Gas Jet Ventilators

Fig. 1

Gas jet ventilators operate on the same principle of a jet pump jet pump in that it converts the pressure energy of the motive gas, by means of a nozzle, into kinetic energy.

The high velocity gas jet emerging from the motive nozzle draws in and accelerates the suction medium. The suction medium, air, gas or vapour is either drawn in from the surrounding atmosphere or from the suction housing, depending upon the type of ventilator construction used.

The motive jet and the drawn in vapours mix in the inlet cone.

The kinetic energy of the gas-air or steam mixture is reconverted to pressure energy in the diffusor. The achievable pressure difference between the suction and counter pressure is the compression of a gas jet ventilator.

In certain cases, gas jet ventilators are fitted with several mixing nozzles, one inside the other (as shown in Fig. 2), in order to obtain the most effective transfer of energy from the relatively small quantity of motive medium to the suction medium.

In this way, the motive flow increases from stage to stage by the amount of entrained suction flow. By this means, a uniform and virtually loss-free suction flow is produced.

Steam may be used, instead of compressed air or gas, as the motive medium for jet ventilators; in this case, one would speak of steam jet ventilators.

For more detailed information see catalogue sheet 2000 dv1.

As well as air, gas or steam, water may be used as the motive medium for jet ventilators. For further information see catalogue sheet 2000 fv1.

As opposed to liquid jet ventilators, gas or steam jet ventilators have the advantage of using an available high pressure motive medium and also larger pressure differentials can be obtained.

Applications

Gas jet ventilators convey air, gases and vapours against small **pressure differences up to approximately 500 mbar.**

Gas jet ventilators are used:

- to draw off stale air, ill-smelling gases and vapours from working and storage areas
- to deaerate reaction vessels, agitator vessels and other aggregates in chemical factories
- to ventilate tanks, e.g. on ships
- as forced blast blowers, or stack ventilators for boiler burners
- for the circulation of air in the leather, tobacco and textile industries

Gas jet ventilators offer the following advantages:

They have:

- an almost unlimited life, when suitable material of construction chosen
- no moving parts.

They are:

- maintenance free
- low priced
- quickly and easily put into operation

They can be:

- manufactured from various materials of construction
- installed in virtually all situations

Gas jet ventilators are specially calculated and fabricated to correspond to the particular operating conditions and can be supplied in the following materials of construction:

GGG40, steel, S/S, plastics, porcelain

Motive nozzle: S/S, plastics

Further, special materials of construction are possible, such as Titanium, Hastelloy etc.

Measurements, connecting dimensions and special capacity data on request.

Gas jet ventilators are available in three different constructions:

