- The charging and discharging currents are small compared to the standard 10-h discharging current I_{10} (at least for system Classes 1 and 2).
- For long periods, sometimes weeks or even months, the batteries do not reach a fully charged state (SOC = 100%).

These features are distinct from other battery applications in, for example, uninterruptible power supplies, where the batteries are kept at a full state of charge for the longest time of the year or in vehicle traction applications, for example, fork-lift trucks, where the batteries are fully recharged regularly with high charging current. Figure 18.6 also demonstrates that in systems of Classes 1 and 2 – the same is true for the solar home system application – the daily discharged capacity is between 5% and 30% of the nominal battery capacity. This is equivalent to the annual full cycles between 20 and 100.

Table 18.2 gives a comprehensive view of the requirements of the battery in the different system classes. In Table 18.3, suggestions for the selection of adequate lead acid battery types out of the variety of products available in the market on the basis of this classification are made.

On the basis of this classification, an evaluation of the properties of a battery according to the requirements of the systems is possible. Solar fraction and storage size in days of autonomy are the output of all commercial system design and simulation-software packages. Therefore, the classification allows the system designer to ask the battery manufacturers for an appropriate battery type by showing him the typical operating conditions.

Table 18.2 Identification of classes by typical system indicators (solar fraction, storage size) for the different classes of operating conditions and importance of battery features for the different classes. The storage size is given in units of battery capacity divided by the mean daily load (days of autonomy). The solar fraction is the amount of energy produced by the PV generator divided by the energy produced by all the energy sources within the system (including the diesel generator in hybrid systems) [9]

System indicators	Class 1	Class 2	Class 3	Class 4
Solar fraction	100%	70–90%	About 50%	<50%
Storage size/days of autonomy	3–>10 days	3–5 days	1–3 days	About 1 day
Capacity throughput[9]	10–25	30–80	100–150	150–200
Necessary battery features				
Number of lifetime cycles[9]	Low (<300)	→		High (>1200)
Capability to withstand long periods in deep discharged states	Important	←		Less important
Low self-discharge rate	Important (<1% per month)	→		Less important (5% per month)
Measures against acid stratification	Important	Very important		Important
Resistance against corrosion	Important	←		Less important

[9] The capacity throughput is defined as the number of ampere-hours discharged from the battery divided by the nominal capacity of the battery. The given numbers are typical of the applications in the defined classes of operating conditions. A full cycle with regard to lifetime cycles is defined by a one capacity throughput. This is equivalent to a complete discharge (100% DOD) of a fully charged battery. In data sheets, often the cycle number is given for cycles with a depth of cycle other than 100% (e.g. 80%). This has to be taken into account while comparing the design capacity throughput of different products (see also Figure 18.24).