ReGenSol Ni-Cd batteries

The robust daily cycling solution for solar PV systems
ReGenSol
The ideal energy storage choice for solar PV systems

The most reliable battery under the sun

The new ReGenSol nickel battery range is a perfect example of Saft’s commitment to supporting sustainability through innovative approaches to effective and reliable renewable energy schemes. ReGenSol offers advanced features:

• The number of capacity steps is 46, from 20 Ah up to 1420 Ah

• The interval for topping-up with water is up to 5 years (charging voltage at 1.50V/cell)

• High cycling capability, typically 10000 cycles at 15% Depth Of Discharge during the 20-year service life

• The excellent charge efficiency ensures availability of more capacity for each daily cycle. The charge acceptability up to 95% can be achieved until 80% State-of-Charge in a typical application with charge voltage at +20°C (+68°F).

ReGenSol nickel battery solutions are ideal for demanding solar photovoltaic (PV) applications. They boast an exceptional efficiency and reliability, even when subjected to extreme temperatures, unpredictable demands and frequent daily cycling at variable depths of discharge. It is a tough role for any battery, yet ReGenSol provides a completely predictable 20-year service life combined with the low maintenance requirements that make it the first choice for remote installations.
Effective energy storage for stand-alone installations

A wide variety of remote safety-critical installations worldwide rely increasingly on solar PV systems for cost-effective and environmentally responsible power.

Oil and gas pipelines
• Cathodic protection

Utilities - Micro Grids
• Off-grid rural electrification schemes in remote areas

Offshore platforms
• Emergency lighting and communications

Transport infrastructure
• Crossing guards, lighting, signalling, information displays

Telecommunications
• Base stations where grid supplies are unreliable or unavailable
• Innovative hybrid power systems working in combination with diesel gensets

Navigational aids
• Offshore and remote lighthouses
• Fairway beacons and GPS (Global Positioning Systems)

Buildings
• Hospitals, Schools, Gas Stations, Commercial Buildings

Factories
• Factory loads for renewable energy initiatives

Typical off-grid PV application

Advantages of ReGenSol for Off-Grid PV installation

ReGenSol battery solutions answer the key requirements for off-grid PV (photovoltaic) applications:
• Capacity to withstand cycling, daily and seasonal, i.e. at variable DOD (Depth Of Discharge) and SOC (State Of Charge)
• Ability to operate under the fluctuating charging conditions (voltage, current) created by the intermittent nature of solar power
• Ability to operate at high and low temperatures
• Minimal maintenance and ease of installation for remote sites
• Total reliability and availability throughout the service life.
ReGenSol is the ideal battery choice for Cathodic protection

An effective solution to avoid corrosion

Cathodic protection is required by law in many countries for applications including gas pipelines, wellhead casings, tanks, vessels and marine structures. It is used widely in the oil and gas, marine and ports industries, and offshore wind farms. Furthermore, remote and off-grid sites face the challenge of providing reliable and low-cost power in locations where it is challenging to schedule a visit by a qualified technician for inspection and maintenance of vital assets.

Impressed Current Cathodic Protection (ICCP) is an important technique used to control the corrosion of steel structures, such as underground or buried pipelines. It ensures safety and process continuity, as well as protecting the environment, as it reduces the risk of leaks from oil and gas pipelines and infrastructure.

ICCP works by overcoming the galvanic current inherent in corrosion processes with an opposing current. In a typical ICCP system, a transformer/rectifier draws power from the local network and converts it from AC to DC. It then provides a constant trickle of direct current via anodes in the ground, with current flowing towards the structure to be protected. As a result, this system can prevent the natural oxidation of steel structures.

Advantages of ReGenSol for On-Grid / Off-Grid Hybrid power Systems

- Diesel genset runs for only a few hours a day, reducing fuel and maintenance costs by up to 65%, while also cutting CO2 emissions in the same range
- Total continuity of supply for critical applications and for remote installations where Grid power in unstable
- Quieter and cleaner operating site.
Depending on the level of current applied, ICCP will slow the rate of corrosion. Some systems can even extend asset life indefinitely as they reduce the rate of corrosion to almost zero. A single system can protect a length of approximately 50 km of pipeline in a desert (where soil resistivity and moisture levels are low) but this can drop to 100 meters for structures immersed in sea water.

