

Basic Knowledge

Thermal Insulation and Heat Recovery



Improving the thermal insulation of walls and roofs is only one possible measure towards energy savings in buildings. An economic assessment requires an analysis of the savings to be expected through reduced heat losses in each individual case.

Heat transport

Temperature differences result in the transport of thermal energy. Transport takes place in the direction of the lower temperature. There are three different heat transport processes:

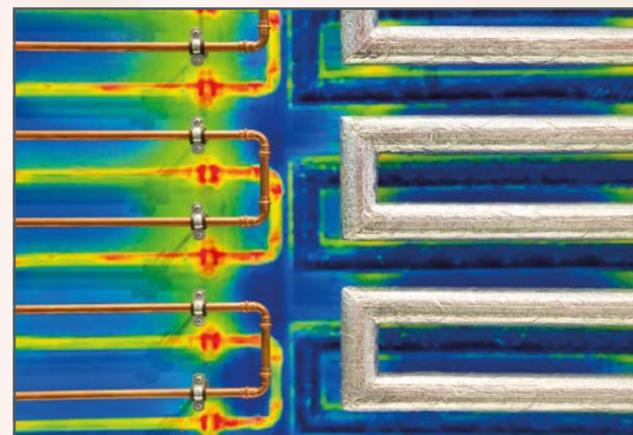
- heat conduction
- convection
- heat radiation

Enabling heat transport with as little obstruction as possible, or suppressing heat transport, are crucial in providing an efficient heat supply for buildings.

If a heat transfer medium is used for transporting heat (forced convection), then an unimpeded intake at the heat source and an unimpeded heat dissipation at the place of use are the ideal. However, heat dissipation should be suppressed as much possible during the actual transport.

In the case of heating for rooms, heat dissipation out of the room being used and into adjacent areas should be prevented. Besides the heat transfer surface, the heat conduction properties of the heat transfer material are a key factor for heat transfer which is as unobstructed as possible. Heat conduction is typically expressed as a coefficient of thermal conductivity.

In contrast, construction materials for suppressing heat dissipation are usually described by the overall heat transfer coefficient. This also includes the thermal resistance of the adjacent air layers.



The insulation of heat transfer conduits also provides a significant contribution to energy efficiency.

Heat recovery

Processes in which the residual heat of a mass flow is used after its primary use are referred to as heat recovery. The heat gained in this way would otherwise be wasted without heat recovery.

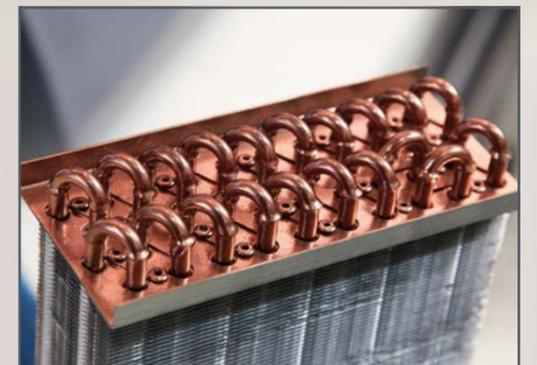
The greatest energy savings potential from heat recovery comes from heating and ventilation systems. In addition, heat recovery systems are conceivable in principle in many other supply and disposal processes in building services engineering.

Heat demand of a passive house

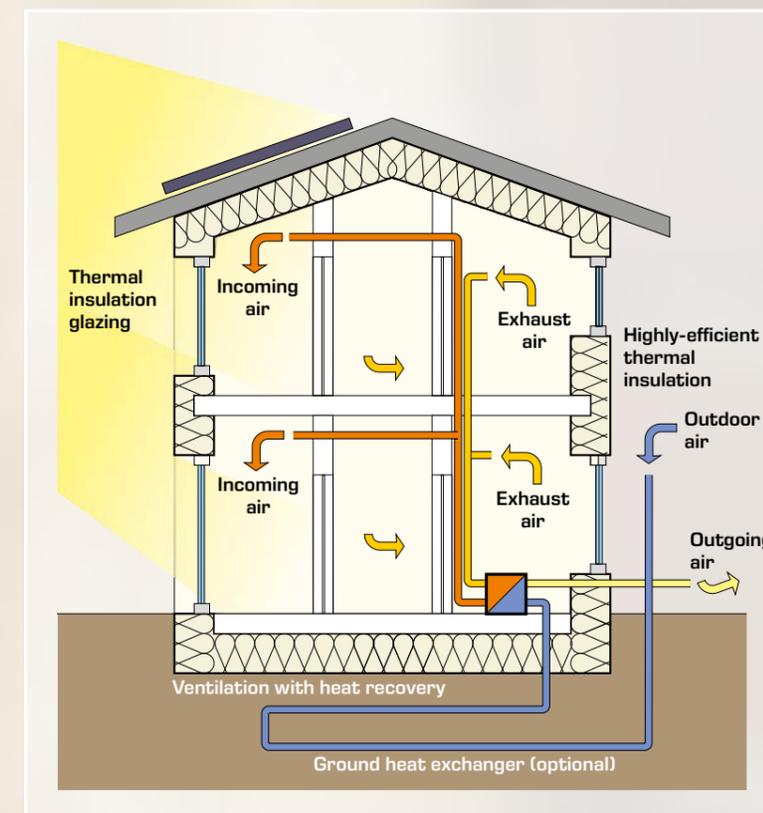
In buildings known as passive houses, the heat demand is reduced by up to 90% by thermal insulation and heat recovery compared to typical houses in existing building stock. Highly effective insulating materials and triple glazing are used in passive houses. One particularly efficient measure is heat recovery from the ventilation system's exhaust air.



In larger buildings in particular, the optimisation of ventilation technology often results in huge savings opportunities in the year-round energy demand for heating and air conditioning.



In so-called circuit compound systems, two separate air-to-water heat exchangers are employed in order to use the heat contained in the exhaust air to heat the incoming air.



A lack of insulation in old buildings can lead to heat leakages. These problem areas can be detected by means of sensitive infrared cameras based on the emitted heat radiation. It is not just the heat conduction of materials, but also how they are fabricated that determine the effectiveness of insulation in walls and heat transfer conduits.