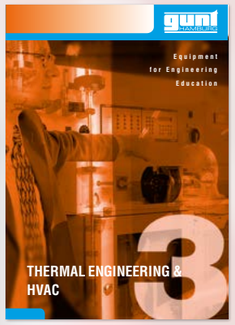
Basic Knowledge

Efficient Heating Technology

Considerable savings possibilities, without any reduction in comfort, are often possible in modern heating systems through more efficient components and a demand-based supply of heat.

High-efficiency heating circulation pumps provide the same capacity as conventional pumps while consuming up to 80 % less power.



Many of the fundamental themes of heating technology are also covered by a wide selection of educational systems from our catalogue 3.

Catalogue 3
Thermal Engineering and HVAC

Significant efficiency gains can be achieved in heating technology using modern circulation pumps or by hydronic balancing of installed heating systems, for example. Our educational equipment on heating technology helps you to teach the detailed knowledge necessary to achieve significant energy savings through a suitable combination of various measures.

Energy-efficient circulation pumps

A heating pump ensures that each radiator is supplied with hot water. Standard pumps with an electrical output of 45 to 90 watts are often still being used even in newer buildings. These circulation pumps are preconfigured according to the amount of water in the heating system – regardless of the actual heating demand. This is very inefficient and consumes a lot of electricity unnecessarily. Modern circulation pumps on the other hand, are adjusted to demand by means of the differential pressure, thereby saving up to 80 % of electricity costs for heating alone.

Optimisation through hydronic balancing

Hydronic balancing adjusts the flow rates of the hot water through all radiators or heating circuits of a surface heater to a certain value. As a result, each room is supplied with the amount of heat required to achieve the desired room temperature at a certain feed flow temperature at the heating system operating point. Hydronic balancing also ensures that the return feeds on all radiators have the same temperature.

Thermostatic valves for demand-based room heating

Before the widespread introduction of thermostatic valves, the only option for adjusting individual room temperatures was often to open the windows. This approach was naturally associated with considerable energy losses. Nowadays, however, thermostatic valves are widely used and allow the heat supply to be adjusted according to demand.

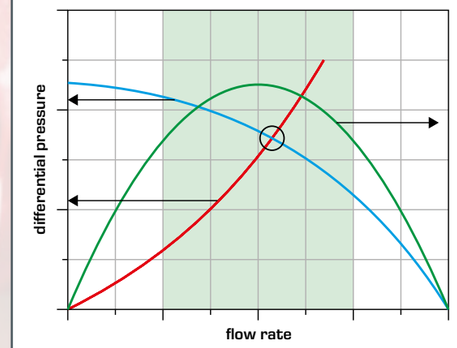
Thermostatic valves are mechanical temperature controllers which permit the flow of a heat transfer fluid depending on the ambient temperature. A valve ensures a lower or higher flow rate in order to keep the temperature of the surrounding space constant.

Design of the heating system

When designing heating systems, it is important to make sure that the components used are well matched to each other. Typical characteristics of the pump and the piping system help with this. This is shown in the diagram by way of example. The efficiency of the pump (C) is also plotted. The operating point of a system is determined by the intersection of the pump characteristic (A) and the system characteristic (B). The operating point should be as close to the central region of the pump characteristic as possible to ensure good efficiency.

Heating system operation under varying heat demand

Naturally, the performance capacity of a heating system should cover the maximum heat demand from room heating and hot water supply in winter. Nevertheless, in order to keep year-round energy demand to a minimum, it is essential to create adaptive heating systems for a highly fluctuating energy demand. In addition to an intelligent control system, factors such as adequate storage and an appropriate mix of renewable heat sources where possible are important.



Ideal operating point of a heating system

Heating controller

The central element of modern heating systems is the heating controller. The heating controller measures the outdoor temperature and the room temperature, and from these it calculates the house's heat demand by means of the heating curve. The feed flow temperature needed to cover the heat demand is adjusted by the flow rate of the circulation pump and/or the position of the mixing valve.

In most cases, hot water is also supplied with heating energy via the boiler. In this regard, the controller switches the charging pump on as required.

In addition to using efficient components and optimising systems, a key element for the long-term reduction of energy demand is regular monitoring of the proper functioning of the system. Nowadays, modern and inter-linkable heating controllers greatly facilitate system monitoring.

Checking the system components