Our energy for your success

HOPPECKE
POWER FROM INNOVATION

Accumulatorenwerke HOPPECKE
Carl Zoellner & Sohn GmbH
Bontkirchener Straße 1
D-59929 Brilon-Hoppecke
www.hoppecke.com

Motive Power Systems

Reserve Power Systems

Special Power Systems

Service

Dr. Marc Zoellner
Managing Director since 2003

Claus Zoellner
Since 2003 Chairman of the Advisory Board,
Managing Director 1967 until 2003

Ernst Zoellner
Managing director until 1967

Carl Zoellner
Founder of the company
Managing director until 1943

Founded 1927 by Carl Zoellner

Value-based, independent family enterprise

Willingness to perform and loyalty are the foundations of our success.

Putting people first

Employees are highly motivated and geared to performance.

Employee participation

Company asset accumulation,
participation and profit-sharing

Training

Training in eight different vocational fields, in part cooperating with universities

Internal und external transfer of knowledge

Forms a dynamic basis for future-oriented energy services

Group Structure

HOPPECKE
POWER FROM INNOVATION

Holding Accumulatorenwerke HOPPECKE

HOPPECKE Batterien

Brilon, D
Lead-acid-battery systems

- R&D
- Production
- Sales
- Recycling of lead-acid industrial battery systems

HOPPECKE Wuhan

Wuhan, CN
Lead-acid-battery systems

- Production
- Sales

HOPPECKE Batterie Systeme

Brilon, D
Akaline battery systems

- R&D
- Production
- Sales
- Recycling of alkaline industrial battery systems

HOPPECKE Technologies

Zwickau, D
Chargers & new battery techno-logies

- R&D
- Production
- Advanced Battery Group

HOPPECKE Service

Brilon, D
Service

- Service for batteries and chargers
- Safety checks
- System advices
- On-site trainings

HOPPECKE Metallhütte (Smelter)

Brilon, D
Recycling

- Recycling of lead-acid batteries in our own smelter

HOPPECKE International

Subsidiaries,
worldwide

- Production
- Sales
- Service

A Strong Brand

HOPPECKE
POWER FROM INNOVATION

Quality is our Trademark

Innovation

Development of optimal solutions for energy supply in one of the largest R&D departments in this industry in Europe.

Quality

High quality right from the start of the development phase, high quality management in accordance with recognised test procedures.

Quality pays its way through:

