SPL Ni-Cd battery

Reliable trackside power

April 2005

Reliable power
for railroad signaling and communication

Saft's 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.

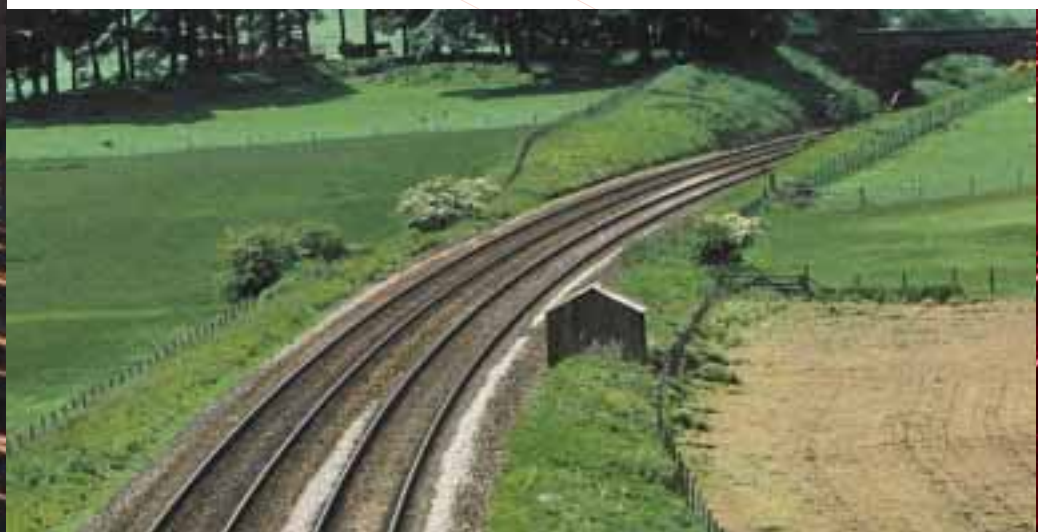
Signaling and communication are complex and critical parts in a railroad system. To guarantee passenger safety, and to give effective control of trains and traffic on highway grade crossings, **system reliability is paramount** – for the supply of power to trackside signals, flashers, switches, communications 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.



Purpose built

to handle temperature extremes

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.

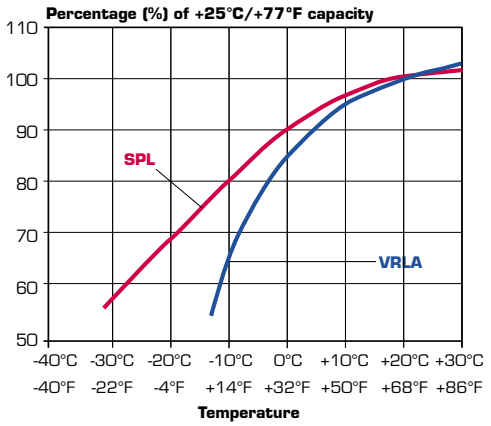
- Electrode active materials are encased in rugged pockets made of perforated steel, giving great physical strength.
- The alkaline electrolyte, a solution of potassium and lithium hydroxide, takes no part in the chemical reaction, so the electrodes are not corroded in use. The electrolyte gives excellent 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.
- 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.

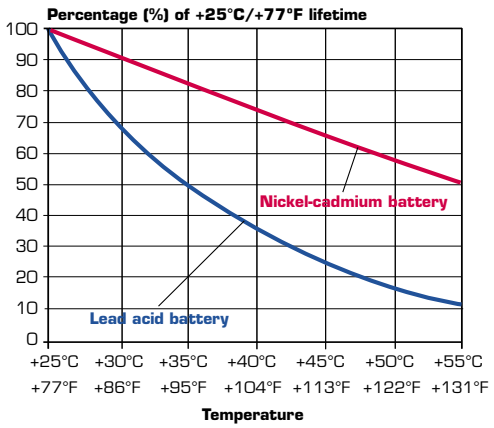
Coping when the heat is on

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 from +25°C (+77°F), while lead acid batteries lose 50% of their lifetime.

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.



SPL batteries outperform VRLA batteries at low temperatures



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

Ultra-low maintenance,
built in by design

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.

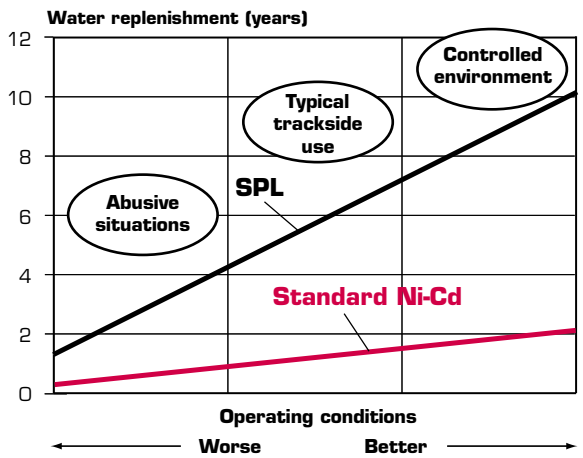
The SPL nickel-cadmium battery meets the need to minimize maintenance and life-cycle cost by combining the reliability of vented, pocket-plate Ni-Cd batteries with Saft's "ultra-low-maintenance" concept.

