



# Renew Cell

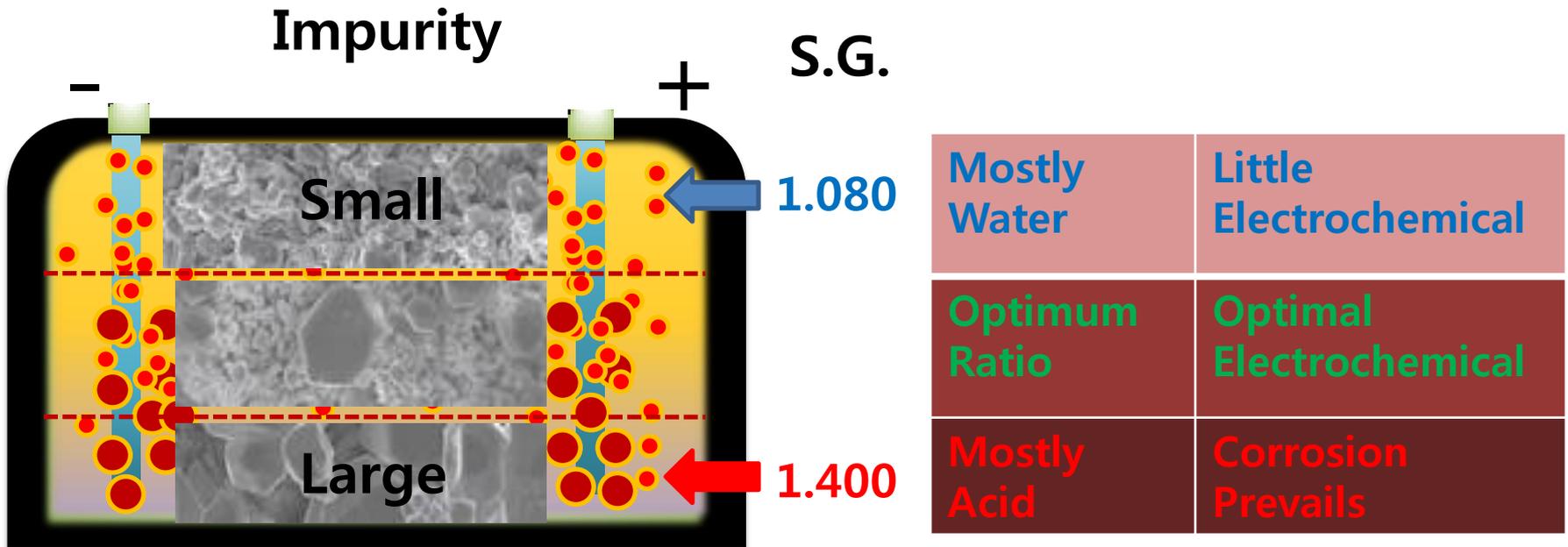


# Why premature death at battery?

## - Flooded Type : Maintenance

Stratification occurs when more dense electrolyte sinks to the bottom of the battery can harm the battery's plates.

As more impurities are at the bottom area, it can make short.

