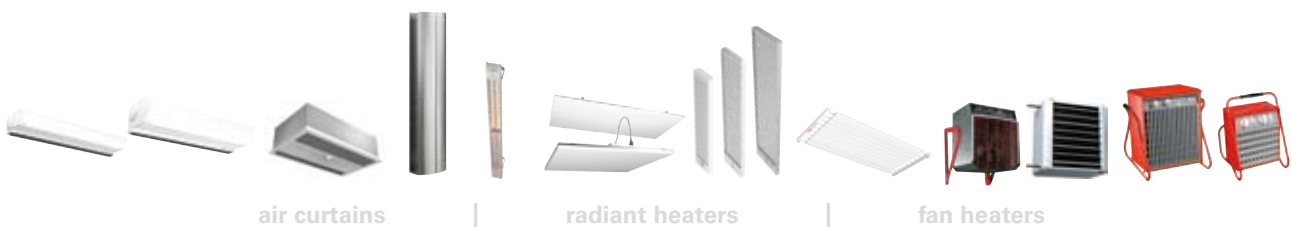
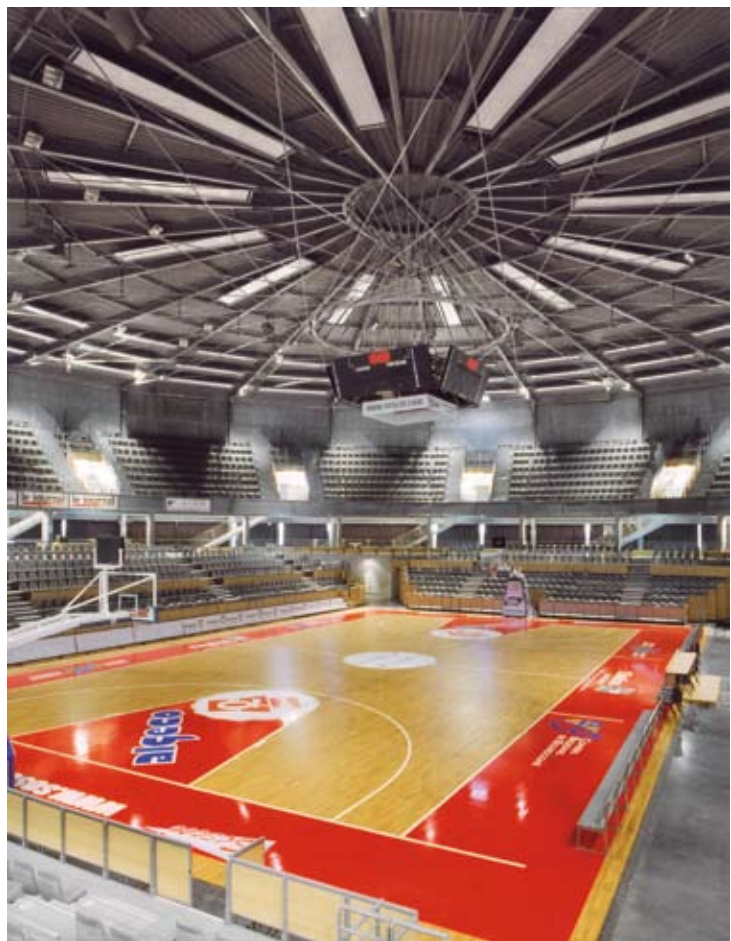


Save energy with Radiant Heaters



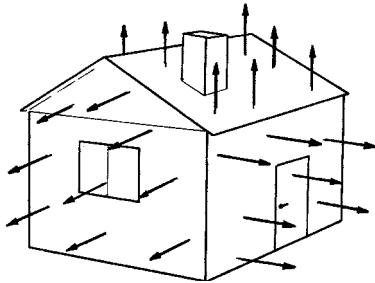
air curtains

radiant heaters

fan heaters

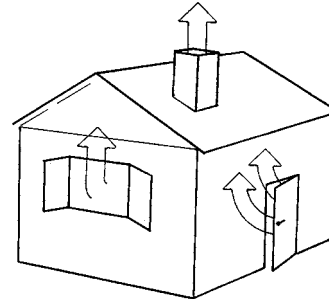
Energy savings

Heat losses



Transmission losses

The size of transmission losses varies according to the areas of the building parts and insulation. The losses are proportional to the temperature differences between indoor air and outdoor air.



Ventilation losses

The ventilation in a building is either mechanical or of the natural type. Mechanical ventilation most often consists of a supply and exhaust air unit that makes heat reclamation possible. Natural and involuntary ventilation consists of thermal currents causing warm air to rise and leak through openings and unsealed areas.

