Central Water Filling System

for mobile nickel-cadmium batteries

Example of a Saft nickel-cadmium battery equipped with the water filling system

Saft, a world leader in nickel-cadmium and advanced battery technologies, is at the forefront in the innovation and development of water filling systems for nickel-cadmium batteries.

From its successful use in electric vehicle applications, the central water filling system has been adapted to meet the specific requirements of other mobile applications, such as railways, hybrid vehicles and automatic guided vehicles.

The benefits of this system are its safety and reliability, as well as its simplicity that allows for faster watering thereby reducing the overall maintenance costs.

SAFT

Fast and reliable

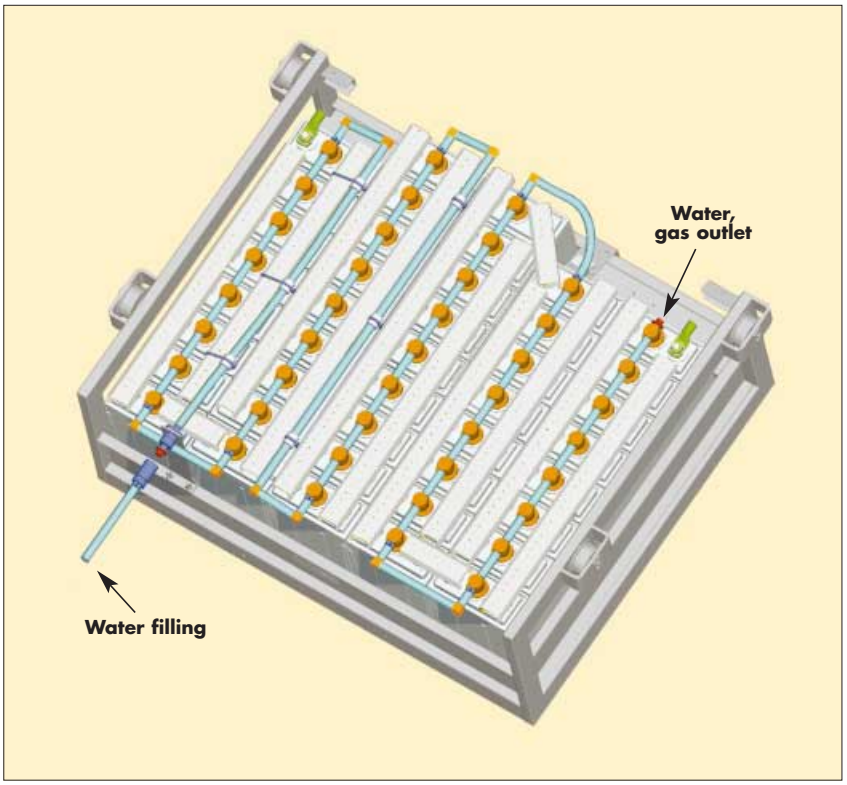
Saft Central Water Filling System is simple, fast and a reliable solution for mobile nickel-cadmium battery topping-up requirements.

The system offers a number of advantages:

