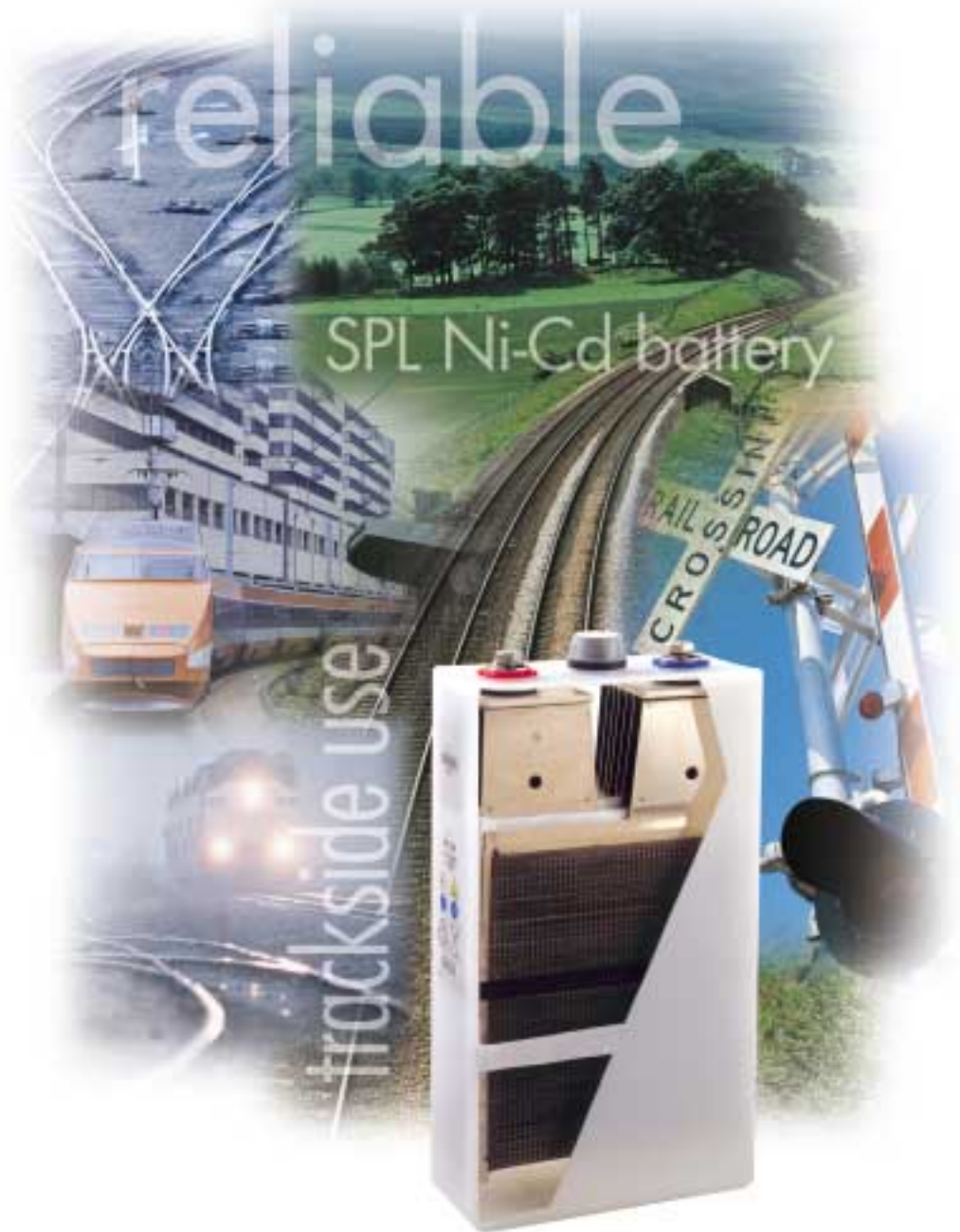


The SPL Ni-Cd battery

Reliable trackside power



S A F T

100% reliable power for railroad signaling and communication

Saft's new SPL nickel-cadmium batteries are optimized for the specific requirements of railroad trackside power. They are extremely reliable, need minimal maintenance, and cost less over their lifetime than lead-acid batteries.