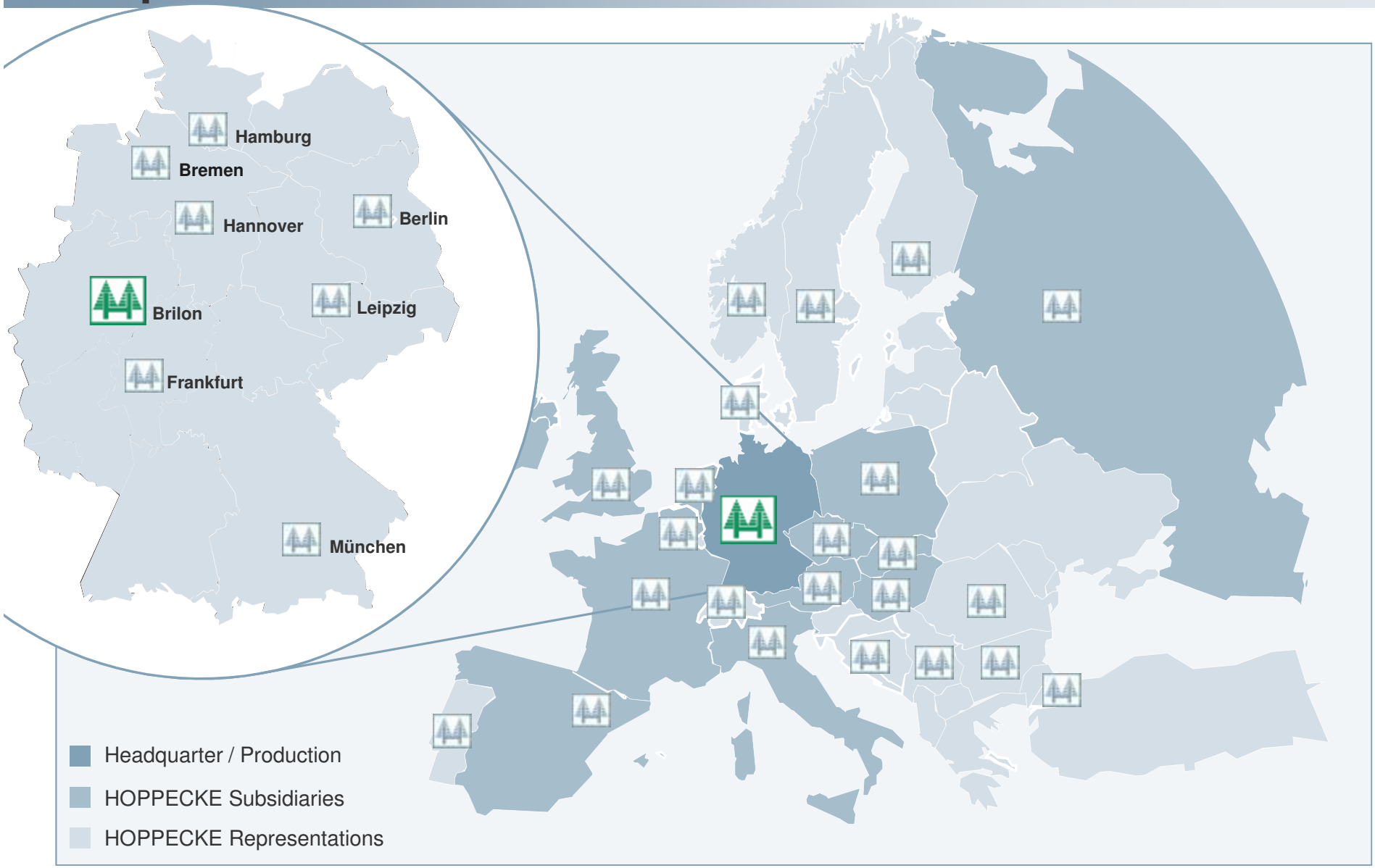
- Longer product life
- Improved usage of resources
- The highest degree of energy safety
- Maximum energy availability

Service

Europe-wide service network. Certified service staff. Consulting, service and training offers - for all technologies and applications of industrial batteries.