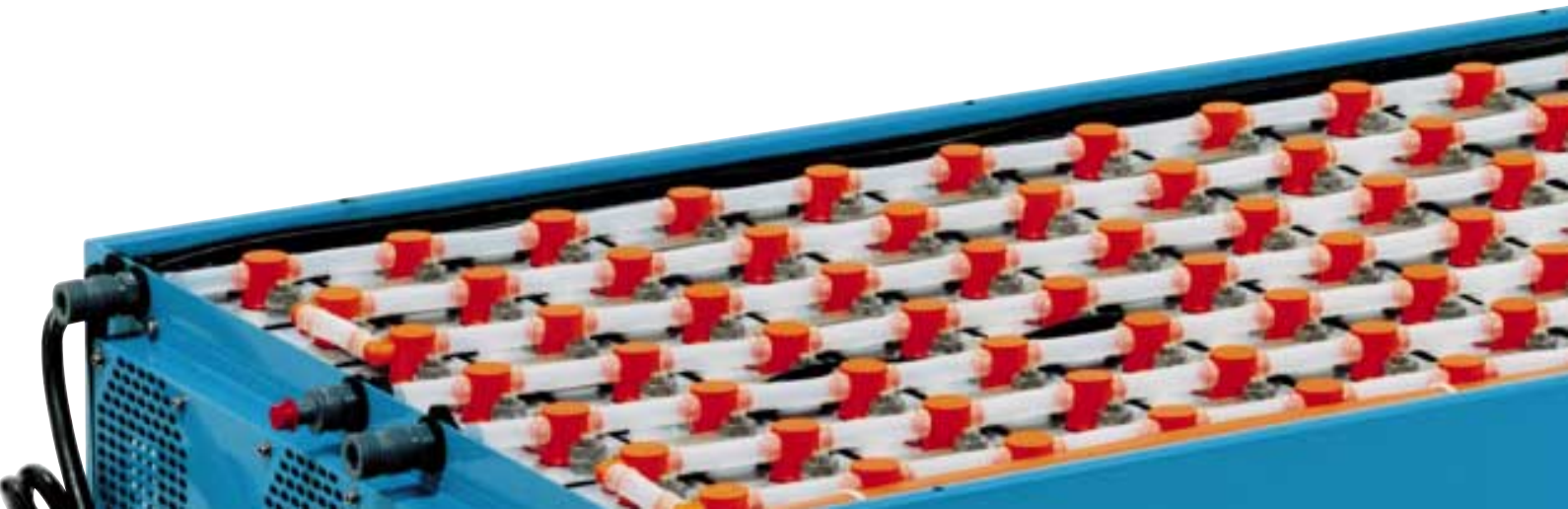
- **Simple use, especially when access to batteries is difficult**
  A single central watering point allows all the cells in the battery to be filled from one central water tank.
- **Reliable**
  The system is based on a filling vent with no moving parts. This ensures that all cells are topped-up properly thereby avoiding any risk of missed cells, exposure to air or malfunction over time.
- **Accurate**
  Topping-up stops automatically once the maximum electrolyte level is reached.
- **Fast**
  The central water filling system eliminates the need for topping-up cells individually.
- **Cost savings**
  A central water filling system is much faster and less labour intensive than filling each cell manually.

Worldwide references

More than 3,000 vehicles (including buses and trucks) are currently equipped with a Saft central water filling system.
In addition, many automatic guided vehicle (AGV) batteries in use around the world incorporate this system.
In the railway market, the central water filling system has been adopted for batteries on-board rolling stock by major operators in France, Finland, Norway, Sweden, Taiwan, Spain, UK, etc.



Typical Battery Assembly

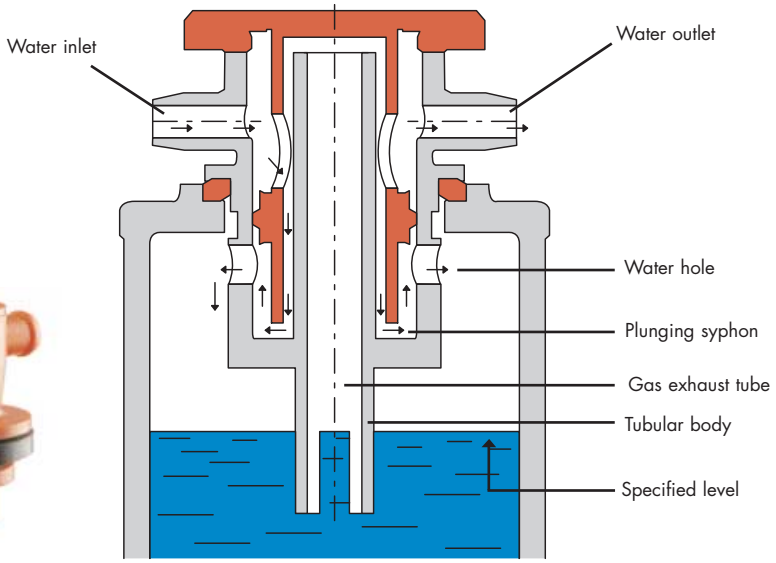


Designed for mobile environments

The Saft central water filling system operates on the principle of a single central watering point to top-up all cells hydraulically connected in a battery (up to a maximum of 50 cells).