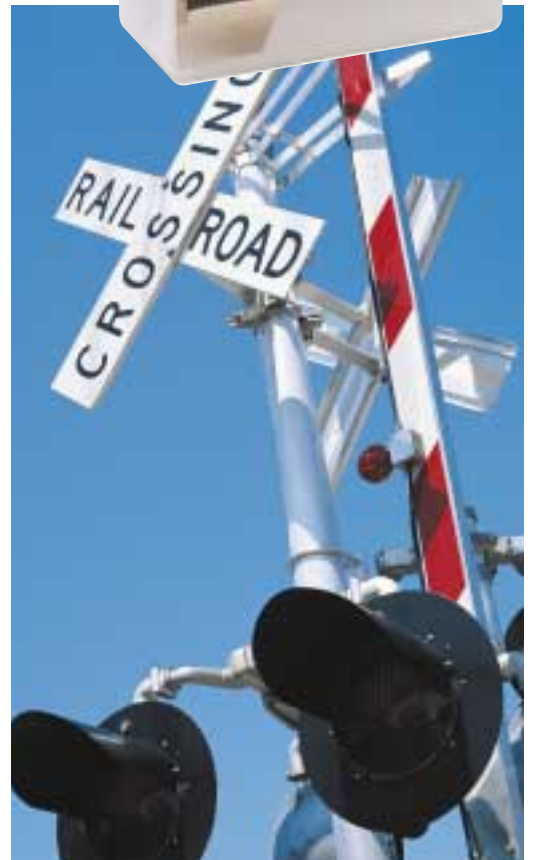
Signaling and communication are complex and critical parts in a railroad system. To guarantee passenger safety, and to give effective control of trains and other traffic on highway crossings, system reliability is paramount – and that applies to the power supply to trackside signal masts, switches, control gear and other equipment.

Reliable battery power

In many applications along the track, batteries are used to meet peak electricity demand and to provide back-up power to all systems in case of emergency. These batteries must meet a range of demanding requirements.

- Complete reliability over a long, predictable lifetime.
- Excellent electrical performance and high resistance to electrical and mechanical abuse.
- Operation in ambient temperatures from +40°C (+104°F) in hot climates to -30°C (-22°F) in cold regions, with extremes from +55°C (+131°F) to -40°C (-40°F).
- Minimal maintenance needs.
- Capable of operating with renewable energy sources.

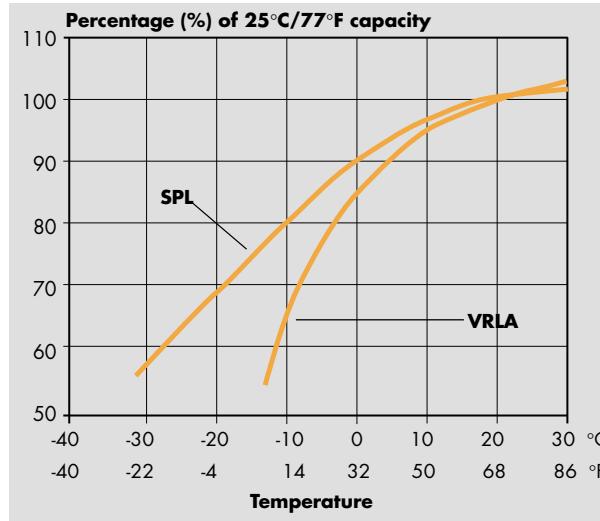
Only nickel-cadmium technology can meet these requirements cost-effectively.



The strong, long-life solution

Saft's SPL battery is optimized for railroad trackside applications. Its field-proven, robust "pocket-plate" construction is used in railroad batteries the world over because of its exceptional reliability.

- Electrode active materials are encased in rugged pockets made of perforated steel, giving great physical strength.
- The alkaline electrolyte, a solution of potassium and lithium hydroxide, takes no part in the chemical reaction, so the electrodes are not corroded in use. The electrolyte gives excellent electrical performance over a wide temperature range.
- The flooded electrolyte and vented design prevents failures such as "sudden death", thermal runaway and cell dry-out that can affect valve-regulated lead-acid (VRLA) batteries.