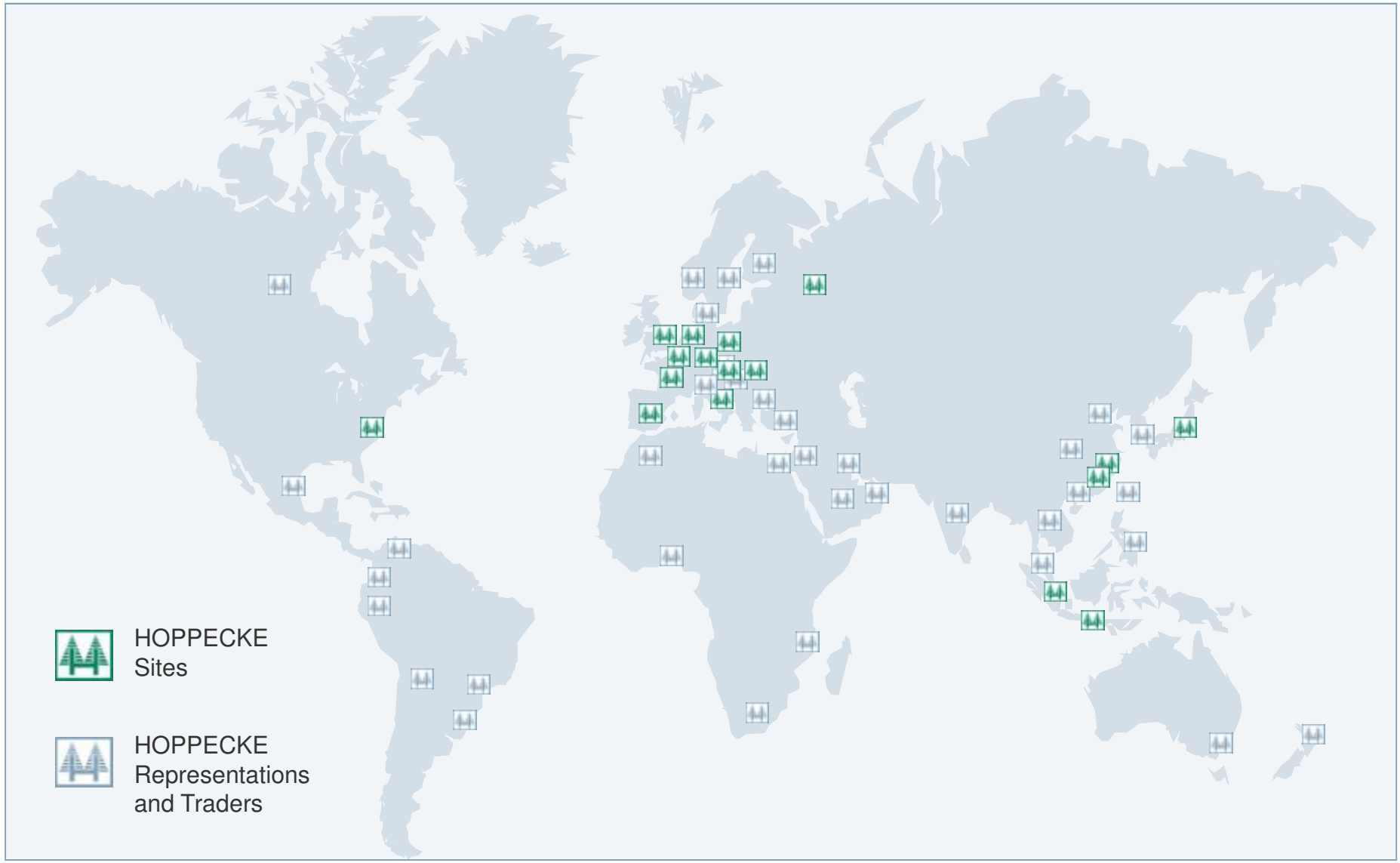
European Presence

HOPPECKE
POWER FROM INNOVATION



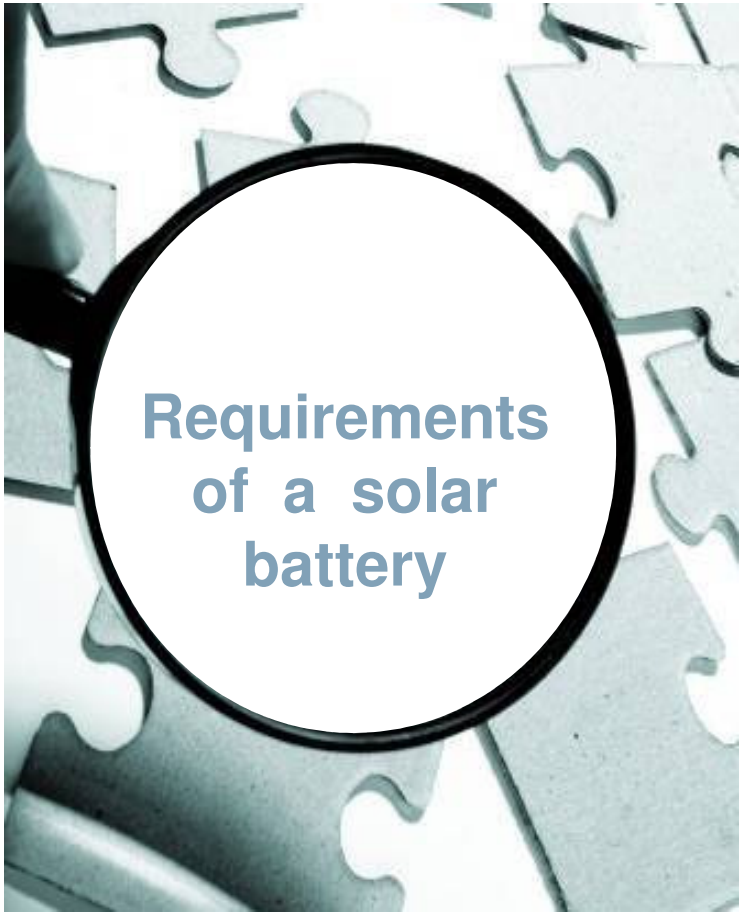
Worldwide Presence

HOPPECKE
POWER FROM INNOVATION



Requirements of a solar battery type

HOPPECKE
POWER FROM INNOVATION



- High **charge / discharge efficiency**
- Minimum **self discharge**
- Reasonable **price**
- Maintenance-free **types**

