# NiCad Vs VRLA Batteries

*Technical comparison*

NiCad batteries are more often found in data and phone centers because their life expectancy is longer than Lead Acid and little maintenance is required. While NiCad costs 2 to 4 times that of Lead Acid it can be recharged 3 to 5 times more often and requires less maintenance with lower life cycle costs.

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| Characteristics | Nickel Cadmium Batteries | VR Lead Acid Batteries |
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| **Discharge properties at 25°C available capacity in percentage to final voltages** | At 5 hours, rate of discharge capacity is > 105% | At 10 hrs. rate of discharge between 90-95% |
| **Voltage Recovery** | Quick and very fast | Sluggish and slow |
| **Charges at high and low temperatures** | Recommended maximum temperature for continuous operation is 45°C | Recommended continuous operational temperature is 25°C -27°C |
| **At high temperatures** | The capacity is unaffected at high temperature. However, for °Ccasional operation at about 60°C lowers the capacity temporarily by 5-10% | For every 9°C rise in temperature, the capacity of the batteries (as per argentous equation) reduces by 50% |
| **Storage** | Long-time storage at 60°C (up to 1year) will not affect the battery capacity or cause any corrosion | Storage at 60°C will rapidly ruin the battery permanently. |
| **At low temperature** | Can be used up to -20°C with standard Electrolyte. Freezing does not harm the battery. | Discharged batteries may freeze at - 10°C and ruin the battery for once and for all. |
| **Life Expectancy** | 15-25 years (maximum d°Cumented life is 58 years) | Life is 20 years subject to the operation of the battery at 27°C on float duty. However, as per IEC 896-2 Euro-Batthigh integrity VRLA Battery is supposed to give an operating life of 10 plus years at 27°C. |
| **Life Cycles** | 2000-2500 Cycles | 800-1000 Cycles |
| **Charging Properties** | Can be charged by any standard methods and will not be affected by high charging rates. | Great care must be taken during charging to avoid excessive formation of sludge from the positive plate and densification of the negative plate which leads to capacity decrease hence shorter life. |
| **Over Charging** | Not affected | Over-charging even at low charge currents is detrimental and decreases the capacity |
| **Partial Charging** | Is not affected | Partial charging results in sulphation of Plates, which leads to, buckled or burst Plates. |
| **Charging at high** | Not affected | High temperature during charging increases the risk of short circuit. |
| **Reliability** | Performance is consistent after storage, over charging and even reversal of charge | Even after an ideal charge sulphation may have taken place and batteries performance is totally affected. |
| **Reversal of charge** | Not affected. | Reversal will ruin the battery. |
| **Resistance to fire / explosion** | Batteries are provided with flame arresting | Vents are pressure sensitive hence less resistant to |

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| | vents which prevents possible explosion | bursting / explosion. |
| **Resistance to abuse** | Mechanically very rugged due to the carefully welded and bolted design of the Cells. | Mechanically strong. However, lead components are weak than steel. |
| **Electrical abuse** | Excellent resistance to electrical abuse. Can be over-charged, deep discharged, reversed and short circuited without permanent damage | Sensitive to overcharging deep discharging. Reversal and short circuit will permanently damage the battery |
| **Maintenance requirements** | Quarterly topping up with water required for Pocket Plate design. However, for VRPP no maintenance is required. | Cell monitoring and cleaning of ICCs is required. However, with time antimony migrates to inactive plates resulting in decrease of Hydrogen which leads to higher gas evolution hence risk of dry outs is more. |
| **Equalizing requirements** | Not affected | Required. Equalizing connectors are required for proper charging. |
| **Storage** | Can be stored for long time in any state of charge, filled or emptied without permanent loss of capacities. Discharged and emptied Cells have been tested after 12 years and have given full capacity after filling and charging | Batteries can be stored up to average 3 months but have to be given freshening charge before re-use. The self-discharge (5-10 % per month) increases, as the battery grows older. Long-time storage results in damaged batteries due to sulphation. |
| **Stratification** | Not observed | Due to in-homogeneous discharge in the Plate group sulphation occurs leading to capacity loss and rapid death of the battery. |
| **Corrosion of the terminals** | Terminals are Nickel Plated hence do not get easily corroded | Corrosion or melting of post due to high rate of discharge is a common phenomenon. |
| **Specific Gravity of Electrolyte** | It is consistent and independent of Cell reaction | If out of range of 1.2 to 1.3, it can cause loss of capacity of discharge and hence reduced battery life. |
| **Thermal Runaway** | Not observed | As per IEEE as well as IEC 896-2 and BS standards, these batteries can experience thermal runaway quite often. |
| **Acceptance of ripple content in the charging current** | Quite tolerant to acceptance of AC ripple | Are not tolerant to accept AC ripple. Excessive ripple can cause increase in battery temperature hence shorten life and accelerate degradation of Plates. |
| **Internal resistance** | Lowest | Lower |
| **Operating voltage band** | 35% of the nominal voltage | 25% of the nominal voltage |
| **Space requirement** | Moderate | Low |
| **Ageing** | Capacity remains almost constant during service life. | Degrades gradually during service life. |