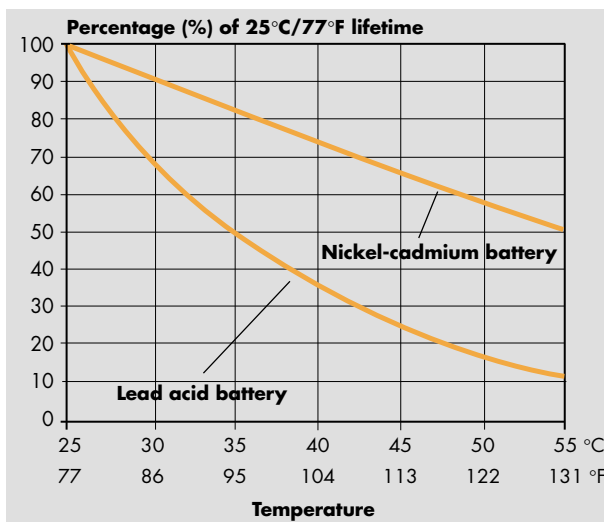
SPL batteries outperform VRLA batteries at low temperatures

- Batteries can perform many hundreds of charge-discharge cycles while retaining excellent electrical performance, and can withstand full discharges without damage, unlike lead-acid batteries.
- Batteries are tolerant to high ripple currents, overcharging, short circuits and other electrical abuse.

Saft SPL batteries typically last 20 years or more. Even in harsh outdoor conditions, their lifetime is more than ten years.

Coping when the heat is on

The temperature in an outdoor battery cabinet can be up to 10°C (18°F) higher than the outside air, and while high temperatures reduce the life of all batteries, SPL batteries cope better than the alternatives. The flooded electrolyte design helps control the temperature more effectively than the "starved electrolyte" concept used in VRLA batteries. SPL batteries lose only 20% of their 20+ year lifetime for each 10°C (18°F) temperature increase, while lead-acid batteries lose 50% of their lifetime.



Nickel-cadmium batteries have superior high-temperature performance compared with lead-acid batteries

At the other extreme, a special low-temperature electrolyte enables SPL batteries to handle temperatures down to -40°C (-40°F). Lead-acid batteries simply cannot operate at these temperatures without additional heating.

Ultra-low-maintenance, for the lowest life-cycle cost

Trackside batteries can be hundreds of miles from the nearest maintenance depot – and the cost of frequent inspection and maintenance visits over the battery’s life can easily outweigh the purchase price. That’s why minimizing maintenance was a priority for the designers of Saft’s SPL batteries.

The SPL nickel-cadmium battery meets the need to minimize maintenance and life-cycle cost by combining the reliability of vented, pocket-plate Ni-Cd batteries with Saft’s “ultra-low-maintenance” concept.



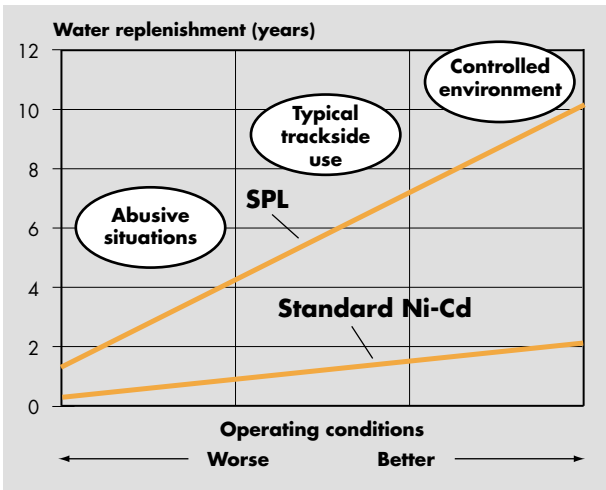
The ultra-low-maintenance concept

This concept, developed for Saft’s Ultima range of industrial Ni-Cd batteries, does not aim for maintenance-free operation at any cost, but rather to preserve the inherent benefits of pocket-plate construction while greatly increasing the time between water additions.

controlled way. Coupled with a large electrolyte reserve, this gives the SPL battery a greatly increased maintenance interval.