and

- **Low maintenance types**
- **Resistance against deep discharge**
- Reduced **space in horizontal installation**
  - battery with fixed electrolyte
- High **cycle life** in partial state of charge (PSoC)

Designs of lead acid batteries

HOPPECKE
POWER FROM INNOVATION

Vented cells solar.power

- Liquid electrolyte
- Open system
- Direct exchange to the atmosphere
- Low maintenance, cells need to be topped up with water from time to time

Advantages:

- **High cycle lifetime**
- **Robust design**

➡ **Maintenance intervals depend on water consumption**

Sealed cells solar.power

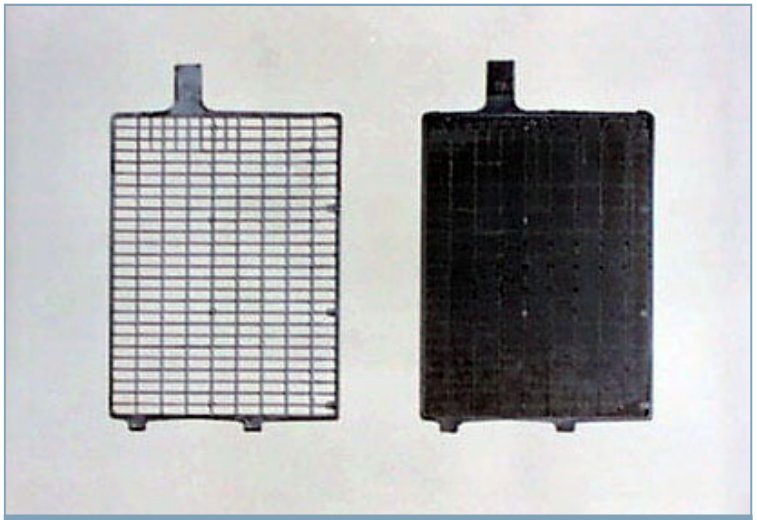
- Fixed electrolyte in Gel or AGM
- Contact to the atmosphere by valve regulation
- In „maintenance-free“ cells; no water topping required (sealed system)

Advantages:

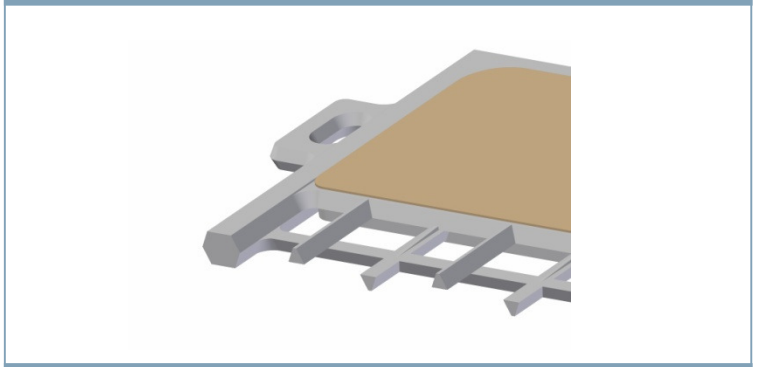
- **Maintenance-free**
- **High energy density**
- **1/4 of air ventilation compared to a vented type**
- **recombination**

