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TECHNICAL SPECIFICATION

Opportunity charging of lead-acid traction batteries



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Opportunity charging of lead-acid traction batteries

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OPPORTUNITY CHARGING OF LEAD-ACID TRACTION BATTERIES

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IEC TS 61044 has been prepared by IEC technical committee 21: Secondary cells and batteries. It is a Technical Specification.

This first edition cancels and replaces the second edition of IEC TR 61044 published in 2002. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) the recommended depth of discharge for opportunity charging has been adjusted;
b) a distinction is made between valve regulated lead-acid batteries (VRLA) and vented lead-acid batteries.

The text of this Technical Specification is based on the following documents:

Draft	Report on voting
21/1081/DTS	21/1088/RVDTS

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this Technical Specification is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

INTRODUCTION

Lead-acid traction batteries find a widespread application in industrial transportation vehicles because of their particular properties of providing a reliable power supply source with a very low environmental impact.

In such applications, both monitoring and power management by electronic means have made great strides not only on the discharge side of the energy balance but during charging as well.

This progress permits refuelling, i.e., charging of a lead-acid traction battery in a well-controlled manner during idle periods in the course of a working schedule.

As a result, the total capacity or ampere-hour output of the lead-acid battery increases per working day substantially beyond the manufacturer's maximum recommended value.

However, such opportunity charging will provide improved capital efficiency only if adequate precautions are taken to prevent premature deterioration of the state of the lead-acid traction battery caused by such a practice.

This document is intended to present requirements, derived from the field experience of battery manufacturers in general and from opportunity charging of lead-acid traction batteries in particular, with the aim of preventing detrimental effects on batteries and industrial equipment.

OPPORTUNITY CHARGING OF LEAD-ACID TRACTION BATTERIES

1 Scope

This document covers opportunity charging of lead-acid traction batteries, i.e., the use of idle time during a working period to increase the state of charge (SoC) so as to extend the daily working period of a lead-acid traction battery while at the same time avoiding an excessive depth of discharge.

This document specifies requirements for the use of opportunity charging of lead-acid traction batteries of vented and valve regulated types when the battery manufacturer has not provided alternative specific operating procedures.

This document is only applicable for lead-acid traction batteries of vented and valve regulated design for which the battery manufacturer has not provided specific operating procedures.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 62485-3:2014, *Safety requirements for secondary batteries and battery installations – Part 3: Traction batteries*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1
opportunity charging
use of periods of inactivity of a partially discharged battery to increase its state of charge

Note 1 to entry: Opportunity charging at a state of charge (SoC) of > 70 % is less effective and can result in a significant increase of battery temperature and water loss.

3.2
regular charge
charge of a battery as specified by the manufacturer necessary to attain the state of maximum storage of electric energy

3.3
self-compensating charger
device which supplies charge, monitors the state of charge, and terminates the charge of the battery when the correct amount of electric charge has been supplied

Note 1 to entry: The control logic of the self-compensating charger will prevent overcharging if a fully charged battery is connected to the charger.

3.4
vented lead-acid battery
secondary battery in which cells have a cover provided with an opening through which products of electrolysis and evaporation are allowed to escape freely from the cell to the atmosphere

[SOURCE: IEC 60050-482:2004, 482-05-14, modified – the term "vented cell" has been replaced by "vented lead-acid battery" and the words "secondary cell having" have been replaced by "secondary battery in which cells have".]

3.5
valve regulated lead-acid battery
VRLA
secondary battery in which cells are closed but have a valve which allows the escape of gas if the internal pressure exceeds a predetermined value

Note 1 to entry: The cell or battery cannot normally receive additions to the electrolyte.

[SOURCE: IEC 60050-482:2004, 482-05-15, modified – a hyphen has been added to the term.]

3.6
excessive discharge
discharge of a battery exceeding the maximum depth of discharge as declared by the manufacturer

Note 1 to entry: For purposes of this document, the maximum depth of discharge is 80 % for vented lead-acid batteries and 60 % for valve regulated lead-acid batteries except when otherwise declared by the manufacturer.

3.7
state of charge
SoC
available capacity in a battery expressed as a percentage of a rated capacity

4 Planning the implementation of opportunity charging

The following list items a) to c) shall be considered when planning to introduce opportunity charging.

- Indications that opportunity charging may be beneficial are:
  a) when the maximum permissible physical size of the battery for the vehicle does not have enough capacity to complete the daily workload before a next complete recharge becomes necessary. This allows an undesirable physical change-out of the battery to be avoided.
  b) when the operational requirements of the vehicle are such that it is impossible to predict when the battery will next be released for a complete recharge. This can occur for example in locations such as airports where 24 h per day working is a rule.
  c) when a battery is close to the end of its operational life and the use of opportunity charging can be shown to maintain an acceptable performance of the vehicle.

An implementation of opportunity charging will result in an additional energy turnover in the battery beyond the 60 % or 80 % limit per cycle specified by the manufacturer. This change in operational mode is therefore to be cleared beforehand with the battery manufacturer as it is possible that this will have an impact on warranty terms and conditions.

NOTE 1 If the periods available for charging are of short duration and infrequent, then opportunity charging will be of little benefit.