Saft SPL batteries have a special fiber mat separator between the electrodes that means that gases generated during charging recombine in an optimal and

Valve-regulated lead-acid (VRLA) batteries extend their top-up interval at the expense of reliability: their starved electrolyte design requires a higher level of gas recombination, and the heat that this generates shortens the life of the battery. It can even lead to catastrophic failure.



SPL batteries are designed to cope better in harsh conditions

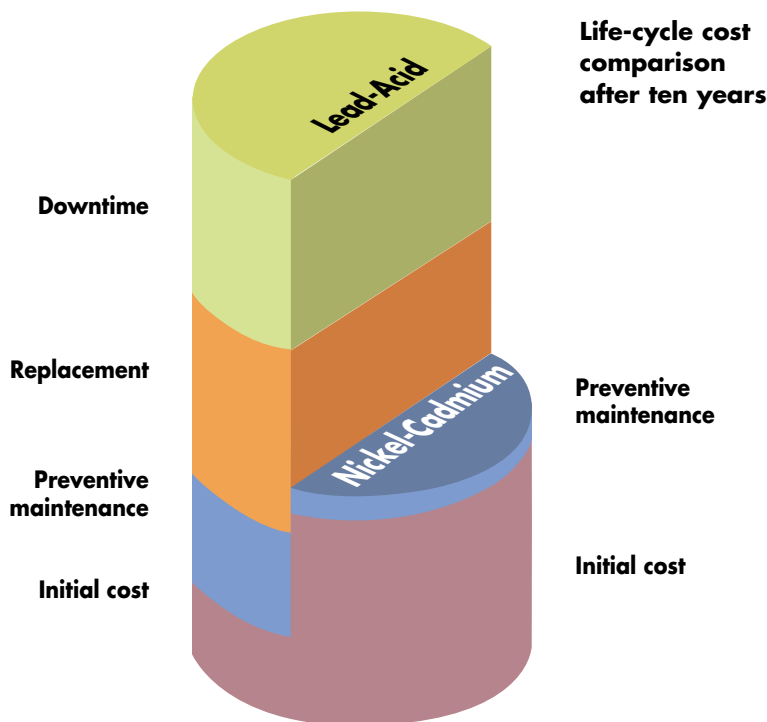
Without making any sacrifices in the rugged pocket-plate design, Saft's SPL batteries achieve a watering interval of many times that of a conventional Ni-Cd battery, and a lifetime two or three times that of a VRLA battery under the same operating conditions.

With the ultra-low-maintenance concept, the battery is no longer the limiting factor in deciding the maintenance interval. In most applications, the routine system maintenance visit is all that is required for the battery.

Minimizing costs over the battery life cycle

There are three distinct parts to the cost of ownership of a battery system:

- initial investment, including the cost of purchase, spares, tools and installation,
- maintenance cost, including unexpected and expensive downtime costs, and
- replacement cost, such as dismantling, shipping, disposal and administrative costs.



So while nickel-cadmium batteries may cost more to buy than alternative types, making a purchase decision on the basis of initial investment alone can prove a costly mistake. In railroad trackside applications, long battery life and low maintenance costs are important. Batteries are situated in remote locations, and maintenance, reliability and replacement cost factors can greatly outweigh the initial cost of the battery. It's vital to take life-cycle costs into account when specifying a battery system, and on this basis, SPL scores heavily.

A product line designed for all trackside applications

SPL cells are available in a range of capacities to allow batteries to meet any trackside power demand.

Soft SPL batteries are a reliable energy source for outdoor conditions; they need minimal maintenance and have good cycling capability. It's a range suited to all standard railroad voltages and for all trackside power requirements, from providing back-up d.c. power to a single signal mast, or peak power provision for groups of switch motors, to large uninterruptible power supplies.

Cell containers are polypropylene with visible electrolyte levels, and are equipped with flame arresting vents. Batteries can be provided in any configuration, from a single cell upwards. The 1.2V cell potential enables batteries to meet any voltage requirement. Cells can be supplied with their own battery crates, and a wide range of racking options is also available.