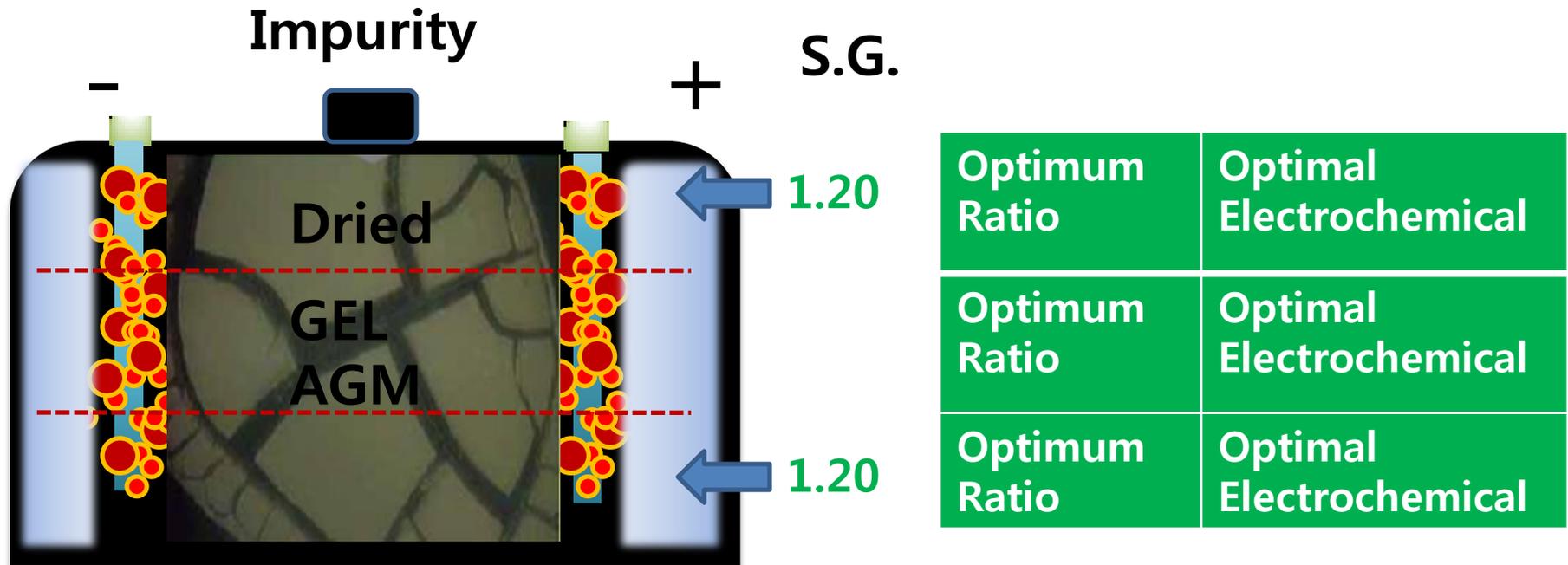


**DYNAMIC SULFATION** is a process when batteries are cycled; a small amount of lead sulphate deposition takes place on battery plates irrespective of full cycling. This is because of internal corrosion invariably associated with each cycle.

**Need Equalizing from bottom to top!!**

## - VRLA(SLA) Type : Maintenance Free

Stratification not occurs because density of electrolyte is **equal** from top to bottom of battery but dried continuously and impurities on plates can be much stronger and harder.



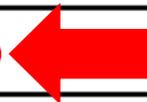
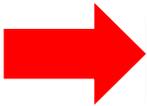
**STATIC SULPHATION** is a process when batteries are in idle condition and not cycled or stored for long time. Lead Sulphate ions in contact with plate's active materials react at room temperature to form lead sulphate and crystallize on plate zone.

**Maintenance Free -> Dry-out -> Need Water!!**

# Primary Failure Modes

Dry-out is often a secondary result of other failure models.

	Flooded	VRLA
Grid corrosion	86%	59%
Cell short	10%	< 1%
Leakage	1%	2%
Block Interconnect open	3%	3%
Cell Interconnect open	<1%	1%
Dry Out*	<1%	33%
Interconnect overheat	<1%	<1%
Thermal runaway	<1%	1%
Cell reversal	<1%	1%
Failure Mode (Primary)	Shorted	Open



Renew Cell can restore "Short and Open" status by operating EC-D mode.