➡ **Water consumption influences lifetime**

Flat (Grid) plate



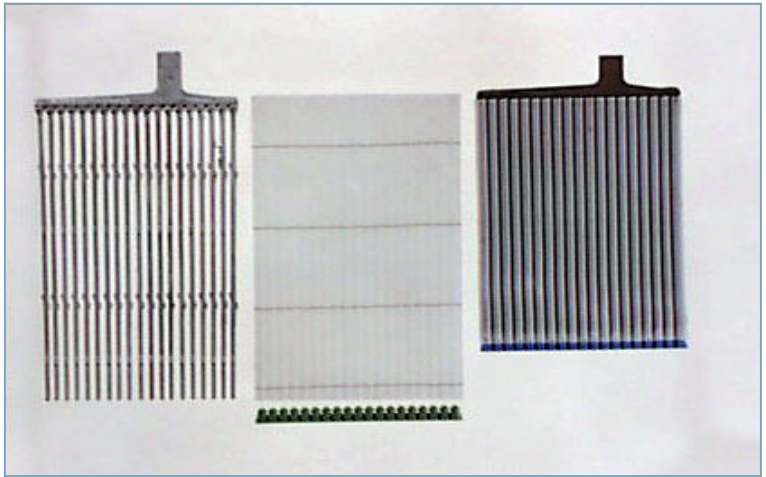
Grid plate



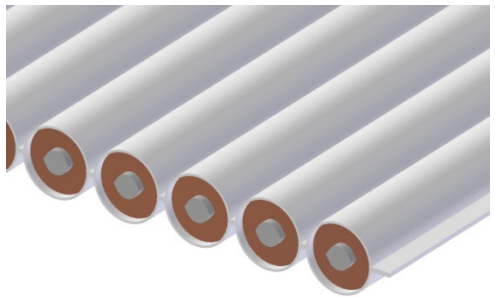
Shematic

- Invented in 1881 (Volkmars patent)
- Optimum grid design for good cast ability and low resistance
- Low antimony alloy for vented and lead calcium tin alloy for valve-regulated batteries
- Applied for all lead acid battery types (negative plate always a grid plate)
- Active mass gets pasted into the grid
- Can be a negative as well as a positive plate

Tubular (Pz) plate



Tubular plate



Shematic

- Invented around 1910 with slitted hard rubber tube
- Electrode for cycle applications
- Always positive plate
- Gauntlets made from woven high-quality polyester (coating the active mass)
- Highest operational life
- Highest endurance of cycles
- Also known as Pz – plate (– plating of the active mass)

New Technologies

HOPPECKE
POWER FROM INNOVATION

OPzS solar.power

OPzS bloc solar.power

- Highest cycle stability during PSoC operation - due to tubular plate design and optional electrolyte recirculation for single cells
- Maximum compatibility - dimensions according to DIN 40736-1 / DIN 40737-3
- Higher short-circuit safety even during the installation - based on HOPPECKE system connectors
- Easy assembly and installation - battery lid with integral handle
- Extremely extended water refill intervals up to maintenance-free - optional use of AquaGen® recombination system minimizes emission of gas and aerosols

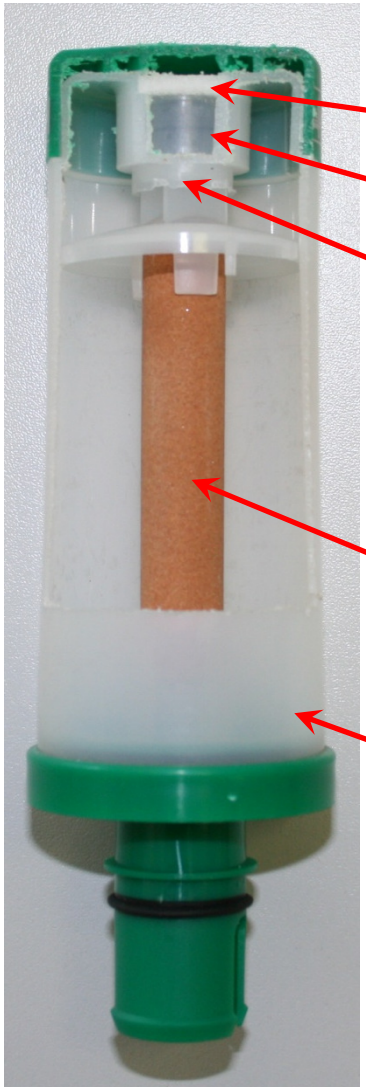
HOPPECKE
POWER FROM INNOVATION

Function of HOPPECKE AquaGen® premium.top

- Secondary reaction inside vented lead acid batteries: Water decomposition of liquid electrolyte
- During operation of the AquaGen® premium.top-recombination systems the developed oxygen and hydrogen gas moves into the AquaGen® system.
- By the integrated catalyst these gases are recombined to water vapor.
- The water vapor condenses inside the housing of the AquaGen® premium.top – system.
- Water drops flow back into the battery cell.