**ICCP powered by renewable energy:** Photovoltaic panels (PV) or wind turbines are the most suitable options to power ICCP systems. Renewable energy does not consume fossil fuel and has low operating costs that offset the relatively high installation cost. PV panels have been used for over 20 years in ICCP installations. As they produce DC power, there is no need for an AC/DC rectifier.

**Battery system:** The integration of a battery system makes it possible to store renewable energy and release it when the sun does not shine or the wind does not blow. For a solar-powered system, the battery charges during the day and releases energy overnight and on overcast days. Typically, the cost of adding a battery is significantly less than the value of the infrastructure that the ICCP system is protecting.

Typically for an ICCP installation, a battery will need to provide a minimum of 2 to 3 days of stand-alone power to provide reliable operation in a remote off-grid site, where temperatures can vary widely and impact performance and lifetime. That calls for a battery able to withstand the extreme heat of the desert day and the extreme cold of the night, combined with a robust design to handle the mechanical stresses of transport to the site.

This is where **ReGenSol** Nickel-Cadmium technology batteries are a perfect fit, as they have been developed specifically to offer superior performance to lead-acid batteries in harsh environments and extreme temperatures. ReGenSol batteries are designed to last up to 20 years, while lead-acid batteries could need replacing a number of times, so they offer a significant reduction in the Life Cycle Cost (LCC) of an installation.

**Cathodic Protection (ICCP) for ReGenSol**

The benefits of combining renewable energy with a battery in an ICCP application
The perfectly adapted battery for solar PV installations

ReGenSol is purpose-designed and fully adapted for optimum performance in PV applications

ReGenSol is fully engineered and tested to meet the specific performance and reliability needs of solar PV applications.
- Provides a range of capacities from 20 Ah up to 1420 Ah in 46 capacity steps.
- Ensures up to 95% charging efficiency in typical conditions.
- Supports daily and seasonal cycling at variable DOD (Depth Of Discharge) and SOC (State Of Charge).
- Provides excellent cycling capability, up to 10 000 cycles at 15% of daily DOD for a 20-year service life.
- Performs under fluctuating voltage and current charging conditions.
- The ReGenSol delivers more than 2-times the cycle requirements according to IEC 61427-1.

The test results demonstrate its superior cycling ability after being subjected to continuous cycling at a partial state of charge (low and high) and at a fixed +40°C (+104°F).

ReGenSol ensures total reliability in remote installations

ReGenSol is ideally suited for remote, hard to access installations where routine maintenance is time-consuming and expensive.
- Low maintenance thanks to internal gas recombination that exceeds IEC 62259 requirements.
- Topping-up intervals are up to 5 years due to the improved charge efficiency.
- Reliable operation eliminates interim maintenance.
- Rugged construction facilitates transportation to remote sites.
- Installation is easy with limited handling equipment.

ReGenSol Ni-Cd batteries - The robust daily cycling solution for solar PV systems
ReGenSol performs in even the harshest operating conditions

ReGenSol features a robust construction that ensures total continuity of backup power anywhere in the world.
- Operates in extreme temperatures from -50°C (-58°F) to +70°C (+158°F).
- Special Electrolyte is necessary for operations below -20°C (-4°F) to ensure typical 120 hour performance with no risk of cell freezing when fully discharged.
- Robust pocket plate construction and shock-resistant polypropylene casing material survives the shocks and knocks experienced when transporting batteries over difficult terrain to remote locations.
- Long shelf-life means it can be stored (under normal storage conditions) «ready for use» (i.e. filled and charged) for 12 months without refreshing charge or maintenance.

