Ozgen Gas Injectors

High efficiency gas injectors are widely used for vacuum injection and mass transfer of gases into liquids. Vacuum injectors are jet pumps for the conveyance and compression of gases with simultaneous mixing with the motive liquid.

Watertec Engineering Pty Ltd has developed the *Ozgen* range of efficient vacuum injectors, primarily for the diffusion and mixing of ozone gas into water

Principal of Operation

- The *Ozgen* range of injectors is based on the liquid jet emerging from the motive nozzle being expanded and dispersed into single droplets. These droplets, evenly distributed over the cross section of the mixing nozzle, hit and entrain the surrounding gasses and compress them to a higher pressure. The degree of intense mixing, gas flow and attainable

Fig. 1 details the relationship between the motive liquid to suction ratio, the effective motive liquid pressure and the injector backpressure. The motive liquid to gas suction ratio:

- Rises with higher supply pressures (p1)
- Drops with increasing backpressure (p)
- Is independent of the nature and specific density of the gas injected. Oil on water.

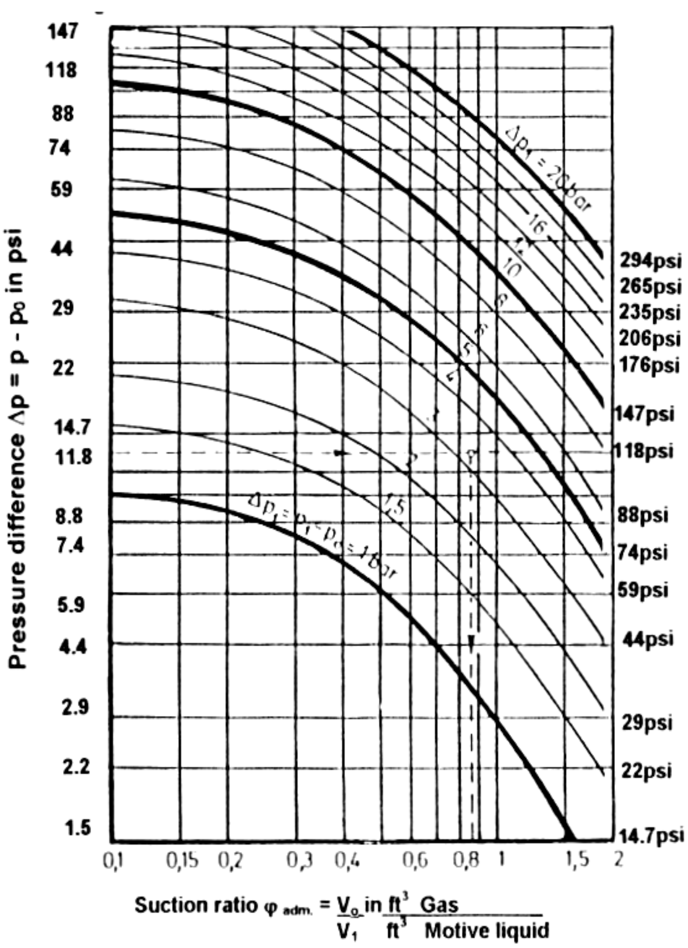

Figure 1

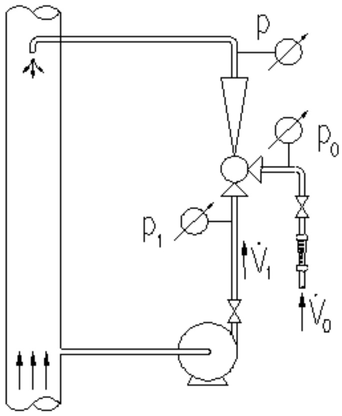

Figure 2

p_1 = Motive liquid pressure in psi
p_0 = Suction pressure in psi
p = Backpressure in psi
Δp = p-p_0 = Total delivery pressure in
Δp_1 = p_1 -p_0 = Effective motive liquid pressure in psi
V_1 = Motive liquid flow in ft^3/hr
V_1 = Gas suction flow in ft^3/hr
φ = $\underline{V_0}$ = Suction ratio

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Known Data

V_1 = 13 m3/hr Gas

p_0 = -0.2 bar (0.8 bar abs)

p_1 = 3 bar

p = 0.7 bar

Data To be found:

Motive liquid flow V_1 and the size of the injector

Calculation:

$\Delta p = p - p0 = 0.7 - (-0.2) = 0.9$ bar

$\Delta p_1 = p_1 - p_0 = 3.0 - (-0.2) = 3.2$ bar

From fig. 1 one finds that for $\Delta p = 0.9$ bar

and $\Delta p1 = 3.2$ bar:

$$\varphi = \frac{V_0}{V_1} = 0.85$$

Therefore:

$$V_1 = \frac{V_0}{\varphi} = \frac{13.0}{0.85} = 15.3 m^3/h$$

Injector Sizing

The injector size is chosen based on the liquid velocity in the supply and discharge piping. For PVC injectors the selection should be based on a maximum liquid velocity of 3m/s.

Table 1 details the maximum suggested motive liquid flow for each injector model.

Design Conditions

For most ozone injector applications the primary aim is to maximum diffusion efficiency while minimising the energy required. To achieve this it is often necessary to design the gas injector for the specific application.

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To enable the most appropriate injector to be selected please provide the following information with all inquiries or orders.

- Required gas flow V_0 in m^3/h
- Gas temperature in ^0C
- Density of gases in kg/m^3
- Motive liquid flow V_1 in m^3/h
- Temperature of liquid in ^0C
- Density of liquid in kg/m^3
- Suction pressure p_0 in bar
- Backpressure p in bar
- Motive liquid pressure p_1 in bar

(All pressure in bar = gauge)

Table 1

Detail	TYPE A					TYPE B				
	INJ01	INJ02	INJ03	INJ04	INJ05	INJ06	INJ07	INJ08	INJ09	INJ10
Max. Motive Liquid Flow in m3/h	2	3	5	9	15	25	45	70	100	140
Liquid connection A	20	25	32	40	50	65	80	100	125	150
Suction connection B	15	15	20	20	25	25	32	40	50	65
Pressure connection C	20	25	32	40	50	65	80	100	125	150
Length in mm a	225	275	350	450	500	600	675	825	1050	1250
b	75	85	95	105	130	100	115	135	165	190
c	150	190	255	345	370	500	560	690	885	1060
d	65	70	80	90	100	125	145	175	215	250
Weight kg	0.6	0.8	1.2	1.9	2.9	5.5	8.5	15	25	45

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