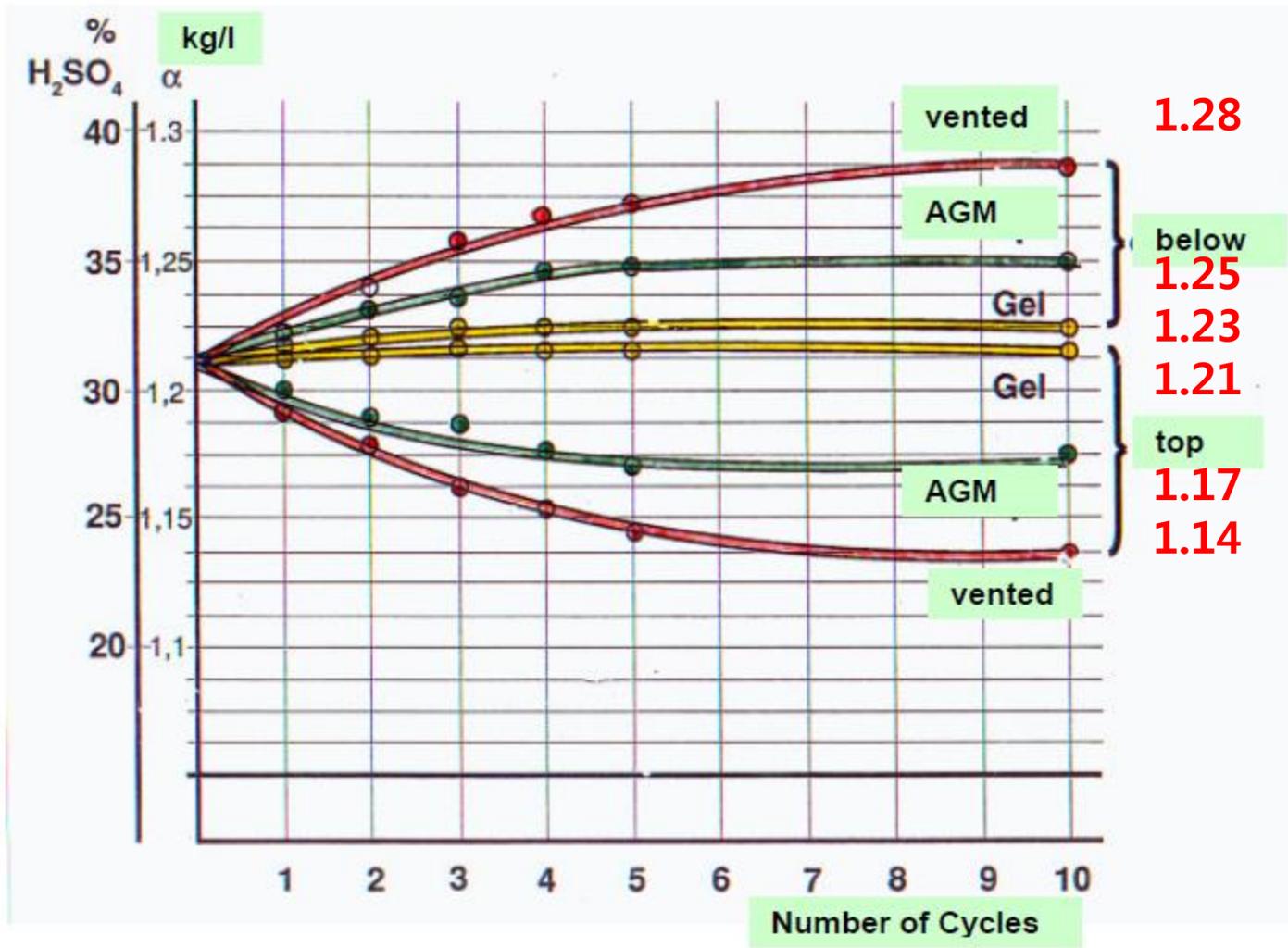


Fig. 10: Acid stratification in lead-acid battery systems

# Unique pulse at Renew Cell

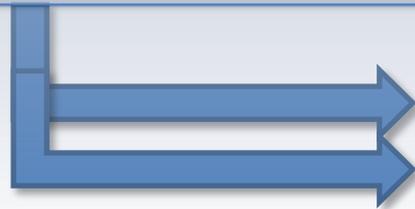
up to  
**10,000 pulses**  
per second

+ - Null

Positive +

- Negative

Positive area?