Methods to reduce heat losses

Improved insulation of a building naturally reduces heat losses and increases energy savings, but there are other methods of reducing heating costs as well.

Equalizing temperature differences

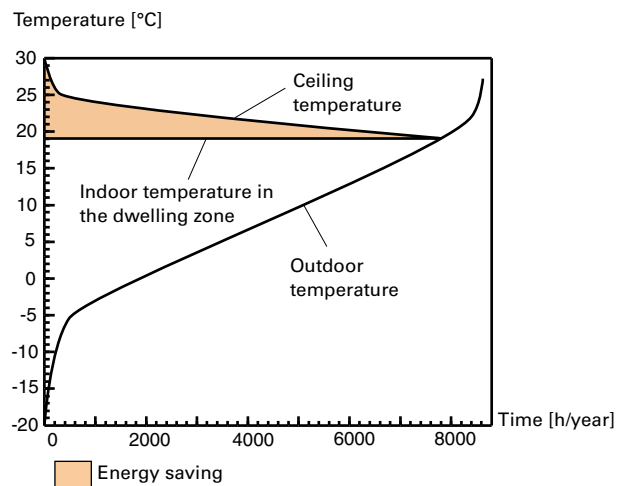
Warm air is lighter than cold air and is gathered in the highest spot inside a building. Vertical temperature differences between floor and ceiling occur. The temperature gradient ($^{\circ}\text{C}/\text{m}$) is a standard of the temperature rise per metre of height and varies depending on the heating system and the season. In rooms with high ceilings, the temperature difference between the dwelling zone and the ceiling is often very big, between $10\text{-}15^{\circ}\text{C}$. Equalizing the temperature differences can reduce heat losses by as much as 30% while making optimal use of the heat.

- Radiant Heaters

Heating with a ceiling mounted radiant heater is indirect. The heat develops when heat rays meet surfaces such as floors, walls, machines, etc. The surfaces then heat the air in the dwelling zone. The temperature difference between ceiling and floor thus becomes very small.

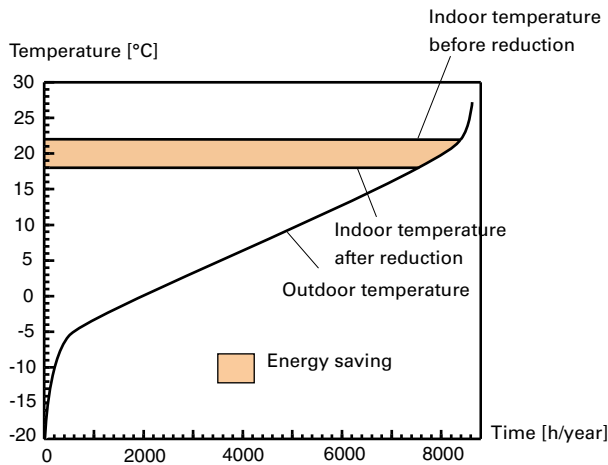
- Ceiling Fans

Heating with e.g. fan heaters or radiators gives relatively high temperature gradients. The installation of ceiling fans is a very simple and inexpensive way to equalize the temperature difference. The heated air is pushed down from the ceiling to the dwelling zone.



Lower indoor temperature

Another method of saving energy is to lower the indoor temperature. However, this must be done without sacrificing the comfort.



A temperature reduction of 1°C gives 5% energy saving.

- Lower air temperatures.

Using radiant heaters, the air temperature in a room can be lowered by a few degrees while still maintaining an experienced high temperature, the so-called operative temperature. A reduction of the temperature by 1°C results in energy savings of around 5%. Operative temperatures are those temperatures which human beings feel. They are the sum of the air temperature and radiation temperatures. All objects provide radiant temperature changes. Cold surfaces cause a subtraction and warm surfaces an addition. Operative temperatures can be described thus:

$$t_{op} = \frac{t_{air} + t_{rad.}}{2} = \frac{t_{air} + (t_{air} + \Delta t_{rad.})}{2} = t_{air} + \frac{\Delta t_{rad.}}{2}$$

where t_{air} = air temperature
 $t_{rad.}$ = radiant temperature (incl. air temperature)
 $\Delta t_{rad.}$ = radiant temperature change (excl. air temperature)

