

BATTERY CYCLIC PERFORMANCE CALCULATION AND ESTIMATION

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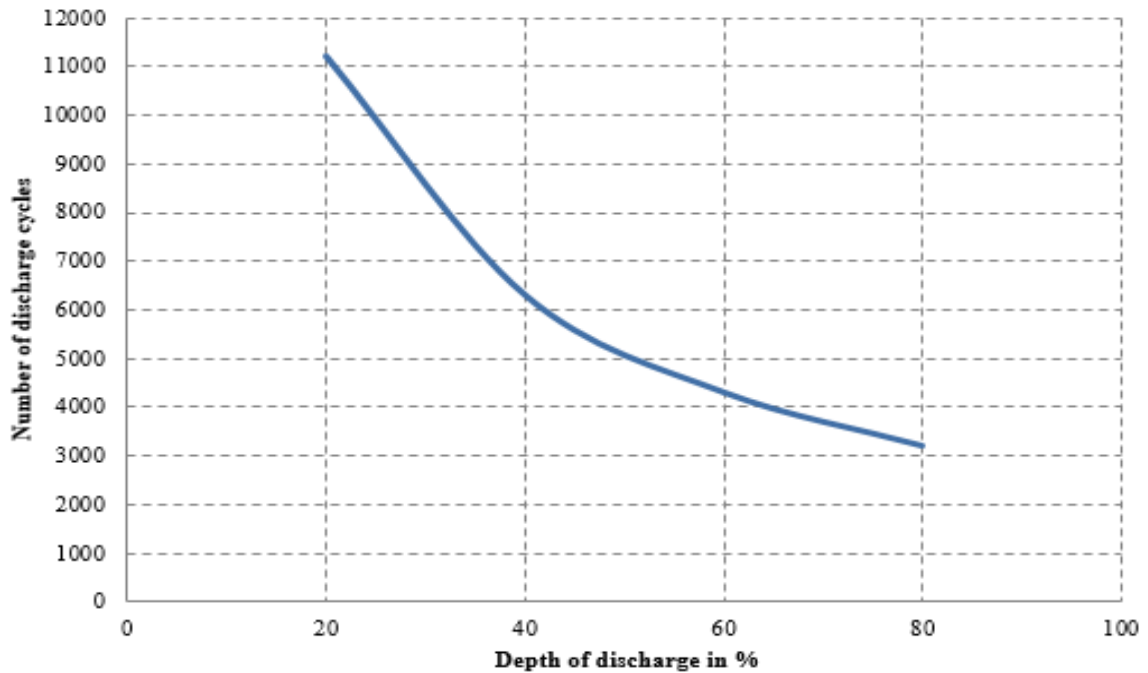
Note:

Lead carbon technology is a way to increase battery fast charge performance and PSOC performance. Nano carbon applied in negative can significantly increase reaction superficial area and conductance, nano carbon like fibers uniformly mixed into negative active material, which could be reaction points and better conductance, and this change makes battery be avoided negative lead sulphation issue to increase PSOC cyclic performance.

Lead carbon technology can be applied to existing deep cycle battery types.

1. Ideal Cyclic Performance

1.1 REXC(2V) Series Cyclic Test Result



Graph 1, Cycle life vs. DOD of REXC(2V) Series with Ideal Charge Model

Table 1, data of cycle number

	Depth of Discharge/DOD			
	20%	40%	60%	80%
Cycle life	11200	6300	4300	3200

1.2 Discharge & Charge Scenario (100%DOD)

**1) Cycle method:** Discharge with  $2I_{10}$  for 4 hours (100% DOD), charge with  $2I_{10}$  for 4.5hour, charge voltage 2.30V/cell, charge and discharge ratio is 103%. This is one cycle.

**2) Residue Capacity determination:** The batteries are discharged at 10 hour rate after every 50 cycles to test battery capacity. When residue capacity of 10 hour rate capacity is lower than 80%, test is ended.



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After discharge at 10 hour rate after every 50cycles, the charge method is: charge 80% of discharged capacity with current of  $2I_{10}$  + charge 20% with current of  $I_{10}$  + charge 20% with current of  $0.4I_{10}$  (i.e. charge 120% of discharged capacity)

**3) Temperature:** 25°C.

### 1.3 Advantage of Upper Constant Current Charge Model

Battery can be completely recharged within 8 hours.

The end charge voltage will be higher than 2.6Vpc, which is good for active material exchange.

### 1.4 Disadvantage of Upper Constant Current Charge Model

It has risk of battery malfunction without voltage limited.

It isn't easy to manage charging in practice.

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