Hot water storage tank dimensioning

Establishing what is needed for efficient operation of the heating system

Buffer storage tanks are used in the most varied of heating systems. They store hot water from when heated until its extraction when required and, in this way, bridge operating interruptions of the heat generators. Only correct dimensioning saves you from unnecessary energy consumption and costs.

Buffer storage tanks are selected and designed in line with the following parameters:

- Type of heat generation, e.g. CHP, solid fuels, solar
- Receiving system types, e.g. under-floor heating, domestic water, radiators
- Loading and unloading capacities
- Individual heat demand
- Properties of the heat transferring fluid
- Hydraulic components and aspects (pressure ratios)
- Characteristics of the heat-transferring components
- Utilization degree
- Effective heat flow volume in kWh
- Additional heating system

As-needed design calculation acc. to heat generator:

Solid fuels - in keeping with DIN EN 303-5:

$$V_{PS} = 15 * Q_K * T_B * (1 - 0{,}3 * Q_H / Q_{Kmin})$$

V_{PS} = Capacity of the buffer storage tank in l
Q_K = Boiler rated output in kW
T_B = min. boiler output in kW
Q_H = Nominal burn-off period in h
Q_{Kmin} = Heating load of the building in kW

Solar installations:

$$V_{PS} = \frac{A_{WF} * V_{SP}}{a_{WF}}$$

V_{PS} = Capacity of the buffer storage tank in l
A_{WF} = Living space to be heated in m^3
V_{SP} = Specific storage tank flow per m^2 of collector surface in l/m^2
a_{WF} = Specific living space per m^2 of collector surface in l/m^2

Heating pumps:

$$V_{PS} = \frac{P_{WP} * t}{(c * \Delta T)}$$

V_{PS} = Capacity of the buffer storage tank in l
P_{WP} = Heat output of the heat pump in kW
t = Bridging time given an interruption to operations
c = Specific water heat capacity
ΔT = Temperature difference Supply flow / Return flow in K

Note: If it is a matter of the size of the buffer storage tank (tank capacity), then preference should preferably be given to the larger appropriate model. It must be appreciated here that the capacity of the buffer storage tanks increases four-squared to the diameter. This means that a larger buffer storage tank will always be higher than thicker. Please refer on this to our size chart as from Page 80.

The size of the domestic water storage tank should be optimally dimensioned and designed to cater for needs to ensure that the heating system is run in an energy and cost-efficient manner. The number of people in the household and their hot water consumption determine the hot water requirements. The 6023 VDI directive proceeds on the assumption of a daily per head consumption of 30-50 litres of domestic hot water. This is in addition to a minimum 100 litres capacity which planning should also consider.

Domestic water storage tanks are designed in line with the following parameters:

- Number of those in the household
- Number of dwelling units (detached house or apartment block)
- Type of heat generation
- Boiler output
- Loading and unloading capacities
- Individual hot water demand
- Hydraulic components and aspects (pressure ratios)

As-needed design calculation in keeping with form DIN 4708-2
(example here of a detached house with bath-equipped bathroom):

Hot water demand - centrally supplied apartments									
Determining the requirement figure **N** to establish the size of the hot water storage heater									
1	2	3	4	5	6	7	8	9	10
Apartment groups	number of rooms	number of apartments	number of occupants per flat		tapping point numb	brief description (see below)	tapping point requirement in Wh	tapping point number x tapping point requirement in Wh	Wh
	r	n	p	n*p	z		w_V	$z*w_V$	$n*p*\Sigma w_V$
1	4	1	3,5	3,5	1	NB1	5.820	5.820	20.370

$\Sigma(n*p*\Sigma w_V) = 20.370$ Wh $\quad N = \frac{\Sigma(n*p*\Sigma w_V)}{3,5 * 5.820} = \frac{20.370 \text{ Wh}}{20.370 \text{ Wh}} = 1$ $\quad N = 1$

Calculate the storage tank on the basis of the N requirement figure and the NL capacity figure, **NL ≥ N** applies here!

Procedure - Enter particulars in the following columns of the form:

1] Consecutive number of the same apartments in acc. with number of rooms and extent of the sanitary equipment
2] Number of rooms according to the structural drawings
3] Number of apartments and/or residential units
4] No. of occupants per flat acc. the owner
5] Outcome of the multiplication Column 3 with Column 4
6] Number of tapping points to be considered (e.g. bath, washstand, sink)
7] Brief description of the tapping points entered in Column 6
8] Tapping point requirement based on particulars from
9] Outcome of the multiplication Column 6 with Column 8
10] Outcome of the multiplication Column 5 with Column 9

Enter the outcome in the equation of the supply pressure and calculate the N requirement figure.

tapping point	brief description	W_V in Wh	V_E in L
Bath	NB1	5820	140
Bath	NB2	6510	160
Small bathroom-sized bath	KB	4890	120
Bath for a large-area bathroom	GB	8720	200
Shower set with mixer tap	BRS	1630	40
Standard shower set	BRN	3660	90
Luxury shower set	RRL	7320	180
Washstand	WT	700	17
Bidet	BD	810	20
Wash basin	HAT	350	9
Sink	SP	1160	30

Note: This is an extract from DIN 4708-2. The extensive design calculation of domestic water storage tanks is subject to additional calculations. They can be taken from the DIN.