HOPPECKE
POWER FROM INNOVATION

Function of HOPPECKE AquaGen® premium.top



Flash back protection

Valve

Opening permits escaping gas which can not be recombined.

Ceramic protection for the catalyst material

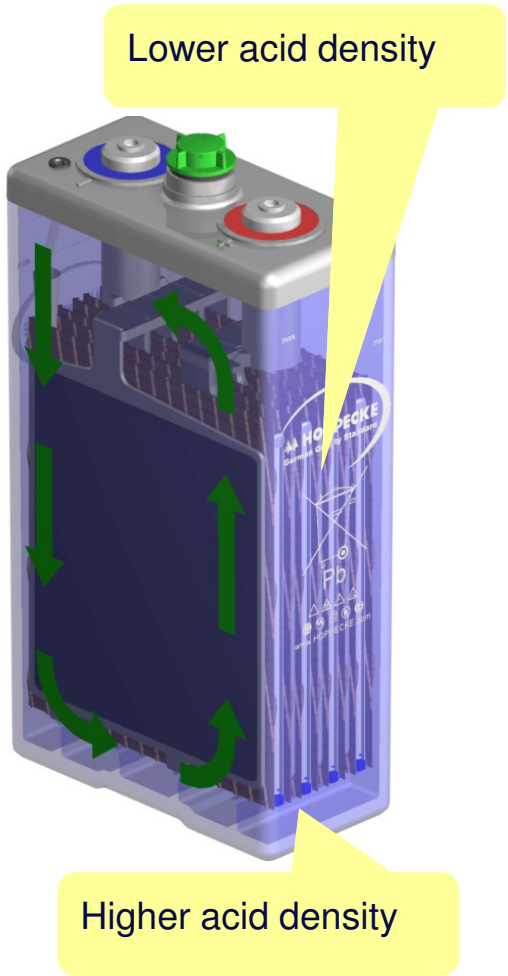
Dome for condensation of water vapor

HOPPECKE
POWER FROM INNOVATION

Benefits of HOPPECKE AquaGen® premium.top

- Greatly extended water refilling intervals (up to 98 % recombination rate).
- Reduced risk of damage due to contaminated refilling water.
- Reduction of ventilation requirements by 50 %.
- Prevention of dangers by flaming/spark through integrated backfire protection.
- No significant escape of gas or aerosols.
- Reduced maintenance with increased safety.
- Minimum costs – no replacement during battery service life.

HOPPECKE Electrolyte Circulation System



Consequences of acid stratification:

Premature aging:

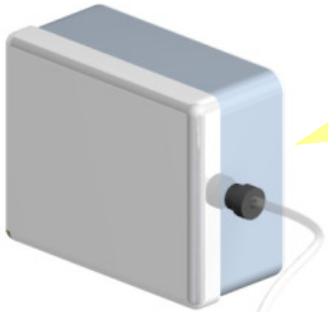
- In the lower cell region:
  Concentrated sulfuric acid attacks lead harder. The lead of negative electrode in particular the active mass is converted to lead-sulfate. This lead-sulfate falls out (-> capacity loss).
- In the upper cell region:
  Lead is not stable in diluted acid – it dissolves.

Furthermore:

- Lower energy efficiency of the battery
- Degraded charge acceptance

HOPPECKE
POWER FROM INNOVATION

HOPPECKE Electrolyte Circulation System



Wall-mounted housing contains pump motor and control electronics.

A central tubing system supplies air to all cells.

Emerging air bubbles stir the electrolyte.

Air is blown into every cell through plastic pipes.

