Air distribution with the Air-Injector
Efficiency

Air distributor Air-Injector

The air distributor Hoval Air-Injector is used to distribute the supply air in high halls with great efficiency.
The coefficient of induction is used to measure the efficiency of an air distributor. The coefficient of induction defines the relationship between the primary air flow, resulting from the flow of forced air, and the secondary air flow, generated by the turbulence created by the primary rate. Measurements taken at the institute TU Stuttgart have shown that the coefficient of induction of the air distributor Hoval Air-Injector is between 4 and 20 times higher compared to conventional air outlets.
For example, a coefficient of induction of 8 means that the secondary air flow generated by the air distributor is 8 times larger than the primary rate. The mixed air flow is mixed intensively, which ensures excellent temperature uniformity and minimum stratification throughout the building.
Several measurements in various halls have proved a temperature stratification of only 0,2 K/m and an air velocity < 0,2 m/s in the occupied area.

Air velocity at the outlet of the Hoval Air-Injector

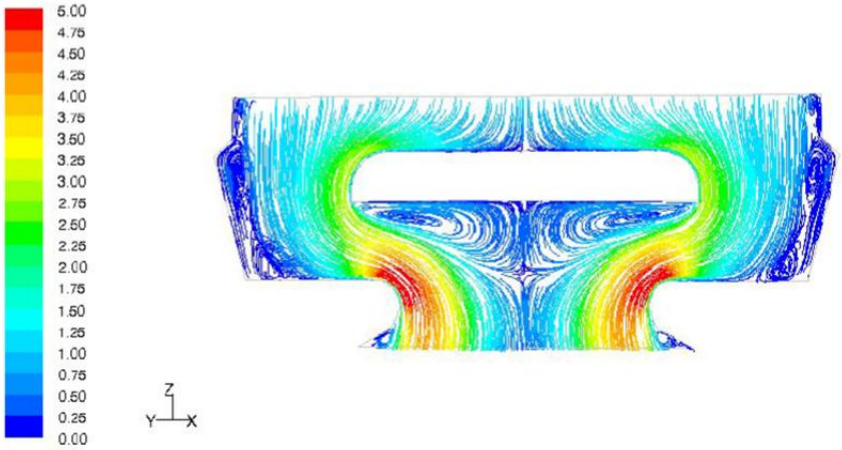


Fig. 1 Position of vanes: 0°

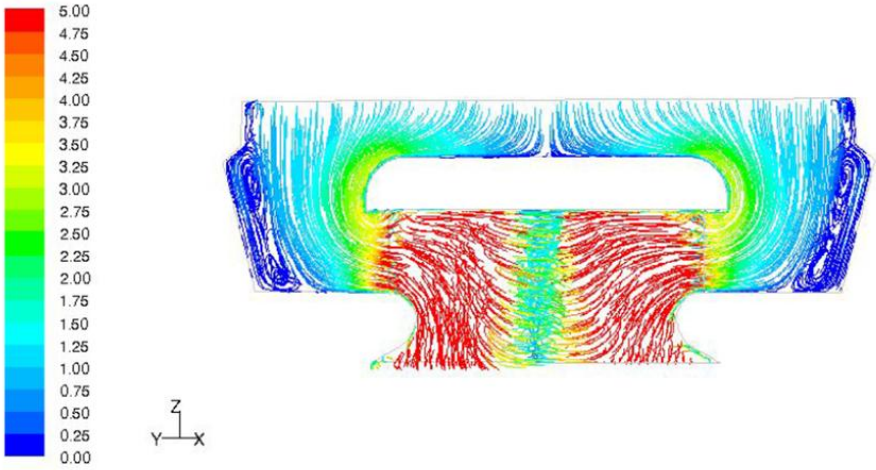
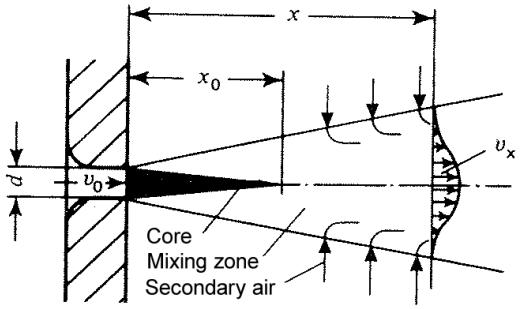


Fig. 2 Position of vanes: 50°

Air flow distribution with cylindric outlet

Isothermal conditions

$$\frac{Vx}{x} = \frac{x0}{x} = \frac{1}{m}.\frac{d}{x} \quad with\ x0 = \frac{d}{m}$$



Legend:

v_0	Air velocity at outlet nozzle [m/s]
v_x	Axial velocity at a distance of x metres [m/s]
m	Induction rate = d/x_0
x	Distance of measurement from outlet [m]
d	Diameter of nozzle [m]
x_0	Virtual characteristic range of the air flow [m]

Cylindric outlet nozzle (from Recknagel, Sprenger, Schramek)
under isothermal conditions

x [m]	x/x0	vmax/v0	vmax	m	Vx [m3/h]	Induction
2	4	0,9	6,36	0,28	11111	2,2
3	6	0,78	5,51	0,21	12821	2,6
4	8	0,68	4,81	0,18	14706	2,9
5	10	0,6	4,24	0,17	16667	3,3
6	12	0,51	3,61	0,16	19608	3,9
7	14	0,45	3,18	0,16	22222	4,4
8	16	0,4	2,83	0,16	25000	5,0

with x_0 = 0,5 m and v_0 = 7,07 m/s

Result of measurement by TU Institute (Technical University) Stuttgart (Germany)

Air distributor Air-Injector
Position of vanes: 50° = horizontal air flow (cooling mode)
Temperature difference between supply air and room air: 0 K

Distance [m]	x/x0	vmax/v0	wmax	m	Vx [m3/h]	Induction
2	8	0,26	1,84	0,48	38462	7,7
3	12	0,175	1,24	0,48	57143	11,4
4	16	0,057	0,40	1,10	175439	35,1
5	20	0,0455	0,32	1,10	219780	44,0
6	24	0,038	0,27	1,10	263158	52,6
7	28	0,0325	0,23	1,10	307692	61,5
8	32	0,0285	0,20	1,10	350877	70,2

with x_0 = 0,25 m and v_0 = 7,07 m/s

Air distributor Air-Injector
Position of vanes: 0° = vertical air flow (heating mode)
Temperature difference between supply air and room air: 25 K

x [m]	x/x0	vmax/v0	vmax	m	Vx [m3/h]	Induction
2	4	0,5	3,54	0,50	20000	4,0
3	6	0,42	2,97	0,40	23810	4,8
4	8	0,32	2,26	0,39	31250	6,3
5	10	0,26	1,84	0,38	38462	7,7
6	12	0,18	1,27	0,46	55556	11,1
7	14	0,13	0,92	0,55	76923	15,4
8	16	0,1	0,71	0,63	100000	20,0

with x_0 = 0,5 m and v_0 = 7,07 m/s

In summary, the decisive advantages of the Air-Injector are the following:

- The Air-Injector covers a large floor area.
- The occupied area is draught-free.
- The temperature stratification in the hall is reduced.
- Air distribution can be automatically controlled depending on temperature conditions.
- Ductless system: hygienic air distribution, low pressure drop, low energy consumption.