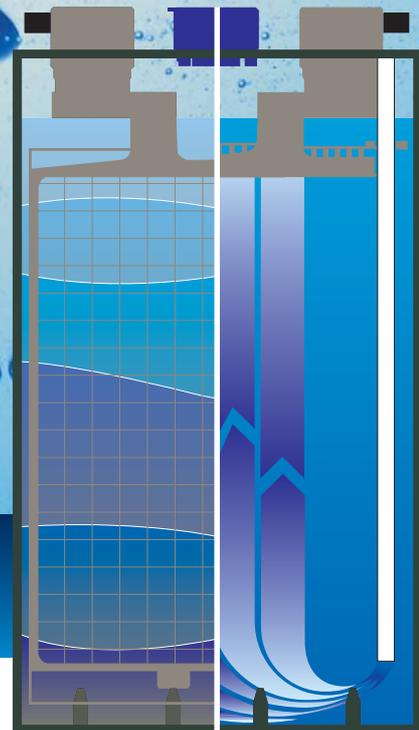




**EC
Hawker
Electrolyte
Circulation
System**



Perfect High Performance



Electrolyte stratification at different specific gravities

Electrolyte circulation using the AirLift principle



Hawker® Electrolyte Circulation System

The advantages of Hawker® vented batteries with electrolyte circulation system and the customer benefit derived from it led to increased use of this series. Particularly in applications where high performance, short charging times and high temperatures are anticipated the Hawker vented battery with electrolyte circulation is the preferred traction battery.

Construction

When batteries are being charged, the acid components in the electrodes find their way into the free space taken up by the electrolyte. Due to their higher specific weight they sink to the bottom of the cell and are concentrated there. Maximum utilization of the active compound requires a uniform specific gravity of the electrolyte over the height

of the plate. In conventional charging processes this would be ensured by a specified overcharge following a full charge. This overcharge would cause heavy gassing, and this would result in a more uniform specific gravity of the electrolyte. It would also entail longer charging times and an increase in heat generated and thus an increase in energy costs and a reduction in battery life. With electrolyte circulation the electrolyte is induced to flow around the cell by the introduction of atmospheric air. The air is supplied by an aeration pump and motor unit fitted in the charger, on the battery or in the vehicle, depending on the application.

Electrolyte Circulation

Hawker electrolyte circulation using the AirLift principle comprises a system of tubes built into the cell. A diaphragm pump conducts a weak current of air into the cell, setting up circulation inside the cell container. This prevents electrolyte and temperature stratification and optimizes charging.

Advantages

- Saving of up to 30% in charging time
- Saving of up to 20% electricity consumption per charge
- Reduction of electrolyte temperature by up to 10°C per charge
- Avoidance of electrolyte and temperature stratification
- up to 75% less water consumption
- water top-up intervals are up to 4 times as long
- even more economical charging equipment possible (reduced current rating)

Efficiency calculation

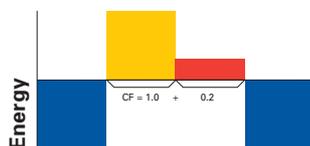
Example: Battery 80 V 620 Ah

- Charger: Type Hawker WoWa 50 Hz, 80 V / 125 A
- Energy saving per charge: 10 kWh
- Charging time reduced by 25%, from 8 hrs to about 6 hrs
- Savings of about 1 litre of water per charge
- Temperature rise during charging reduced by about 10°C

Charging

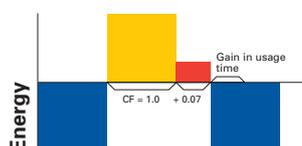
■ Discharging stage
 ■ Main charging stage
 ■ After-charging stage

Normal



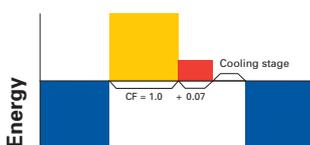
Normal charging with charging factor (CF) = 1.2

With EC - Variant 2



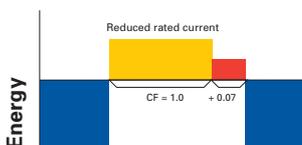
With charging factor (CF) of 1.07:
 1-way temperature reduction effect due to lower charging factor of 1.07 combined with gain in usage time
 • Savings of up to 30% in charging time, giving greater battery availability for even more economical usage