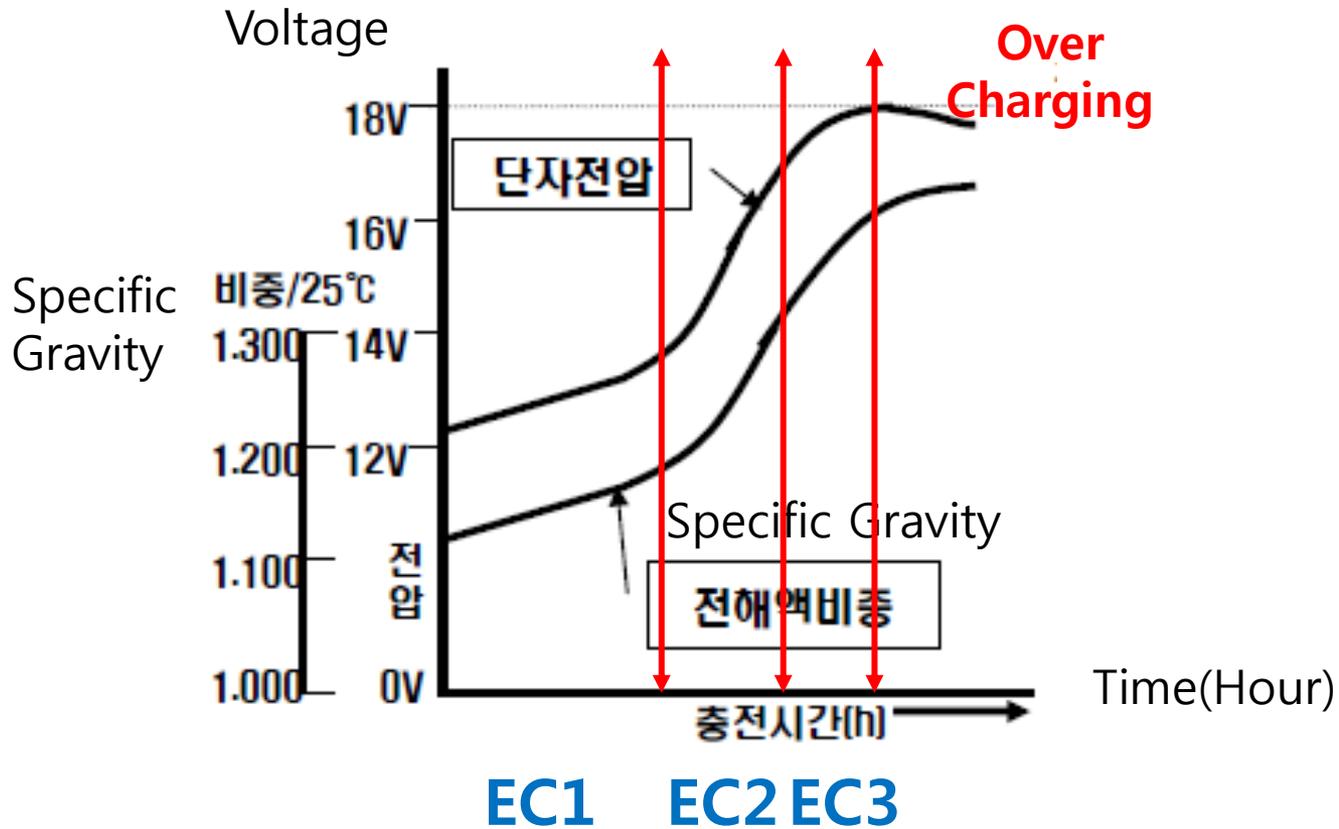


(A) Shock Pulse?  
(B) charging current?

