Use of lead-acid batteries

Temperature

The operating temperature of lead-acid batteries must be limited to -40 and 55 °C. Reasons for this are the thermodynamic properties of the battery system.

At lower temperatures the risk of freezing of acid is present. This can result in cracks in the cell container and lid. There are some further practical problems at lower temperatures, on one hand

- the diffusion velocity of sulfuric acid is that low that internal resistance of the battery increases
- the available capacity until a preset final voltage decreases

and on the other hand

- the voltage of the battery decreases due to Nernst's law.

At higher temperatures internal resistances are lower, more capacity can be taken out, but due to higher reaction speed also the corrosion of the lead grids is higher. Therefore the operational life time is shorter. In principle, a shortening by a factor of about 2 is expected with an increase of temperature of 10 K.

Humidity

If poles and the connectors of the battery have the same or higher (due to discharge/ charge behavior) temperature to ambient temperature, then no negative effect to the battery is to be expected. Only in the case that the battery temperature is lower than ambient temperature and the ambient humidity is approximately 100 %, air humidity can precipitate as liquid water at free lead surface and can cause corrosion. Therefore

- isolated connectors should be used
- before connecting the cells, the pole contact surface should be clean

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