All batteries with a larger number of cells are equipped with a water filling system in independent circuits. In each circuit, the cells are connected through silicone pipes.

The hydraulic connection of cells is parallel to the electrical connection, in order to avoid voltage differences of more than 1.2 V between two hydraulically connected cells.



Plug - detailed description

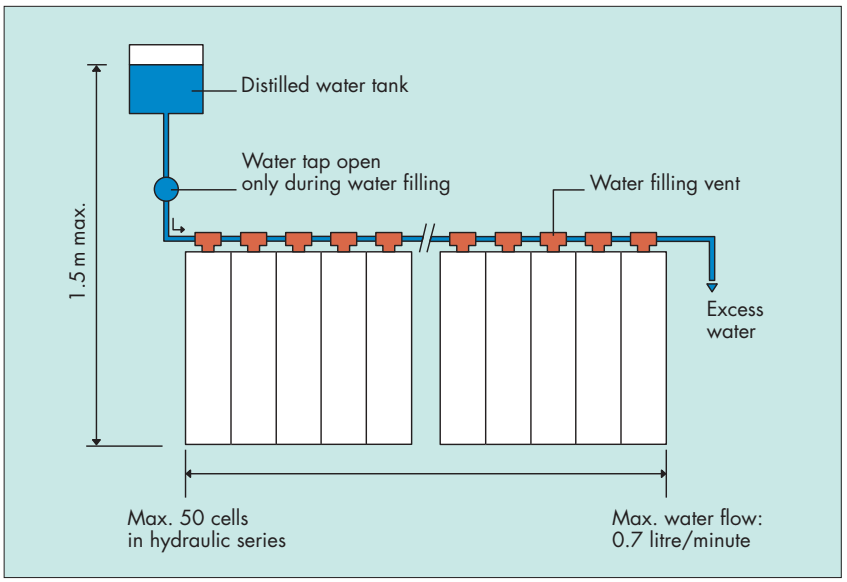
The central filling system enables each cell to be accurately filled with water to the specified level at a flow of 0.7 l/min and a pressure of 0.15 bars, while allowing any excess gas in the cell to escape. Once the maximum electrolyte level in a cell has been reached, the internal pressure of the cell ensures that the process stops automatically. The entire system operates without any moving parts, thereby ensuring maximum reliability.

Operating principle

Each cell is equipped with a water filling plug, of which the nozzle ensures the cell is filled to a precise pre-set level. The water filling plug is made up of:

- water inlet, used to top up the cell to the specified level,
- water outlet, connected to the next cell by a silicone pipe and used to fill up the next cell,
- gas exhaust tube, to exhaust gases up to the moment when the correct water level is reached,
- plunging syphon,
- water hole, through which water flows into the cell,
- internal chicane system to prevent cell electrolyte from coming into contact with the next cell.

Water flows through the filling plug's plunging syphon into the cell, while gas is stored in the exhaust tube. When the specified level is reached, the electrolyte closes the gas exhaust tube and the resulting excess pressure stops the water flow into the cell. The water then flows through to the next cell, and so on, until all cells have been filled.



Water Filling System, skeleton diagram during filling period

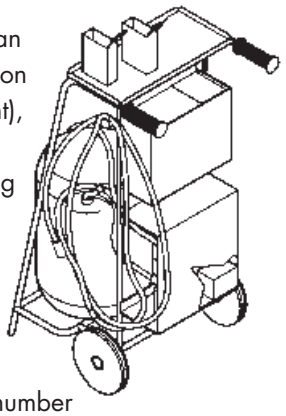
The plug's water inlet and outlet nozzles are cone-shaped to ensure easy installation and prevent leaks in harsh railway environments without any further restraining devices.

Meeting specifications

Saft central water filling system has been qualified in conformity with the IEC 77 and RIA 20 shock and vibration test, and consequently meets the highest standards.

The filling plug is made of ABS plastic and the filling pipes of silicone.

As an option, Saft can provide a filling station (workshop equipment), consisting of a portable cart carrying a water tank, pump and back-up battery.



The central water filling system can be adapted to a large number of Saft battery types, such as:

- sintered / pbe products of the SRX, SRM and STH ranges
- pocket products of the SBL / SBM / SBH and SCM S / SCH S ranges

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