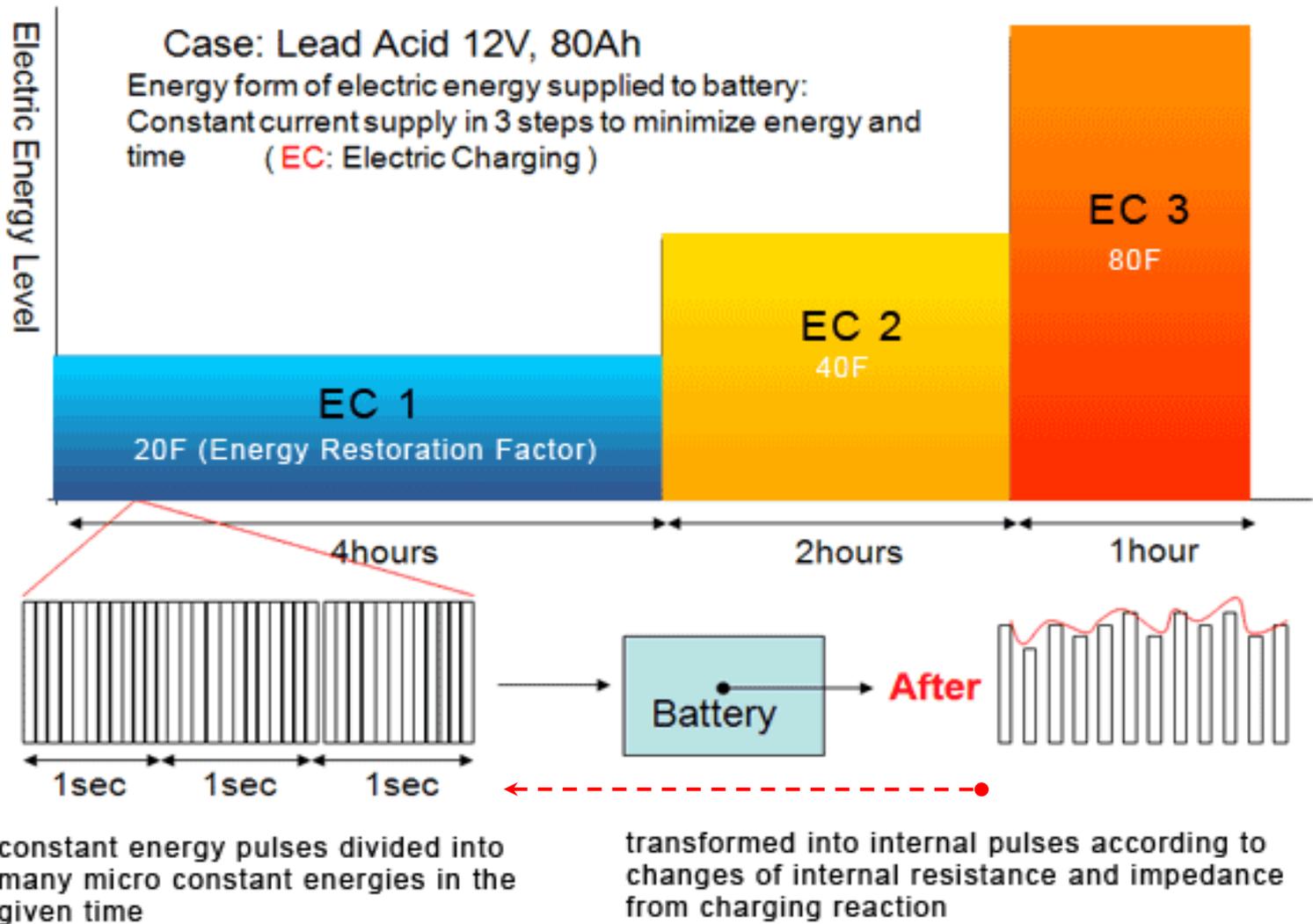


Negative area  
: (C) discharge

# Charging Curve according to Chemical Reaction



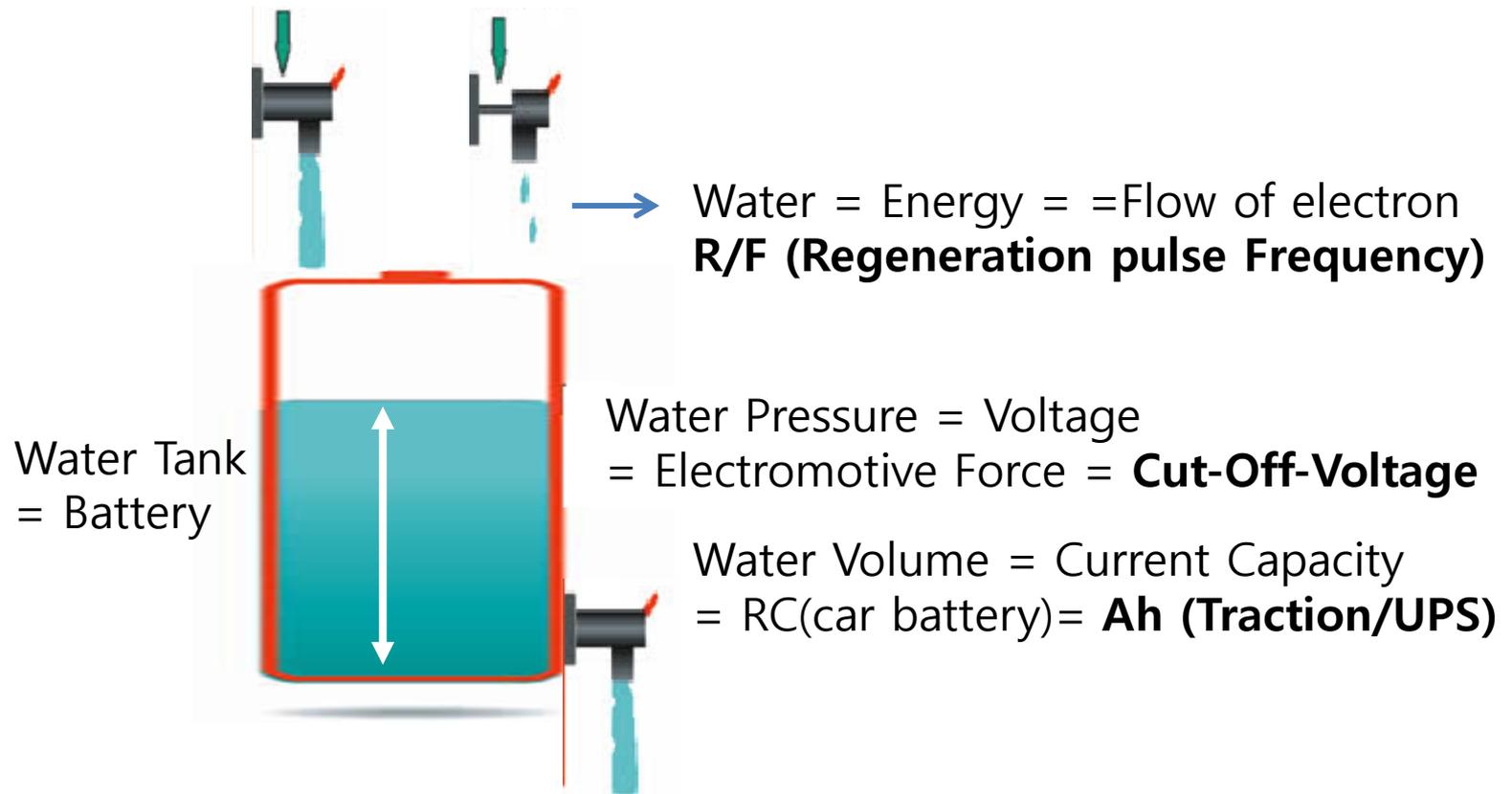
Renew Cell restore aged battery in 3 steps.