ReGenSol drives down the TCO of both the batteries and the entire PV system due to its durability and robustness

ReGenSol is based on Saft Ni-Cd technology that delivers excellent performance over a long, predictable Total Cost of Ownership (TCO).
- Eliminates the risk of premature failure or degradation associated with lead-acid batteries.
- Resists electrical abuse, including 100% discharge. So there is no need for a low voltage disconnect.
The full battery capacity can be utilized without over-sizing.
- Remains unaffected by accidental overcharge, such as during a charge regulator failure, as well as deep discharge or inversion.
- Prevents: premature capacity loss when cycling at low State Of Charge (SOC), with insufficient recharging; corrosion, when cycling at high SOC and/or high temperature; shedding of active mass when submitted to deep cycles.
The reliable and sustainable battery solution for solar PV

ReGenSol batteries are designed in full compliance with the highest quality, safety and environmental standards

Electrical characteristics:
- Certified IEC 62259 - Secondary cells and batteries containing alkaline or other non-acid electrolytes - Nickel-cadmium prismatic secondary single cells with partial gas recombination.
- Complies with IEC 61427-1 - Secondary cells and batteries for renewable energy storage - General requirements and methods of test - Part 1: Photovoltaic off-grid application

Safety:
- Complies with EN 50272-2/ IEC 62485-2 - Safety requirements for secondary batteries and battery installations - Part 2: Stationary batteries - The protective covers for terminals and connectors, the insulated cables are compliant with IP2 level protection against electrical shocks according to safety standard.

Quality:
- ISO 9001
- Saft world class continuous programme

Environment & Recycling:
- Fully recyclable
ReGenSol Ni-Cd batteries - The robust daily cycling solution for solar PV systems

Saft – end-to-end service and support

Saft’s comprehensive service provides expert support throughout every stage of your battery’s life from initial concept through volume supply, installation and training. Courses cover basic and advanced skills, with a specific focus on installation, maintenance guidelines and standards to ensure maximum performance and reliability from your PV power systems.

Photovoltaic battery sizing

Our Battery Sizing and Configuration System, helps customers to quickly size the ReGenSol solution for their photovoltaic applications in taking into account all parameters (temperature, charge derating factors, design margin) affected the battery size.

Contact SAFT sales team for the BaSiCs battery sizing software and training
For more information email us at marketing@saftbatteries.com

<table>
<thead>
<tr>
<th>Battery system</th>
<th>Number of cells</th>
<th>Daily Depth Of Discharge (% of C 120)</th>
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<td>480 V</td>
<td>360</td>
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ReGenSol Ni-Cd batteries - The robust daily cycling solution for solar PV systems

Physical and performance

Terminal Pole Bolt with Protective cover
- Nickel plated bolted connection for easy installation & maintenance. Terminals marked with polarity indicators
- PP protective cover on terminals shall prevents external short-circuits in line with safety standards EN 50272-2 and IEC 60485-2 with IP2 level (not shown in this image)

Removable flame arresting vent
- ReGenSol vents are fitted with Flame Arresting Disks, while they allow release of excess gas from the cell

Terminal Pole
- Nickel plated terminal pole to eliminate risk of corrosion

Plate Group Bus
- Connects the plate tabs with the terminal post. Plate tabs and terminal posts are bolted to the plate group bus.

Electrodes
- Proven SAFT Nickel-Cadmium Pocket plate electrodes with horizontal pockets of double-perforated steel strips.

Separators
- These separate the electrodes and insulate the electrode frames from each other. This special type of separator improves the internal recombination.

Containers
- Made of tough polypropylene. Lids are thermally welded to eliminate leakage
- Block concept: up to 6 cells

Plate Frames
- Seals the plate pockets and serves as a current collector. Sides of these plate frames are insulated to reduce the risk of short-circuit.
## ReGenSol - Physical Properties

<table>
<thead>
<tr>
<th>Cell type</th>
<th>Nominal Cell Volt (V)</th>
<th>Rated C20 Capacity to 1.0V (Ah)</th>
<th>#Nominal C120 Capacity to 1.0V (Ah)</th>
<th>Cell overall dimensions L (mm) W (mm) H (mm)</th>
<th>Terminal Bolt Type</th>
<th>Connection Bolt per Pole</th>
<th>Approx. Filled Cell Weight (Kg)</th>
<th>Approx. Electrolyte volume (Liters)</th>
<th>Charging current 0.1C120 (A)</th>
<th>Cell Internal Resistance* (mOhm)</th>
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# Nominal C120 capacity in accordance to IEC 61427-1

* Rigid connector included
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