.26	2.8	1.86	1.4	0.93	0.46	
		0.6	7.1	6.31	5.52	4.73	3.15	2.36	1.57	0.78	
		0.9	11	9.78	8.55	7.33	4.88	3.66	2.43	1.12	
		1.2	18	16	14	12	8	6	3.98	1.98	
		2	28	24.89	21.77	18.66	12.42	9.31	6.19	3.08	
		3	42	37.33	32.65	27.98	18.63	13.97	9.29	4.62	
		5	57	50.66	44.31	37.98	25.29	18.96	12.61	6.27	
		5	71	63.1	55.2	47.3	31.5	23.6	15.7	7.8	
7.5	99	88	76.96	65.96	43.92	32.92	21.9	10.9			
REGENERATIVE BLOWER	N / A	0.6	54	17							
		0.9	82	50							
		2.4	124	86							
		0.6	29	22.5	16						
		0.9	46	40	29	20					
		2.4	73	60	48	35					
		2.4	94	80	66	50					

R.E. Morrison Equipment Inc.

Mississauga, Ontario

1-800-668-8736

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