**Up to 10,000 pulses per second using FET!**

# “R/F” and “Voltage” at Renew Cell?

Charging : Electric Energy -> Chemical Energy



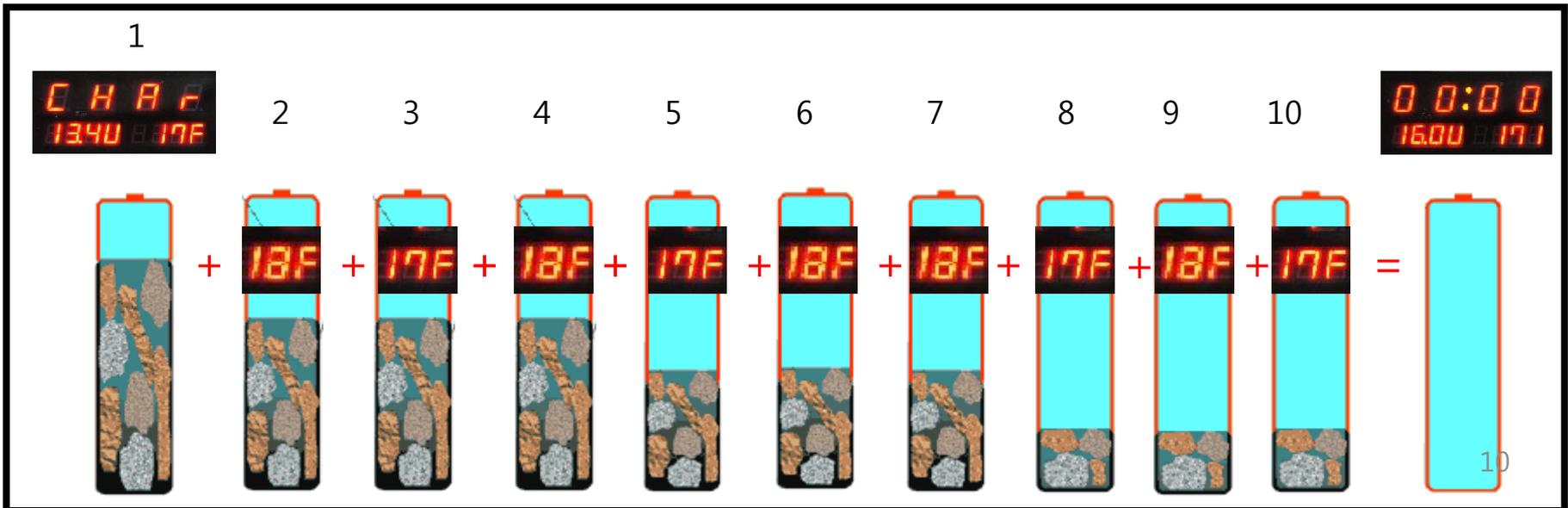
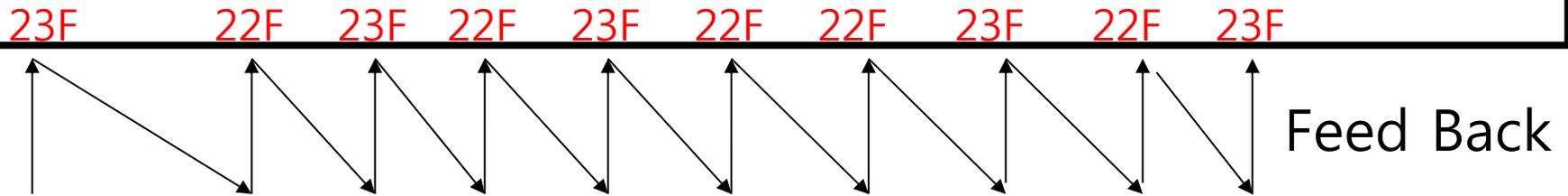
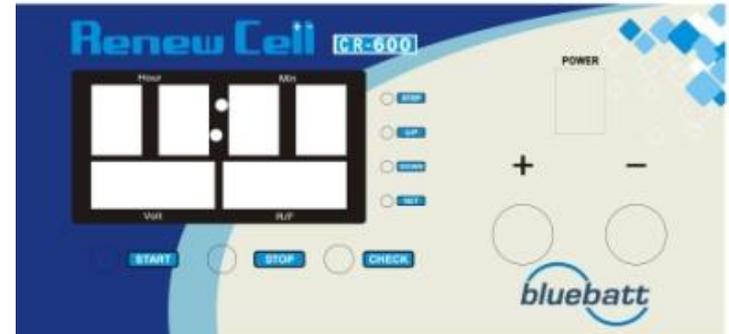
Discharging : Chemical Energy -> Electrical Energy