HOPPECKE
POWER FROM INNOVATION

HOPPECKE Electrolyte Circulation System

Increase of efficiency and cost savings:

- Typically up to 120% of discharged energy need to be recharged to eliminate acid stratification.
- Application of HOPPECKE electrolyte circulation system reduces required charging factor significantly. Increase of efficiency is up to 15% compared to charging without electrolyte circulation system.
- Less time and energy is required to recharge the battery and to achieve a homogeneous electrolyte distribution.
- The electrolyte circulation system reduces also service costs because of reduced water loss compared to conventional charging.
- Moreover the HOPPECKE electrolyte circulation system increases service life of the battery and provides environmental and economical benefits for the entire battery system.

New Technologies

HOPPECKE
POWER FROM INNOVATION

OPzV solar.power

OPzV bloc solar.power

- Maintenance-free regarding water refilling - due to innovative Gel-technology
- Very high cycle stability during PSoC operation - due to tubular plate design with efficiently charge current acceptance
- Maximum compatibility – dimensions according to DIN 40742 / DIN 40744
- Extended storage intervals up to 12 months at 20°C
- Higher short-circuit safety even during the installation - based on HOPPECKE system connectors

solar.bloc – customer benefits

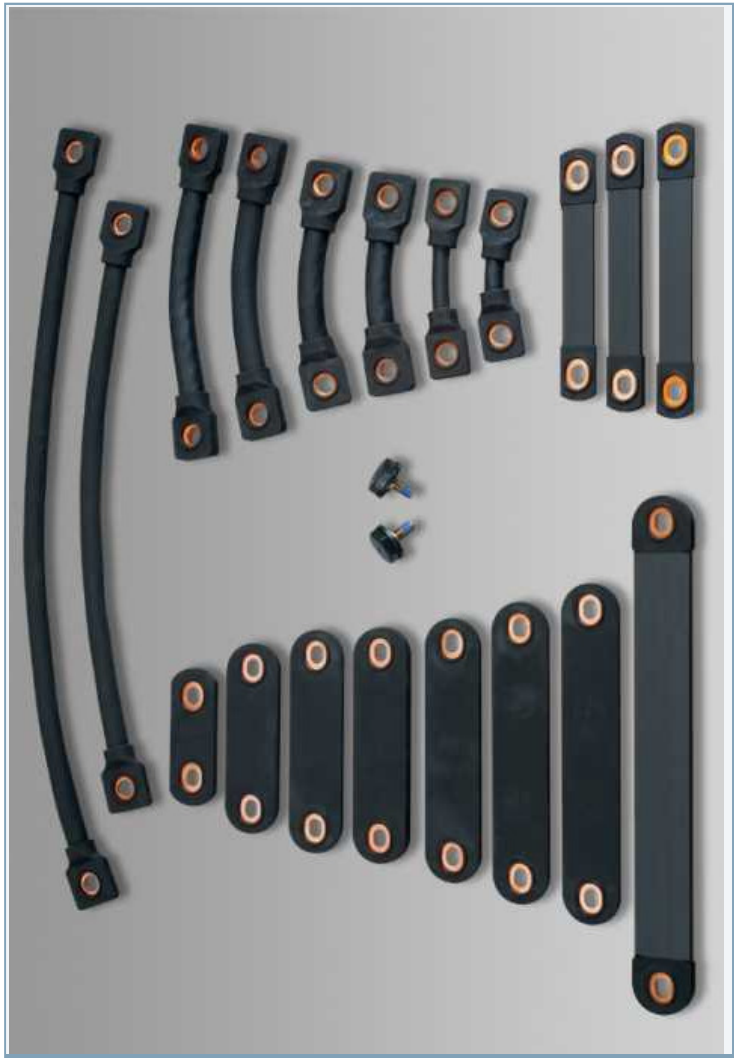
HOPPECKE
POWER FROM INNOVATION

solar.bloc

- **Optimized cycle stability combined with efficient storage capability** - special design of grid electrode for solar applications
- **Minimum maintenance costs with maximum safety** - maintenance-free[1] with sealed AGM[2] technology
- **Easy handling** - battery lid incorporates an integral lifting handle
- **Optimal environmental compatibility** - closed loop for recovery of materials in an accredited recycling system
- **High resistance against mechanical stress** - reinforced impact-proof polypropylene housing