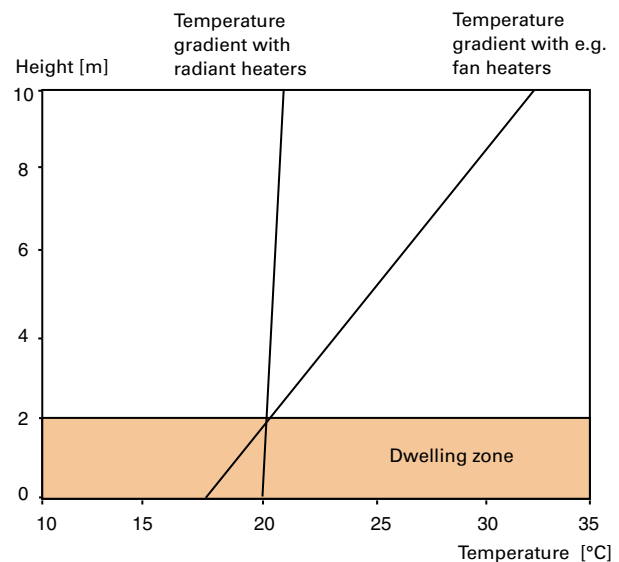
- Zone and spot heating

With radiant heaters, different zones of a building may have varying temperatures. The entire building does not have to have the same high temperature if for example work stations are far apart. Even the comfort aspect means that different work situations require different temperatures. Spot heating can be regarded in the same way as spotlighting. When someone is there, the heating or lighting is increased.

- Low temperature gradient.

Heating with radiant heaters provides a highly equalized vertical temperature distribution. The heat develops when the rays meet surfaces such as floors, walls, machines, etc. The surfaces in turn heat the air in the dwelling zone. The temperature differences between the ceiling and the floor become very small and "overheating" minimal. Especially in buildings with high ceilings, great energy savings are obtained compared to conventional heating systems.

The temperature gradient [°C/m], the temperature rise per metre of height, is very low for radiant heaters, approx. 0.3°C/m. Warm air heating or heating with conventional radiators causes significantly greater temperature differences per metre of height with temperature gradients of 2.5 and 1.7°C/m respectively, at full output.



- Time control

When there is no-one in the building, e.g. at night and on holidays, the temperature can be lowered.

Reduce leakage

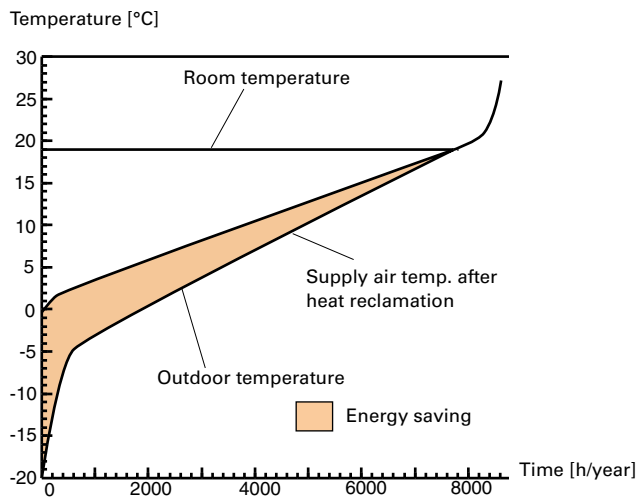
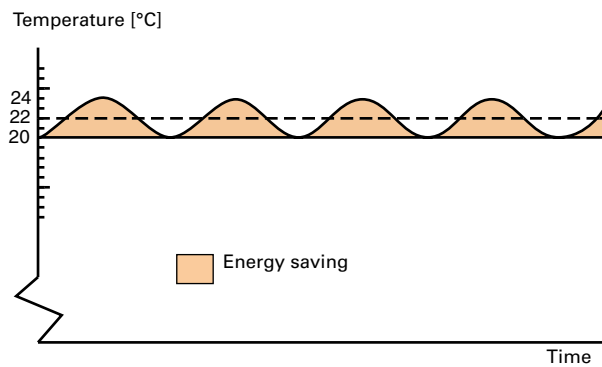
Tremendous energy losses often occur through openings such as doors and gates. Expensive heated or cooled (air-conditioned) air disappears through the opening. This can be prevented by the installation of air curtains. Air curtains create a block between different temperature zones. Balanced ventilation and shorter opening times also contribute to the reduction of energy leakage. Read more about Frico air curtains in Product catalogue Thermozone air curtains.

Heat reclamation

To reduce ventilation losses when ventilation is mechanical, a portion of the energy content of the exhausted air can be reclaimed. One simple method is to immediately recycle portions of the warm exhaust air to the supply air unit, so-called return air. Another way is to use a heat exchanger that takes in and returns portions of the heating energy to the building.

Greater equalization of temperatures

A standard on/off thermostat can be used to vary the temperature around a set value. If the desired temperature should never be lower than 20°C, the average temperature is approximately 22°C. With a triac-controlled output regulator, the room temperature can be set to 20°C and the temperature won't deviate from the setting. Lowering the temperature by 1°C gives energy savings of 5%.



For more information on radiant heaters, please visit www.frico.se or contact your local Frico representative.