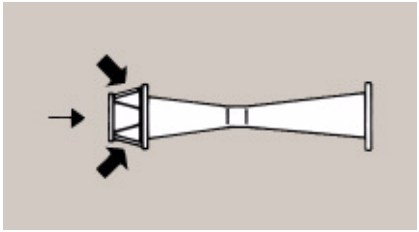

Fig. 2
Without head, giving free access to the entrained fluids

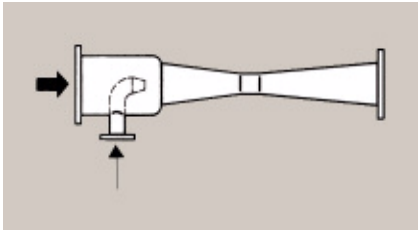

Fig. 3
With axial suction connection

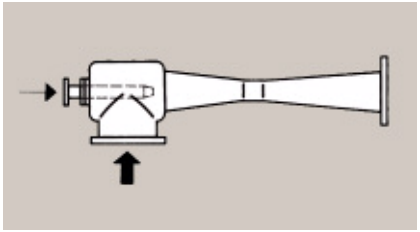

Fig. 4
With lateral suction connection

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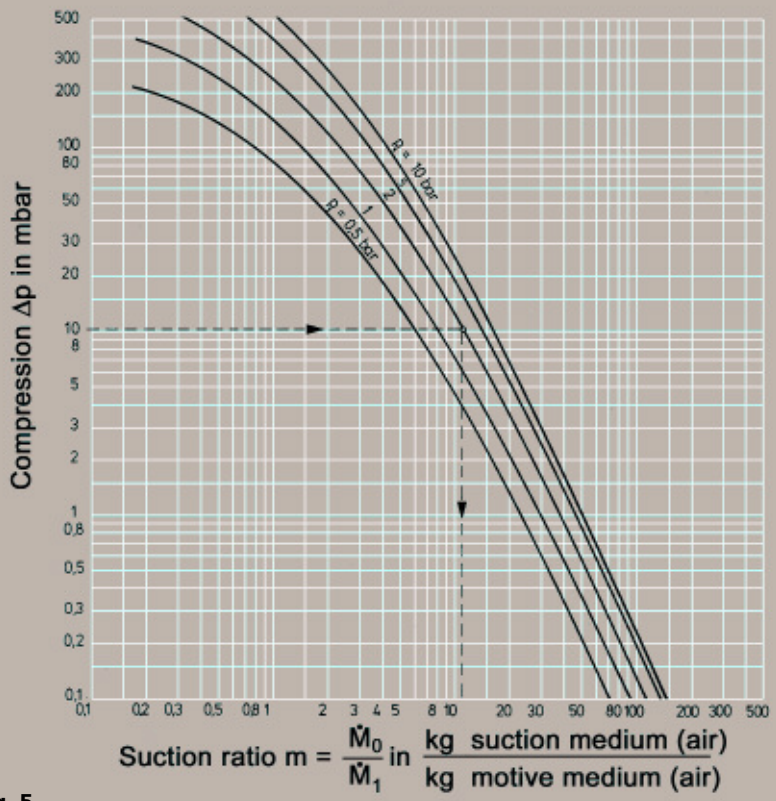


Fig. 5

p_1 = Motive air pressure gauge

The diagram Fig. 5 opposite shows the suction ratio m in kg of suction medium per kg of motive medium in relation to the compression Δp in mbar, at various motive pressures in bar gauge.

The characteristic lines apply to air as motive medium. In case the motive medium used is a gas other than air, the corresponding correction factors have to be considered.

Gas jet Ventilators operate in a range between Δp = 0 to 500 mbar. Above 500 mbar, gas jet compressors are used.

The motive medium consumption is calculated as follows:

$$\dot{M}_1 = \frac{\dot{M}_0}{m} \text{ in kg/h}$$

$\dot{M}_0$ = Suction flow in kg/h

$\dot{M}_1$= Motive medium consumption in kg/h (compressed air)

m= Suction ratio in kg suction medium/kg motive medium

Examples:

Suction flow 1500 kg/h air ≅ 1250 m3/h
compressed air pressure gauge: 2 bar (g)

1. required compression
Δp = 10 mbar

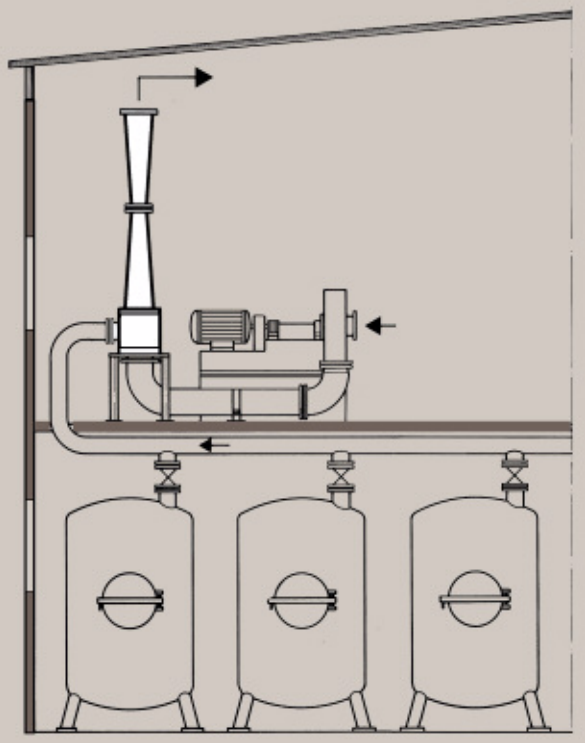
with compressed air at 2 bar, Fig. 5 gives a suction ratio m = 12,7 kg/kg

$$\text{Compr. air consumption} = \frac{1500}{12{,}7} = 118 \text{kg/h}$$

2. required compression Δp ~ 0 mbar

with compressed air at 2 bar, Fig. 5 gives a
suction ratio m = approx. 120 kg/kg

$$\text{Compr. air consumption} = \frac{1500}{120} = 12{,}5 \text{kg/h}$$



A = exhaust gas B = air C = to exhaust gas cleaning plant

Fig. 6 **Suction plant with a low-pressure gas jet ventilator**

An example for the deaeration of reaction vessels with a low-pressure gas jet ventilator is shown. Here, air is fed into the gas jet ventilator as motive medium by a blower with low compression. As the blower is only in contact with atmospheric air, a standard design without special corrosion proofing is sufficient.
The drawn off exhaust gases are heavily rarified by the motive air. For reasons of air pollution control the exhaust gas air mixture is usually supplied to a central exhaust gas cleaning plant.

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