



**Industrial Batteries (UK) Limited**

*Main distributor of Alcad Ni-Cd Batteries in the UK and suppliers of Battery Support Services*

## **Application Note No.4**

**Industrial Batteries (UK) Limited**

**Greenlands Business Centre**

**Studley Road**

**Redditch, Worcestershire, B98 7HD**

**Tel: 01527 520052 Fax: 01527 520053**

**E-mail: sales@ibluk.co.uk**

**Web: www.ibluk.co.uk**

# Switchgear and Switching

Switchgear systems are in applications where isolation and protection are required and may include generators, motors, transformers, and substations.

In substations the switchgear can be found on both the high and low voltage side of large power transformers. It is located on the low voltage side of the transformers in distribution type substations. These are typically smaller, medium-voltage (~15kV) circuit breakers feeding the distribution system. Inside these substations are communication equipment and associated components allowing for intelligent control of the substation. This is important in S/S (Gas or Electric) SCADA systems.

Switchgear for low voltages are often enclosed within one building and these can often be in remote applications (e.g. railways) and may be susceptible to extremes of temperature. For transmission levels of high voltages over 66 kV, switchgear will be mounted outdoors and insulated by air, though this requires a large amount of space. Gas-insulated switchgear used for transmission-level voltages saves space, although it has a higher equipment cost.



Battery rooms are found in electric power plants and substations where reliable power is required for operation of switchgear, critical standby systems, and possibly black start of the station. Often batteries for large switchgear line-ups are 125 V or 250 V nominal systems, and feature redundant battery chargers and batteries with independent power sources (dual systems) to ensure security of the supply. For stations that are capable of black start, power from the battery system may be required for many purposes including switchgear operations.

Factors driving the requirement for switchgear applications are:

- Meeting the required standards
- Risk management
- Importance of user safety
- Importance of life cycle cost evaluations

In order to provide the desired protection, the application requirements and the capability of the battery must be correctly matched. The basic requirements of the application can involve a mixed load duty cycle, which, in effect, are low level continuous loads coupled with short peak loads for switching operations. It is essential that the battery type must be optimised for the required loads.

Valve regulated lead acid batteries have a useful lifetime of up to five years and, in determining when to replace batteries, it is important to remember that VRLA batteries can be completely exhausted after five years, lose their ability to hold a charge gradually up to that time and are subject to unpredictable sudden failure. Switchgear systems have replaceable batteries, but require a qualified technician or electrician to replace them, and so battery replacement is costly. Temperature is relevant as there is a large reduction in lifetime for lead acid batteries at temperatures exceeding 25 °C. This is not so significant with nickel cadmium batteries where the affect is electrochemically less important and is predictable.

The requirements for a reliable switchgear application can be summarised as follow:

- The highest level reliability is required as continuous energy transmission and distribution are vital and the battery protects expensive transformers.
- Long life is required as the typical substation life is over 25 years and this should apply to all components.
- The low maintenance requirement is of primary importance as the sub-station may be difficult to access and life cycle cost is a major parameter.
- Good operation in uncontrolled environments has to be considered as, in particular, smaller distribution substations can have extremes in temperature.

Traditionally, the lead acid Plante cell was used in this application. This has the best lifetime and reliability of all lead acid batteries but does suffer from a high level of maintenance and user intervention.

So, for this type of application, the ideal solution is the reliability of the Plante cell but with the maintenance requirement of the lead acid VRLA cell. This may seem contradictory but can be achieved by a low maintenance nickel-cadmium cell.

### **Nickel-Cadmium offers the following advantages to ensure complete system reliability and security.**

- ✓ Ni-Cd offers complete reliability with lifetimes in excess of 20 years
- ✓ Ni-Cd has a high lifetime independent of performance.
- ✓ Ni-Cd has a simple and infrequent maintenance requirement.
- ✓ Ni-Cd lifetimes at elevated temperature are degraded far less than lead acid and it has a superior low temperature performance.
- ✓ Ni-Cd has no frequent battery replacements due to long lifetime and reliability
- ✓ Ni-Cd performance can be optimised for the duty cycle.
- ✓ Ni-Cd cycling ability is well within the requirements of the application.
- ✓ Ni-Cd high reliability and low operating costs make it a truly cost effective solution.



### **Our Battery Ranges for UPS systems.**

IBLUK supply premium quality industrial nickel-cadmium batteries from the leading manufacturers Alcad and Saft. Our range of low maintenance Alcad batteries for switch tripping applications include:



- The Vantage ultra low maintenance range which uses the advantages of proven Ni-Cd flooded electrolyte technology in a range of pocket plate recombination products from 8 Ah to 850 Ah and is suitable for applications where the low level continuous load predominates.
- The XHP range uses sintered positive and plastic bonded negative plates. This high performance low maintenance product has an excellent temperature capability, a small footprint, is available in a capacity range from 11 to 320 Ah and is suitable where the high rate switching load predominates.

### **IBLUK Support**

Industrial Batteries (UK) Limited has been serving the industrial battery market in the United Kingdom since 1997 and specialises in nickel-cadmium industrial battery supply and support.

We will size the optimum battery for your application from our extensive ranges, provide battery layouts, supply battery stands where required and help you to choose the most cost effective solution.

We also provide battery training, maintenance equipment, accessories and support services. Please do not hesitate to contact us.

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