Time : 1 Hour

Cut-Off Volt : 17.4 Volt

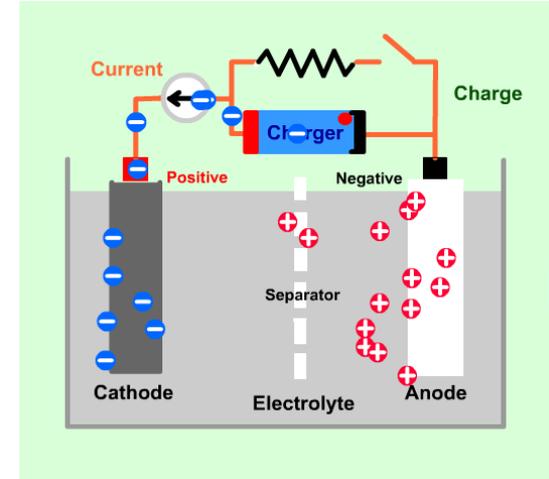
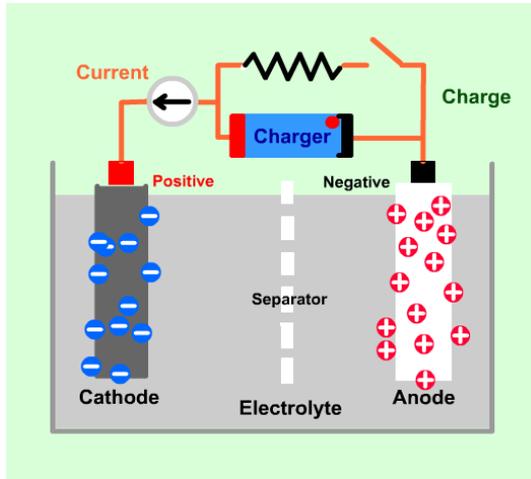
R/F : 20 F

\* Renew cell will supply constant 20F of micro pulse energy during 1 hour up to 17.4 Volt if we set the above restoration condition.



# Battery Internal Status from EC1 to EC3

Before  
Restoration  
(Charging)

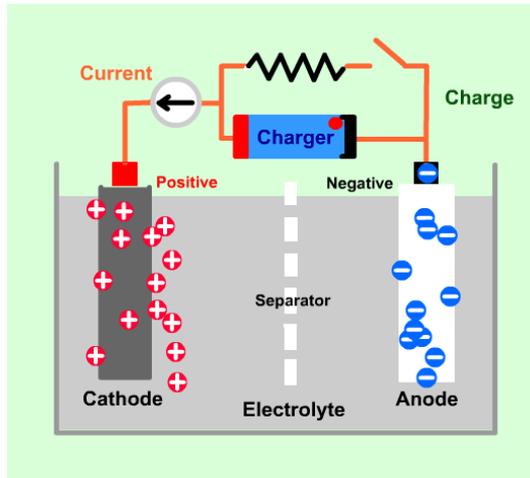


**EC1**

some of electrons start to be activated.