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.

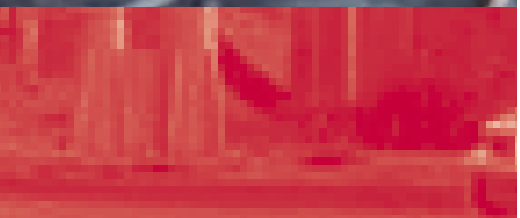
Saft SPL batteries have a special fiber mat separator between the electrodes to allow the gases generated during charging to recombine in an optimal and controlled way. Coupled with a large electrolyte reserve, this gives the SPL battery a greatly increased maintenance interval.

Flooded and valve-regulated lead acid batteries extend their top-up interval at the expense of reliability.



SPL batteries are designed to cope better in harsh conditions

Top performance
for the lowest life cycle cost



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 of at least three times that of a lead acid 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 very well.

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.

Saft 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 a large control point to uninterruptible power for a multi-lane highway grade crossing.

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 1.2 V 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.

Fast, flexible charging

SPL batteries can be charged economically within a wide voltage range. They are compatible with all types of charging equipment used in railroad applications and there is no need to use temperature compensation, though this will improve performance and reduce maintenance intervals.

If temperature compensation is used, the recommended change in voltage is –3mV per °C per cell (–1.7mV/°F/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. Additionally, in contrast to lead acid batteries, end-of-charge/discharge detection devices are not necessary, with SPL.

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.

Charge voltages

Two voltage charge:

High rate	1.45 to 1.55 V/cell
Float	1.42 ± 0.02 V/cell

Single voltage charge:

1.43 to 1.50 V/cell

Battery type	Rated capacity* C_5 Ah	Dimensions L		W		H		Weight	
		mm	in.	mm	in.	mm	in.	kg	lbs
SPL 80	80 Ah	68	2.67	192	7.56	352	13.86	6.9	15.2
SPL 100	100 Ah	68	2.67	192	7.56	352	13.86	6.9	15.2
SPL 130	130 Ah	68	2.67	192	7.56	352	13.86	7.5	16.5
SPL 165	165 Ah	93	3.66	192	7.56	352	13.86	9.9	21.8
SPL 200	200 Ah	93	3.66	192	7.56	352	13.86	10.6	23.3
SPL 250	250 Ah	109	4.29	195	7.68	406	15.98	13.8	30.4
SPL 290	290 Ah	121	4.76	195	7.68	406	15.98	15.6	34.3
SPL 340	340 Ah	133	5.24	195	7.68	406	15.98	17.4	38.3
SPL 380	380 Ah	157	6.18	195	7.68	406	15.98	20.7	45.5
SPL 420	420 Ah	169	6.65	195	7.68	406	15.98	22.5	49.5

* Rated capacity according to IEC 60623.

Performance Data

all trackside applications

Performance after prolonged float charge of fully charged cells

Available amperes at +20°C ± 5°C (+68°F ± 9°F) **Final voltage: 1.00 V/cell**

Cell type	C_5 Ah	Hours					Minutes								Seconds		
		10	8	5	3	2	90	60	30	20	15	10	5	1	30	5	1
SPL 80	80	8.16	10.1	16.0	25.8	35.3	44.0	54.7	61.9	65.6	68.5	71.2	76.0	86.5	91.0	104	115
SPL 100	100	10.2	12.6	20.0	32.3	44.1	55.0	68.4	77.7	82.3	85.4	89.2	95.4	108	114	129	145
SPL 130	130	13.3	16.4	26.0	42.0	57.3	71.5	88.9	101	107	111	116	124	141	148	168	188
SPL 165	165	16.8	20.8	33.0	53.3	72.8	90.8	113	128	135	141	147	157	178	188	214	238
SPL 200	200	20.4	25.2	40.0	64.6	88.2	110	137	155	164	171	178	190	216	228	259	288
SPL 250	250	25.5	31.5	50.0	80.8	110	135	167	190	201	210	218	233	262	276	308	338
SPL 290	290	29.6	36.5	58.0	93.7	128	157	194	220	233	243	252	270	304	321	357	392
SPL 340	340	34.7	42.8	68.0	110	150	184	227	258	273	285	296	316	356	376	418	460
SPL 380	380	38.8	47.9	76.0	123	168	205	254	289	306	319	331	353	398	420	467	514
SPL 420	420	42.8	52.9	84.0	136	185	227	280	319	338	352	365	391	440	464	517	568

