FIAMM
MOTIVE POWER

Perfect High Performance and economy

Fiamm Motive Power Electrolyte Circulation System

EnerSys
Power/Full Solutions

Fiamm Motive Power Electrolyte Circulation System

Perfect High Performance

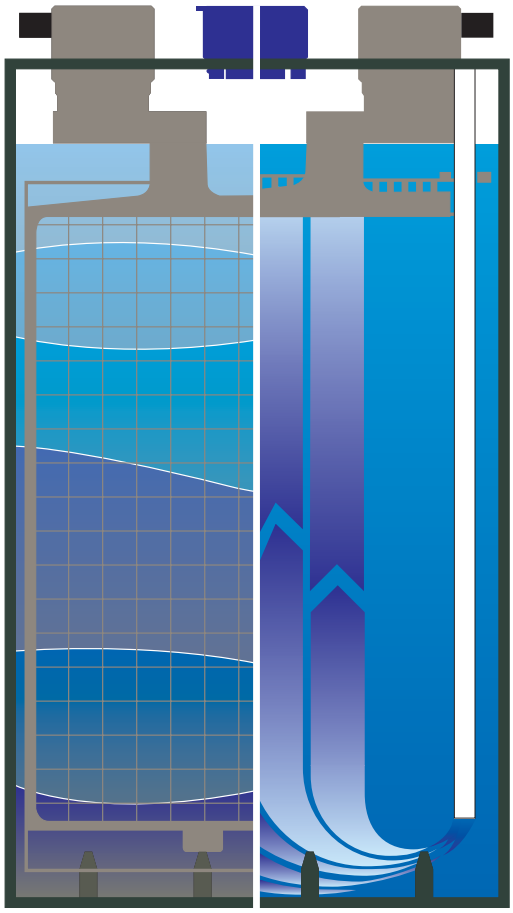
The advantages of Fiamm Motive Power vented batteries with electrolyte circulation system and the customer benefit derived from it led to increased use of this series. Particularly in applications where high performance, short charging times and high temperatures are anticipated the Fiamm Motive Power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

The electrolyte circulation using the AirSystem 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.



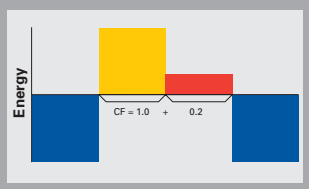
Electrolyte stratification at different specific gravities

Electrolyte circulation using the AirSystem principle

Charging

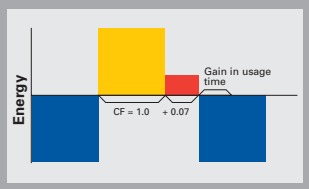
Discharging stage | Main charging stage | After-charging stage

Normal



Normal charging with charging factor (CF) = 1.2

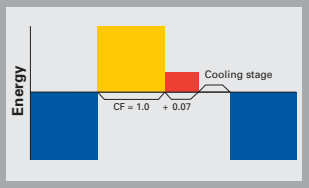
With EC - Variant 2



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

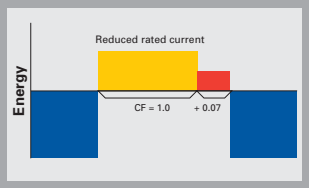
With EC - Variant 1



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

Electrolyte Circulation

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 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

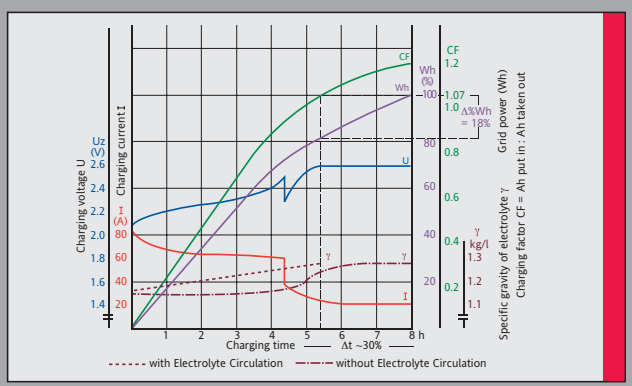
HF charger and electrolyte mixing

The Fiamm Motive Power Premium HF flex, Premium HF com & Premium ES (from 24V 50A) are ideally suited for use with Fiamm Motive Power electrolyte mixing. In addition to operating at a low CF 1.07, these chargers adapt automatically to:

- Capacity of the battery
- Voltage of the battery (Premium HF flex)
- Depth of discharge of the battery.

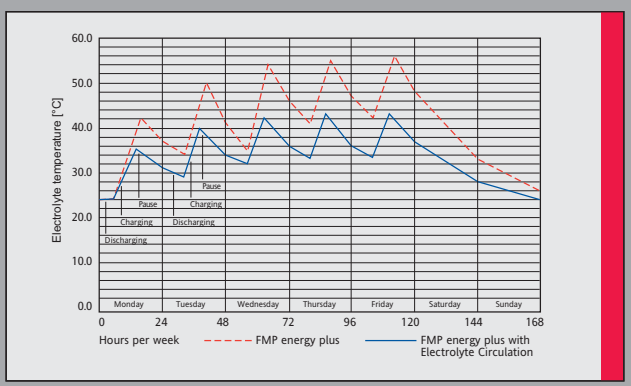
These factors plus high energy efficiency, very high and constant power factor, reduced overcharge factor and delayed start of charge available on Fiamm Motive Power Premium HF flex and Premium HF com ranges deliver significant energy cost reductions.

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 x I_5*
- Mean discharge current = 0.5 x I_5*
- Ambient temperature = 20°C

* Current I_5 = rated 5 hr capacity

FIAMM MOTIVE POWER

European Headquarters:

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

www.enersys-emea.com

EnerSys® Power/Full Solutions