With EC - Variant 1



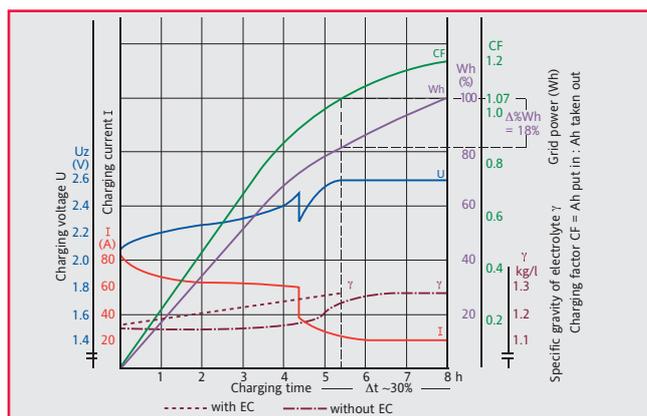
With charging factor (CF) of 1.07:
 2-way temperature reduction effect due to lower charging factor of 1.07 and cooling stage
 • Longer working life due to lower heat generation and careful charging

With EC - Variant 3



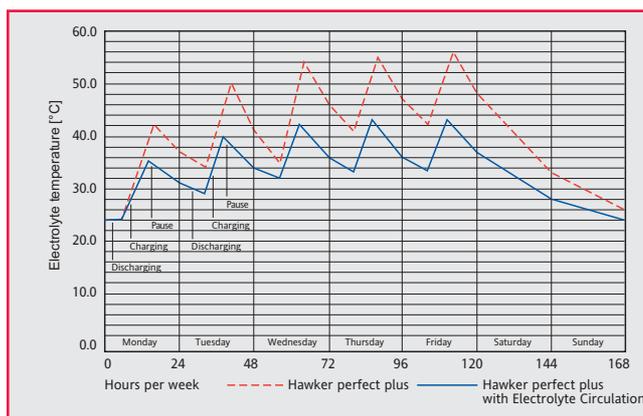
With charging factor (CF) of 1.07:
 2-way temperature reduction effect due to use of a charger with a lower current rating and a charging factor of 1.07
 • Lower investment costs due to more economical design of charging equipment

WOWa charging graph



The fully charged state is achieved when the final specific gravity of the electrolyte γ has been reached. The graph shows that with the use of the electrolyte circulation (EC) system this state has been reached after only 5.5 hours with a charging factor (CF) of 1.07. This represents a saving in charging time of up to 30% (Δt), compared with a full charge with a charging factor (CF) of 1.2.

Temperature



Temperature changes over one week with normal charging and with charging with electrolyte circulation. Usage over one week.

Example: Battery: 80 V 6 PzS 930
 • Charging current = $1.1 \times I_5^*$
 • Mean discharge current = $0.5 \times I_5^*$

• Ambient temperature = 20°C
 *Current I_5 = rated 5 hr capacity

HF charger and electrolyte circulation

The Hawker® Lifeplus & Lifetech® (from 24V 50A) are ideally suited for use with Hawker electrolyte circulation. In addition to operating at a low CF 1.07, these chargers adapt automatically to:

- Capacity of the battery
- Voltage of the battery (Lifeplus)
- Depth of discharge of the battery.

These factors plus high energy efficiency, very high and constant power factor, reduced overcharge factor and delayed start of charge available on Hawker Lifeplus ranges deliver significant energy cost reductions.





Wherever you do business, EnerSys® can support you with motive power energy. The Hawker® branded battery range, matched chargers and systems provide trouble free performance under the most demanding service conditions. Our strategically located manufacturing plants are efficient and responsive with a culture of continuous improvement and added value for our business partners.

EnerSys has an enviable position in technology leadership and with significant investment in research and development we intend to stay at the leading edge in product innovation. The recently developed energy solutions: Hawker XFC™ and Water Less® 20 batteries, Lifetech® and LifeSpeed IQ™ HF chargers, have defined new benefits for our customers: faster recharge, more machine availability, lower operating and investment costs, reduced carbon footprint. Our team of development engineers is driven by the desire to build the best energy solutions and works closely with our customers and suppliers to identify development opportunities. Our bias for rapid innovation means we get new products to market fast.

EnerSys's integrated sales and service network is dedicated to providing our customers with the best solutions and after-sales support for their business. Whether you require 1 battery or a complete fleet of batteries, chargers, a battery handling system and a state of the art fleet management system, you can count on us. EnerSys is the world's largest industrial battery manufacturer and we are dedicated to being the best.



www.enersys-emea.com

European Headquarters:

EnerSys EMEA
EH Europe GmbH
Löwenstrasse 32
8001 Zürich
Switzerland
Phone: +41 44 215 74 10
Fax: +41 44 215 74 11

Local contact:

Enersys Ltd
Oak Court
Clifton Business Park
Wynne Avenue
Swinton
Manchester M27 8FF
Phone: 0161 794 4611
Fax: 0161 727 3809

Please refer to the website address for details of your nearest EnerSys office: www.enersys-emea.com

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