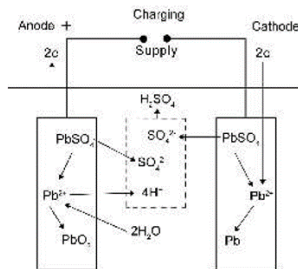


## BATTERY AGING

### General description

Battery aging result is capacity drop. What is behind that?



#### Charging

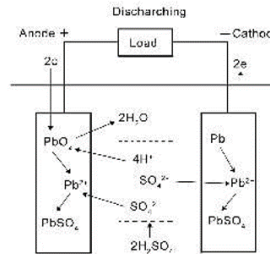
Lead oxide is formed at the anode, pure lead is at the cathode and sulfuric acid is liberated into electrolyte.

#### Why aging happens?

- Deep discharge
- Poor charging
- Storing / keeping long time in low charge (self discharge)
- Ripple current
- High temperature
- Overcharging
- Uneven capacity

**In case lead acid battery is discharged to too low SoC or left standing in discharge state for prolonged periods, hardened lead sulphate cotes the electrodes and cannot be removed during charging. Sulfation will reduce the efficiency and life of the batteries.**

**In case overcharging there is high risk that electrolyte to escape as gases out from battery (and positive side grid corrosion)**



#### Discharging

Lead sulphate is formed at both electrodes and sulfuric acid is removed from the electrolyte.

#### What is the phenomena?

- Sulfation
- Acid stratification
- Positive side grid corrosion
- Excess gasification (drying)
- Water loss



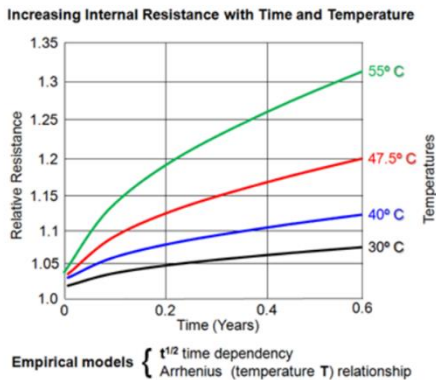
#### How to avoid aging problems typically?

String voltage measurement, battery room temperature measurement, periodical discharging tests, periodical preset battery replacement

## Enedo Product Offering for Battery Charging

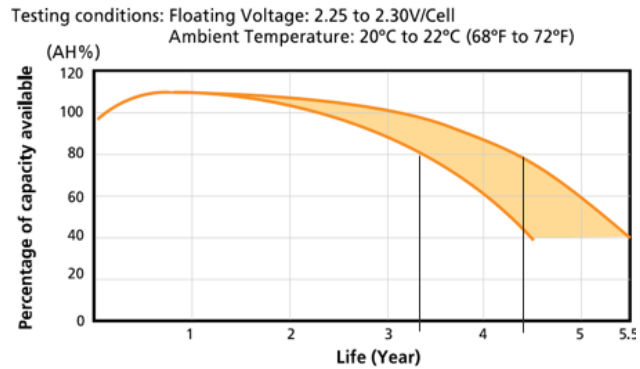
### Base battery info

#### Internal resistance



Sulfidation & Corrosion  
Electrolyte resistance  
Separator efficiency

#### Life time

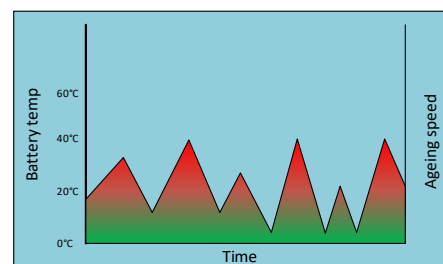
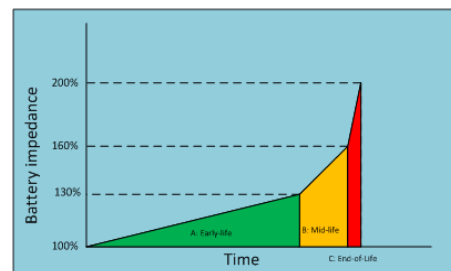


Battery Shelf Life like calendar life is the time an inactive battery can be stored before it becomes unusable, usually considered as having only 80% of its initial capacity

Enedo solution is a Smart Battery Charger Platform developed for small capacity stationary SLA back-up batteries capable of:

- Continuous battery AC impedance monitoring and trending
- Continuous battery temperature monitoring and trending
- Continuous charge/ discharge current monitoring
- Deep discharge prevention
- Battery over temperature prevention
- Precision charging control for optimum battery lifetime expectancy
- Communication interface and status indicators to Host system
- Built-in battery data logging
- Firmware upgradable on field

Based on these capabilities and the proprietary algorithm a reliable end-of-life estimation can be derived for the batteries



### ADC8580 series battery charger and DC UPS

- Output power: 80W from AC supply, 250W combined from battery and mains
- Input voltage: 230VAC
- Output voltage: 24VDC
- Lead acid battery condition monitoring capability with pre-set warning threshold
- Modbus RTU on isolated RS-485
- Convection cooled