[1] No topping necessary
[2] Absorbant Glass Mat

Benefits HOPPECKE system connector



Systemverbinder

high flexible or massive rigid copper connectors with Santoprene® (Elastomer) rubber moulding

- ***prevent short-circuits even during installation***
- ***permanent touch protection***

rubber moulded, acid tight cover with lip sealing between terminal and screw

-no maintenance required

solid copper and availability of high cross sections

- **low voltage drop**

→ safety and long operation of battery installation

Summary

HOPPECKE
POWER FROM INNOVATION

How to find the right solution:

- analysing your power consumption and usage
- choose the right Battery Technology.
- choose the right Battery type
- use solar.air on daily cycling from Hoppecke
- optimize the system with a fuel cell

References

Tahiti 2010

Rural electrification

AC system

- Battery: OPzS solar.power
- Aqua Gen

References

HOPPECKE
POWER FROM INNOVATION

Cape Town (ZA) 2011

72 x 16OPzV solar.power 2300
Project: House Gaia
Private Power Consumption

References

Namibia 2011

Rural electrification

AC system

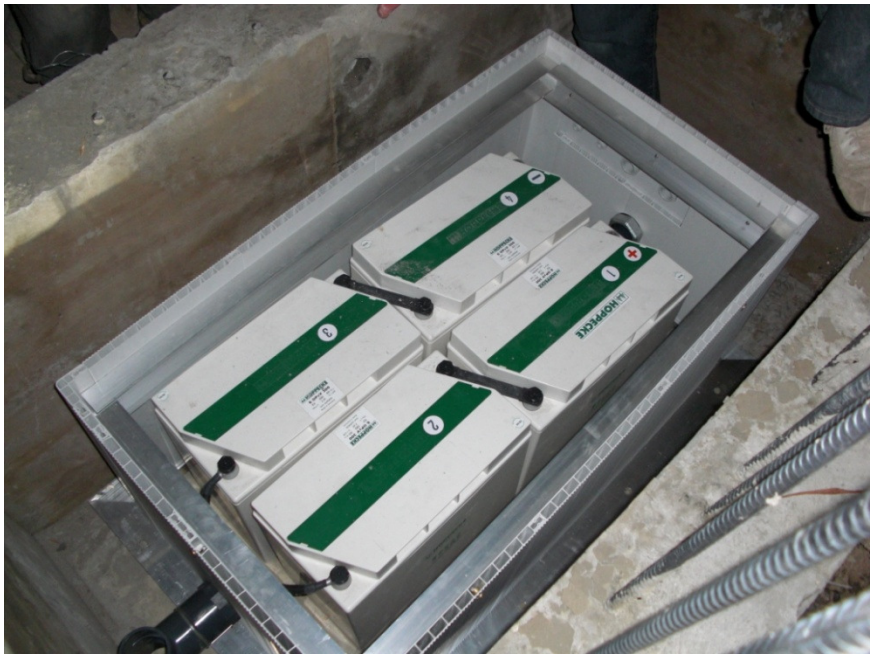
- Battery: OPzS solar.power
- Water Refill System

OPzV bloc solar.power

HOPPECKE
POWER FROM INNOVATION

Middle East 2010

- Oil & Gas
- Cathodic Protection
- DC system
- Battery used: OPzV bloc solar.power



HOPPECKE Stand

We warmly invite you to visit us, **Booth B3.276**.

You are looking for effective energy storage solutions for maximum profitability in the area of renewable energy? We offer you the optimal solution!

Learn about HOPPECKE sustainable concepts for effective storage of renewable energy. Our new solar product line has been developed especially to fulfill the requirements of cyclic applications.

Your Global Specialist For Energy Storage Systems Solutions

HOPPECKE
POWER FROM INNOVATION

We offer…

- optimized, high-quality energy storage solutions, which are convincing due to their excellent cycle stability

- Founding **market segment „Renewable Energies“**
- Introduction of the **new product line „solar.power“**
- Optimal support by **qualified engineering and sales teams**
- Optimal **cooperations** with market leaders of component producers and system integrators