General Technical Information

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Heat Exchanger Selection

Heatex AB can offer a wide variety of plate heat exchangers when it comes to plate designs, plate sizes, plate distances and width of the heat exchanger. This enables the customer to choose from several alternatives regarding performance (efficiency and pressure drop) for each set of air data.

The selection and performance calculation is preferably done in our computer program, which can be downloaded for free at www.heatex.com. The program is frequently updated (1 or 2 times per year) so in order to have the latest update regarding product assortment we recommend that you visit our website now and then.

All heat transfer and pressure drop calculations are done with the actual heat exchanger geometry and based on correlations from scientifically well renowned sources such as VDI Wärmeatlas and International Hand Book of Heat Exchanger Design. This means that the calculations are made in accordance with the European norm EN 308 and its sub documents.

Uneven airflow and temperatur profile will affect the efficiency

Applications with uneven air velocity or temperatures over the heat exchanger may affect calculated efficiency and are to be evaluated at given occasions. In case of uncertainty, do contact Heatex AB for a correct evaluation of the specific product.

Heatex AB will guarantee a production accuracy of +/- 1% on the efficiency.

Some useful terms:

Since we at Heatex are mostly concerned with air-to-air heat exchangers for ventilation or cooling applications some useful technical notions will be described:

Exhaust air: This is the used air, mostly the hot air stream, and to save energy the heat of this air can be used to heat the fresh air (supply air) that will replace the exhaust air.

Please note definition of Nm^3/h and m^3/h

Mostly airflows are given as Nm^3/h or m^3/h or per minute or per second in stead of per hour. The "N" stands for normal and refers to the normal conditions of 1 bar and 20°C.

Supply air: This is the fresh air, mostly the cold air stream, that will replace the exhaust air and that will be heated from the exhaust air.

Relative humidity: This is the amount of water the air contains in relation to the maximum possible at the actual temperature and pressure. The maximum possible amount of water will vary with the air temperature.

Moisture content: This is the amount of water the air is carrying in absolute terms, i.e. kg of water per kg of dry air.

Efficiency or **effectiveness** (temperature efficiency of the heat exchanger): One of the most important ways to measure how well a heat exchanger performs, is to look at the temperature efficiency of the exchanger.

The efficiency on the hot side of the exchanger is defined as:

$$h_h = \frac{t_{h,in} - t_{h,out}}{t_{h,in} - t_{c,in}} \qquad (1)$$

And the efficiency on the cold side as:

$$h_c = \frac{t_{c,out} - t_{c,in}}{t_{h,in} - t_{c,in}} \qquad (2)$$

η is efficiency (1).
t is temperature (°C).
c is cold side and h is hot side.
in is into the exchanger and out is out from the exchanger.

When the fluid flows (actually the mass flow multiplied with the specific heat) are equal on both sides the efficiency will also be equal on both sides.

As you can see the efficiency tells you how much of the maximum available temperature difference (the denominator) you can utilise in the heat exchanger.

Pressure drop: The price you have to pay for the heat transfer is the pressure drop in the heat exchanger. The pressure drop is most easily described as friction between the fluid and the wall surface in the heat exchanger and must be overcome by using a fan or a pump to force the fluid through the exchanger channels. Normally the pressure drop is given in Pa or mm water column (mm w.c.).

Transferred heat or **Power** (mostly given as W or kW): When the temperatures or efficiencies and the flows are known it is easy to calculate the amount of heat that is transferred from the hot to the cold side.

on the hot side the amount of heat is:

$$q_{hot} = r \cdot \dot{V} \cdot c_p \cdot (t_{hot,in} - t_{hot,out}) \qquad (3)$$

q is the amount of heat transferred (W).
V is air volume flow (m^3/s).
ρ is fluid density (kg/m^3).
c_p is specific heat of fluid (J/kg°C).
t is temperature (°C).

The same relation is valid for the cold side and they must also be equal since no heat is created or disappears:

$$q_{cold} = r \cdot \dot{V} \cdot c_p \cdot (t_{cold,out} - t_{cold,in}) \qquad (4)$$

In order to be able to make a good selection and to speed up the selection process the following data should be provided and should be as accurate as possible.

Exhaust air:

- Airflow (either at standard air conditions i.e. 1 bar and 20°C or else the temperature at which the airflow is given must be stated).
- Air temperature.
- Relative humidity of the air.

Supply air:

- Same data as for exhaust air.

Required performance:

- Expected efficiency.
- Maximum allowed pressure drop in the heat exchanger. See separate information sheet about the effect of differential pressure on the pressure drop.

Restrictions regarding dimensions:

- Since space often is limited the maximum allowed diagonal distance (or maximum allowed plate size) should be given.
- Maximum allowed width of the heat exchanger should also be given.

With these data it will be possible to find one or several alternative selections that give the required performance.

When the correct heat exchanger size has been chosen there are several options to choose from such as integrated by-pass section, damper, epoxycoated aluminium plates, painted framework, sealing material for higher temperatures, different corner profiles etc.

In the final selection price versus performance must be evaluated.