

Domestic hot water in focus



The EPBD 2010 demands all new buildings in EU countries to be nearly zero energy buildings by 2020. This requirement has gained a lot of attention since 2010, also in this Journal. The focus has mainly been on the building envelope performance, space heating and ventilation.

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One area which has not been discussed much is the use of domestic hot water (DHW), and how to reduce energy used to heat the water. However, its role is getting more and more important, especially in residential buildings. The share of energy used to heat the DHW has been increasing significantly as the thermal performance of building envelope has been improving. The heating energy for DHW depends on the use of water, which has decreased significantly during the last few decades. Twenty five years ago the average use was around 200 litres per day per occupant in residential buildings; now it is 120–140 litres (113 to 133 litres per day per person in Germany – article by Seybold & Brunk in this issue). The reduction is partly due to water saving faucets, new washing methods and even more importantly, the common use of a shower instead of a bath tub for better personal hygiene. About 40% of the domestic water is used as hot water. It can correspond to 30–40 kWh/m² of energy use in residential buildings, which is significant (25%) in relation to energy use in the EU buildings that is typically in the range of 100–150 kWh/m². The share is even higher in low energy and nearly zero energy buildings: about 50% in single family buildings and more than 50% in multifamily buildings.

An interesting article by Agudelo-Vera et al in this issue reports that the water systems may be oversized in non-residential buildings like hotels, and new design rules should be established. Water use, including hot water, depends, of course, on the occupants, their behaviour and customs. Not much information is available on the variation of real use between countries. However, the European Commission has based the sizing of water heaters on water use profiles. An article by Klobut in this issue gives an overview of the contents of the recently adopted ecodesign regulations for space and water heaters. Occupant behaviour can be influenced and DHW saved by charging the actual heating cost

from occupants based on metered use. Metering can be installed in new buildings as required by EPBD, but is a problem in existing buildings.

Water usage profiles depend on the day, time and month in addition to the building type and occupants. The information on profiles is becoming more and more important for the efficient use of renewable energy sources for heating. Solar heating of DHW is, in most cases, the most cost effective use of renewable energy. Water use profiles affect the sizing of the collector, storage tanks and back up heating. An important issue to keep in mind with solar water heating systems is the possibility of low temperature level (below 55°C) in the system, which may allow the growth of *Legionella* bacteria in the plumbing system.

Water use can be further reduced by user behaviour and wider use of water saving technology, like easy to operate and automatic faucets and well-designed shower heads. The reduction in water use may have an effect on the waste water system. The sewage pipes and their slopes are designed for a minimum water flow to stay clean. The reduced water flow may have an effect on sewage system design. An opposite trend, however, is the luxury bathrooms with private jacuzzis and rain showers. Domestic hot water systems can also 'leak' heat through the uninsulated or insufficiently insulated piping, and the bath room or towel heaters which circulate high temperature hot water year around.

Heat recovery is a widely used technology; it is also possible with waste water. The article by Seybold & Brunk focuses on that and reports significant saving potential, but also points out the problems with the fouling of heat transfer surfaces and the need to develop automatic cleaning methods. The reduced sewage water temperature may also have an effect on the performance of sewage treatment plants. ■