

Techem Consumption Figures Study

Climate change, the energy transition and ensuring the energy supply demand our full attention as well as quick action. The outbreak of the energy supply crisis clearly shows that the energy transition is no longer only about decarbonization, but also about Europe's dependence on fossil energy imports from Russia and improving the intra-European energy supply infrastructure. Our goal must therefore continue to be to save energy and expand renewable and CO₂-neutral energy sources and the necessary infrastructure, and to continuously improve the use of energy by increasing efficiency. To this end, we at Techem consider all conceivable measures for increasing efficiency and avoiding emissions, both in existing and new buildings.

The **2021 Techem Consumption Figures Study** provides comprehensive results and insights into the current situation. It is based on the evaluation and analysis of data from 2020 on final energy and water consumption as well as the costs for heating and hot water from 2.1 million German apartments in around 176,000 apartment buildings.



Majority of the properties have insufficient energy efficiency

Our evaluations show that a large share of the properties assessed still have energy efficiency that needs to be improved. Some of the heating systems are also quite old: one third are older than 25 years and correspondingly inefficient. This considerable potential for renewing or switching to efficient technologies in heat generation is evidenced by our analysis of data from around 92,000 energy performance certificates currently issued. Furthermore, efficient and highly automated heating system operation is crucial to achieving a low-emission real estate industry.

Continuous monitoring of heating and optimized operational management alone can increase the efficiency of conventional heat generation in existing buildings by around 15 percent.

Optimal insulation of the building shell in turn offers potential savings of 30 to 50 percent. User behavior, especially ventilation behavior, which is geared to saving energy, enables consumption to be reduced by an additional 10 to 15 percent.

Over 50 percent of the utility units are heated with natural gas

With a view to the supply of multi-family residential buildings in Germany, there continues to be a striking dependence on natural gas as an energy source, with a share of around 52 percent in residential terms. District heating comes in second place and accounts for around 36 percent of the space. While the use of heating oil has declined quite significantly since 2011 from around 16 percent to a good 11 percent, wood pellets at 0.7 percent and electricity-powered heat pumps at 0.14 percent do not yet play a major role in the current housing stock. In view of the geopolitical situation and steadily rising energy prices, it is all the more important to switch heating system technology to the consistent use of renewable forms of final energy such as green electricity and environmental heat (heat pumps) as well as green district heating, and thus to continue to drive the decarbonization of the building stock.

Heat pumps offer considerable potential for operational optimization

Electrically driven heat pumps are likely to play a key role in the energy turnaround and the necessary reduction in the aforementioned dependence on natural gas and other fossil fuels. According to the Federal Statistical Office, nearly every second heating system in new buildings was a heat pump in 2020. In 2021, around 154,000 heat pumps (air-to-water heat pumps and natural gas-coupled heat pumps) were sold in Germany. At 50.6 percent, heat pumps were the preferred primary heat generation system – and the trend is rising sharply. While the share for single- and two-family homes was 53.9 percent, the figure for multi-family homes was 30.6 percent. These figures can be expected to continue to rise significantly in the years ahead.

The efficiency of heat pumps depends much more on the operating conditions than that of boilers. With well-designed and optimally operated heat pumps, annual coefficients of performance of at least 3 to over 4 can be expected. Our evaluation of systems with heat pumps as the sole heat source (monovalent systems) showed that in the multi-family home stock in 2020 an average annual performance factor

of only 1.9 (systems with room heating and drinking water heating) to 2.2 (room heating only).

This is far too low, both from an economic standpoint and with regard to the overall CO₂ balance! Ergo, the leverage for optimizing the operation of heat pumps – compared to boilers – is significantly greater at a good 50 percent. In view of the energy turnaround and the related use of heat pumps to supply residential buildings, monitoring and operational optimization are therefore of considerable importance and must be out to use on a broad scale basis for all heat generation systems.

CO₂e-emission reduction – Stagnation in consumption for space heating

CO₂e-emissions caused by room heating and domestic hot water heating in multi-family buildings fell by around 13 percent in 2020 compared to 2018, after adjustment for weather conditions – in terms of living space or per unit of use – although consumption for room heating and domestic hot water remained virtually stagnant during this period. Consequently, the reason for this reduction in emissions is not the change in consumption patterns, but the change in the energy mix and the associated change in emission factors. Nevertheless, the goal must continue to be to actively reduce emissions for room heating and hot water from about 2.1 metric tons of CO₂ equivalents per apartment (equivalent to around 31.4 kg/sq. m. of living space = Class 5 to 6 of the CO₂ emission classes of the Carbon Dioxide Cost Sharing Act).

Summary

In view of the challenges posed by current energy price developments, the goal must be to activate all conceivable measures to improve efficiency and avoid CO₂ emissions in existing buildings and in new construction. According to the data available to us, the combination of measures to improve the building shell, the behavior of occupants (especially ventilation behavior) and system efficiency could have the potential to avoid around 20 million metric tons of CO₂e in the German multi-family housing stock.