



Nickel-cadmium batteries



Benefits in brief

Nickel-cadmium batteries offer key benefits that make them ideal for demanding applications:

- Very long life
- Resistant to mechanical and electrical abuse
- Resistant to temperature swings and extremes
- Gradual loss of capacity rather than sudden death
- Limited maintenance requirements
- Attractive Total Cost of Ownership



Key applications

Nickel-cadmium batteries placed on the EU market today are almost exclusively used in industrial applications. Main areas of use are:

Public transportation

Nickel-cadmium batteries provide critical back-up power functionalities to ensure public transportation systems operate safely in case of main power failure:

Aviation: Due to their unique benefits, industrial nickel-cadmium batteries are the preferred battery technology for both civilian aircraft (Airbus, Boeing, Embraer and others) and military aircraft. They provide back-up power for avionic and other critical on-board systems should the principal power source fail, and also start aircraft engines on the ground.

Rail: Industrial nickel-cadmium batteries are widely used as back-up power in railways and underground metro systems. They ensure that emergency braking, coach lighting, heating & air conditioning, and driver-to-passenger communication remain fully functional should the main power source fail. They also provide locomotive starting and trackside back-up power for signalling and warning lights in harsh climate areas.



Mission-critical industrial assets

Nickel-cadmium batteries are an important tool in a company's industrial strategy through their ability to supply back-up power to mission-critical industrial assets. These include nuclear power plants, steel mills, sea-based oil exploration and extraction platforms, refineries, emergency lighting and alarm systems in hospitals, as well as navigation assets such as lighthouses and buoys.



Nickel-cadmium batteries in the circular economy

Manufacturers of industrial nickel-cadmium batteries have developed an extensive network of Bring Back Points (BBPs) in the countries which they serve. These facilities provide a free of charge, easy to use, environmentally compliant end-of-life service for end users of industrial nickel-cadmium batteries that have reached the end of their life.

BBPs are tasked by manufacturers to receive, consolidate and ship used nickel-cadmium batteries to fully permitted recyclers which specialize in the treatment of cadmium-containing waste. All transport is carried out in compliance with applicable Dangerous Goods regulations and with Basel Convention requirements which regulate transborder shipment of hazardous waste.

The recyclers heat up the cadmium-containing fraction of the used batteries to over 800 °C, which is the temperature at which cadmium vaporizes. The cadmium is then cooled and condensed into high-purity ingots. Most of the recycled cadmium is then used to manufacture new batteries.

Besides cadmium, other metals present in these batteries, such as iron, copper and nickel, are extracted and resold to be further reused by industry.





Unmatched excellence

No other technology matches the industrial nickel-cadmium chemistry in its areas of excellence.



When it comes to use life, reliability, sturdiness and operational temperature range, its performance exceeds that of the standard industrial battery technology.

New technologies such as Li-ion batteries which display a superior cycling ability and a higher energy density have made new applications possible. The most significant ones are electrical mobility and grid-connected energy storage systems.



However, the Li-ion battery technology does not display the intrinsic properties of nickel-cadmium batteries. Furthermore, they require an embedded electronic management system to continuously ensure the proper surveillance of their functioning. The presence of such a system reduces the reliability of this technology.

Benefits in depth

Very long life

A nickel-cadmium battery lasts three to five times longer than an equivalent standard technology battery.



Resistant to mechanical and electrical abuse

These batteries have the mechanical strength to withstand harsh operating conditions associated with vibrations and shocks. They survive electrical abuse which would destroy a conventional battery, such as overcharging, deep discharging, and high ripple currents.

Resistant to temperature swings and extremes

Nickel-cadmium batteries have the ability to operate with limited performance loss in both low and high temperature environments, as well as in settings with large temperature swings.



Limited maintenance requirements

The nickel-cadmium battery is one of the most reliable battery systems available today. It has thus become an obvious first choice for users looking for a reliable, long life, low maintenance system. It can be left in remote locations without the need for any maintenance.

Gradual rather than sudden loss of capacity

A critical issue with standard (industrial) technology batteries is the “sudden death syndrome”, which can lead to catastrophic consequences, particularly in mission-critical applications. Nickel-cadmium batteries, on the other hand, age and lose their capacity gradually. This enables preventive maintenance; a nickel-cadmium battery can be replaced before it no longer meets the requirements of the application.



Attractive Total Cost of Ownership

While the initial cost of a nickel-cadmium battery can be three to five times higher than an equivalent standard industrial battery, its Total Cost of Ownership is significantly lower. This is explained by the combination of longer life, reduced maintenance, and low failure rates.



More information

To discover more about cadmium and its use, check out the website of the [International Cadmium Association](#).

Address your specific questions to contact@cadmium.org.