Battery type	Rated capacity C ₅ Ah*	L		W		H		Weight	
		mm	in.	mm	in.	mm	in.	kg	lbs
SPL 80	80Ah	68	2.67	192	7.56	352	13.86	6.9	15.2
SPL 130	130Ah	68	2.67	192	7.56	352	13.86	7.5	16.5
SPL 165	165Ah	93	3.66	192	7.56	352	13.86	9.9	21.8
SPL 200	200Ah	93	3.66	192	7.56	352	13.86	10.6	23.3
SPL 250	250Ah	109	4.29	195	7.68	406	15.98	13.8	30.4
SPL 290	290Ah	121	4.76	195	7.68	406	15.98	15.6	34.3
SPL 340	340Ah	133	5.24	195	7.68	406	15.98	17.4	38.3
SPL 380	380Ah	157	6.18	195	7.68	406	15.98	20.7	45.5
SPL 420	420Ah	169	6.65	195	7.68	406	15.98	22.5	49.5

* Rated capacity according to IEC 623.

Charge voltages

Two voltage charge:

High rate	1.45 to 1.55 volt per cell
Float	1.42 volt per cell

Single voltage charge:

1.43 to 1.50 volt per cell

Fast, flexible charging

SPL batteries can be charged economically within a wide voltage range, and are compatible with all types of charging equipment used in railroad applications. There is no need to use temperature compensation or end-of-charge discharge detection devices. However, if temperature compensation is used, the recommended change in voltage is $-3\text{mV per }^{\circ}\text{C per cell}$ ($-1.7\text{mV}/^{\circ}\text{F}/\text{cell}$) starting from an ambient temperature of 20°C – 25°C (68°F – 77°F). The speed of charge can be optimized, and the water consumption minimized, by the use of a two-level charging regime. The alternative single-level charge has the benefit of simplicity and reliability.

A partner for renewable energy

In many remote trackside applications, renewable sources of energy, such as photovoltaic arrays, represent a cost-effective primary source of power. Such applications present particular challenges for batteries used to store the energy.

Saft's SPL battery is designed to cope, with features such as low self-discharge, good charge efficiency, and capacity for frequent and deep cycling.



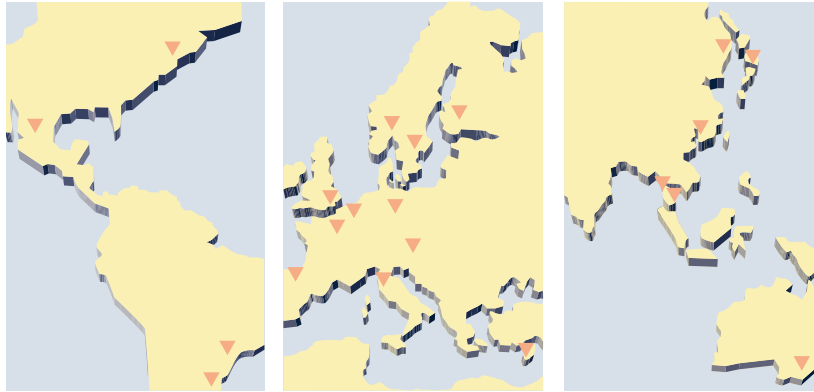
Commitment to the environment



All batteries contain materials that can be harmful to the environment, and they must be collected for correct treatment and material recovery or recycling.

For each region, and in line with local regulations, Saft has developed an efficient collection and recycling program. An information package with a list of collection points certified by Saft is available.

For many countries the Saft production plant in Sweden recovers from waste batteries around 30% of the cadmium needed as raw material for new batteries.



Saft, the brand name of the battery activity within Alcatel's Cables and Components Sector, holds a leading position in the worldwide marketplace of self-contained energy solutions. Saft's product range includes portable power sources, industrial and advanced technology and power systems.

As one of Saft's product groups, the Industrial Battery Group spans an extremely broad range of industrial applications: aircraft, railways, electric vehicles, space, defense and other industries. Its plants, located in Bordeaux and Poitiers in France, Oskarshamn in Sweden and Valdosta in Georgia, USA, are operated through a quality management system that extends to R&D and production automation. All sites are ISO 9001 certified. Nickel cadmium batteries are 99.9% recyclable and Saft operates its own dedicated recycling center.

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