

# **System Efficiency of Heating Systems**

## **Data from Practical Use in Austria**

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The system efficiency of a heating systems depends from the operating conditions. The higher the load and the longer the operation time, the better the efficiency. Because of the fact, that the load in high-efficient housing is low and the operating period is short, the maximal theoretically efficiency – as measured in testing laboratories – can not be achieved. For example, the advantages of “condensing” are not so high both in small heating systems and for hot water preparation outside the heating season compared to heating systems with a larger load, e.g. for apartment housing.

The following Figure 1 illustrates the measured system efficiencies of modern heating systems for high-efficient housing (heat load smaller 10 kW) in Austria. Especially in solar-supported heating systems the reduced efficiencies have to be considered. Thus, the solar system for hot water preparation should be designed for a solar share more than 90% outside the heating season. The small demand for auxiliary heat should be produced by electricity. With larger heat storage with a heat capacity of three to five days the demand for auxiliary heat will be remarkable reduced. From the point of efficiency as well as environment (pollutions), also biomass / pellets boilers should not be operated outside the heating season.

## System Efficiency of Heating Systems for High-Efficient Housing *Data from Practical Use in Austria*

Heating Period / Heating System	Winter-period Space heating and hot water	Summer-period Only Hot Water
Gas boiler, condensing, %	95%	65%
Gas boiler, %	90%	60%
Oil boiler, %	85%	60%
Fire wood boiler, %	60%	-
Wood chips boiler, %	80%	50%
Pellets boiler, %	80%	50%
Direct electricity, %	99%	99%
Heat pump, (ground-coupled), COP	4,0 (COP)	2,3 (COP)
Heat recovery & heat pump, COP	2,9 (COP)	2,1 (COP)

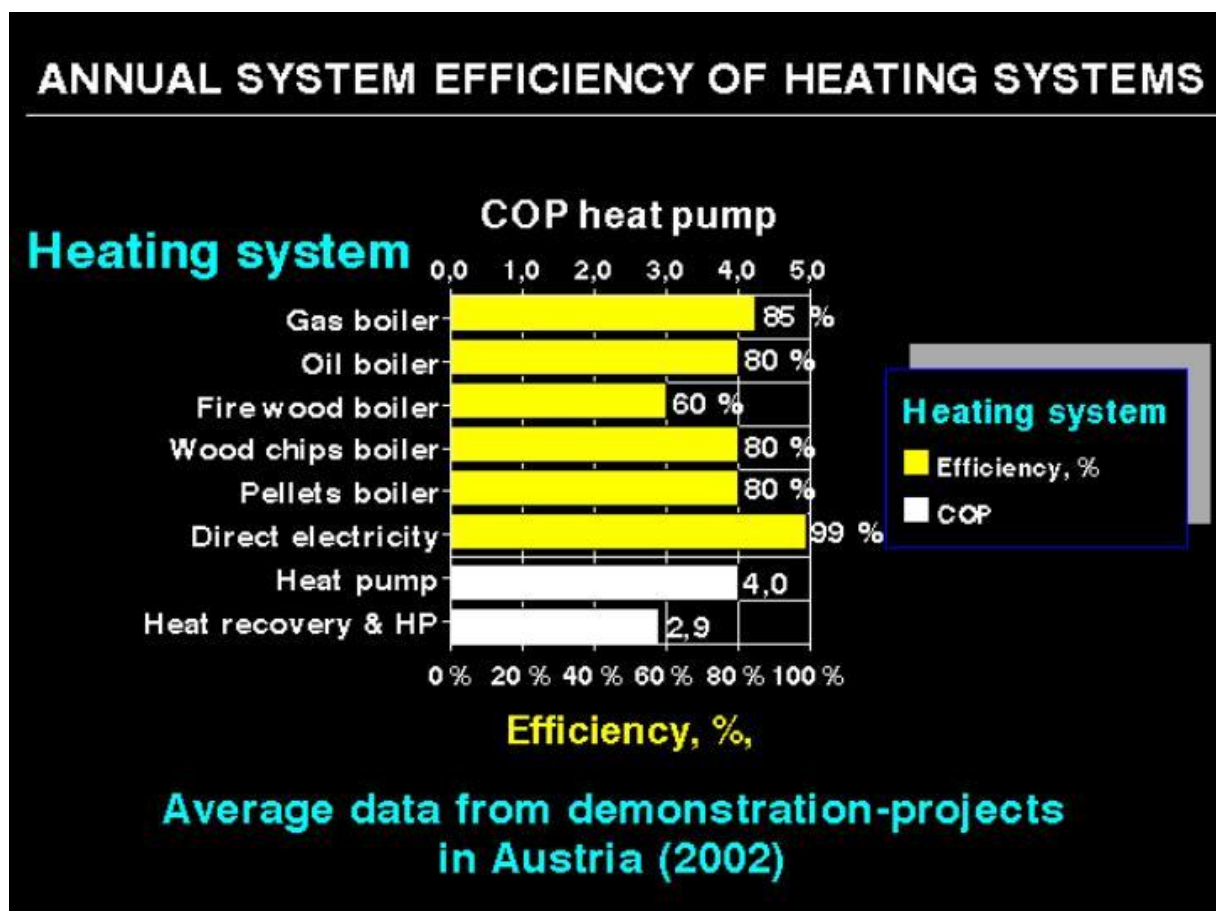


Figure 1: System efficiency of heating systems