Available amperes at +20°C ± 5°C (+68°F ± 9°F) **Final voltage: 1.05 V/cell**

Cell type	C_5 Ah	Hours					Minutes								Seconds		
		10	8	5	3	2	90	60	30	20	15	10	5	1	30	5	1
SPL 80	80	8.08	10.0	15.8	23.1	31.0	37.6	43.4	51.4	54.0	56.1	58.4	62.4	72.0	77.1	87.2	95.5
SPL 100	100	10.1	12.5	19.8	28.9	38.8	47.0	54.2	64.2	67.5	70.1	73.0	77.7	90.0	96.2	109	119
SPL 130	130	13.1	16.3	25.7	37.6	50.4	61.1	70.5	83.5	87.8	91.1	94.9	101	117	125	142	155
SPL 165	165	16.7	20.6	32.7	47.7	64.0	77.6	89.5	106	111	116	120	129	149	159	180	197
SPL 200	200	20.2	25.0	39.6	57.8	77.6	94.0	108	128	135	140	146	156	180	193	218	239
SPL 250	250	25.3	31.3	49.5	72.3	97.0	116	134	157	165	170	178	190	220	233	263	286
SPL 290	290	29.3	36.3	57.4	83.8	113	134	155	182	191	197	206	220	255	270	305	332
SPL 340	340	34.3	42.5	67.3	98.3	132	157	182	214	224	231	241	258	299	317	357	389
SPL 380	380	38.4	47.5	75.2	110	147	176	203	239	251	258	270	289	334	354	399	434
SPL 420	420	42.4	52.5	83.2	121	163	194	224	264	277	285	298	319	370	392	441	480

Available amperes at +20°C ± 5°C (+68°F ± 9°F) **Final voltage: 1.10 V/cell**

Cell type	C_5 Ah	Hours					Minutes								Seconds		
		10	8	5	3	2	90	60	30	20	15	10	5	1	30	5	1
SPL 80	80	7.68	9.52	14.0	20.5	27.3	31.2	35.8	40.0	42.0	44.4	46.8	50.8	58.4	61.2	67.2	72.4
SPL 100	100	9.62	11.9	17.5	25.6	34.1	39.0	44.7	50.1	52.5	55.5	58.5	63.5	73.0	76.5	83.8	90.8
SPL 130	130	12.5	15.5	22.8	33.3	44.3	50.7	58.1	65.1	68.3	72.2	76.1	82.6	94.9	99.5	109	118
SPL 165	165	15.8	19.6	28.9	42.2	56.3	64.4	73.8	82.6	86.6	91.6	96.5	105	120	126	139	149
SPL 200	200	19.2	23.8	35.0	51.2	68.2	78.0	89.4	100	105	111	117	127	146	153	168	181
SPL 250	250	24.0	29.8	43.8	64.0	84.8	96.3	110	123	130	136	144	156	180	186	195	201
SPL 290	290	27.8	34.5	50.8	74.2	98.3	112	127	143	150	158	167	181	209	216	226	233
SPL 340	340	32.6	40.5	59.5	87.0	115	131	149	168	176	185	196	213	245	253	265	273
SPL 380	380	36.5	45.2	66.5	97.3	129	146	167	187	197	207	219	238	274	283	296	306
SPL 420	420	40.3	50.0	73.5	108	142	162	184	207	218	229	242	263	302	313	328	338

Available amperes at +20°C ± 5°C (+68°F ± 9°F) **Final voltage: 1.14 V/cell**

Cell type	C_5 Ah	Hours					Minutes								Seconds		
		10	8	5	3	2	90	60	30	20	15	10	5	1	30	5	1
SPL 80	80	7.20	8.96	12.1	18.1	22.7	22.8	24.4	27.8	30.0	31.7	33.6	36.8	43.5	45.8	52.8	58.9
SPL 100	100	9.0	11.2	15.1	22.6	28.4	28.5	30.5	34.8	37.5	39.7	42.0	46.0	54.4	57.2	66.0	73.6
SPL 130	130	11.7	14.6	19.6	29.4	36.9	37.1	39.7	45.2	48.8	51.6	54.6	59.8	70.7	74.3	85.8	95.7
SPL 165	165	14.9	18.5	24.9	37.3	46.9	47.0	50.4	57.4	61.9	65.5	69.3	75.9	89.7	94.4	109	121
SPL 200	200	18.0	22.4	30.2	45.2	56.8	57.0	61.1	69.5	75.0	79.3	84.0	92.0	109	114	132	147
SPL 250	250	22.5	28.0	37.8	56.5	70.3	71.3	76.3	85.5	92.0	96.5	103	113	132	140	155	163
SPL 290	290	26.1	32.5	43.8	65.5	81.5	82.7	88.5	99.2	107	112	119	131	153	162	180	189
SPL 340	340	30.6	38.1	51.3	76.8	95.5	96.9	104	116	125	131	139	153	180	190	211	221
SPL 380	380	34.2	42.6	57.4	85.9	107	108	116	130	140	147	156	171	201	213	236	247
SPL 420	420	37.8	47.0	63.4	94.9	118	120	128	144	155	162	172	189	222	235	260	273

Committed to a clean environment

Saft takes seriously its responsibility to safeguard the environment. For each battery technology, Saft manages every stage of the life cycle - from design and production to recovery and recycling. Saft takes back all its batteries at end-of-life, whatever the technology used, and is the only battery company to operate an in-house recycling unit.

To locate the nearest collection site, visit www.saftbatteries.com

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