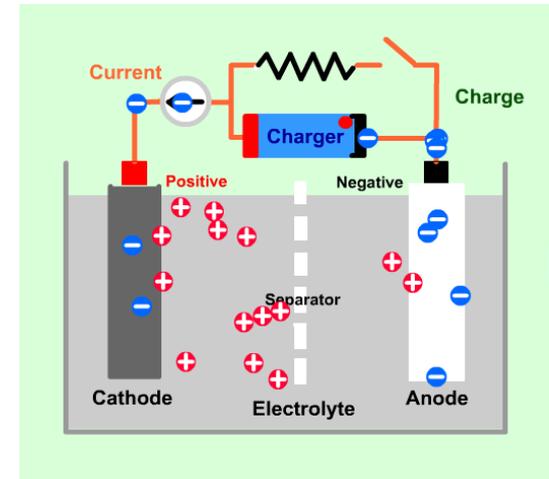


After  
Restoration  
(Charging)



**EC3**

All electrons are activated.

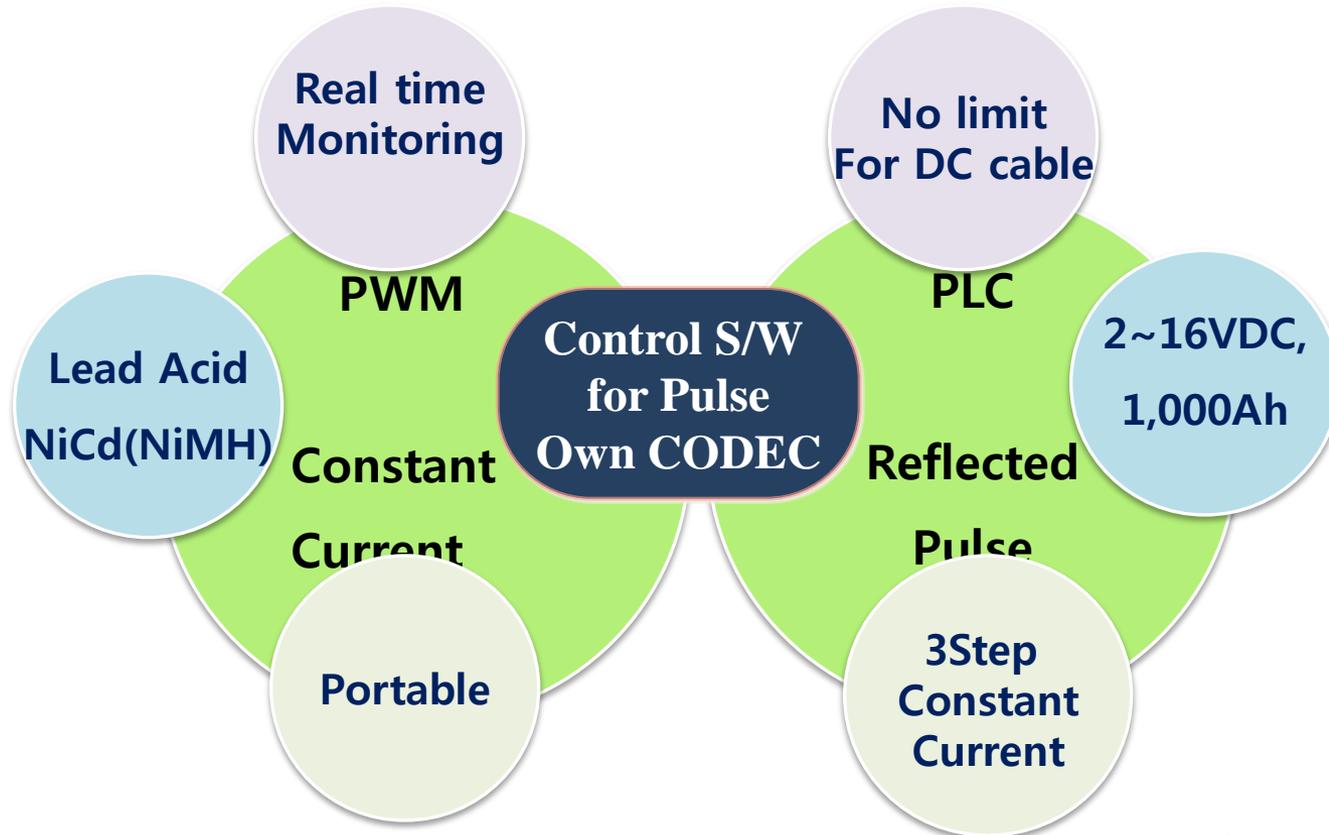


**EC2**

Most of electrons are activated.

# Renew Cell

## World Best Battery Restoration System



PWM : Pulse Width Method  
PLC : power Line Communication  
CODEC : Coding and Decoding

## What Renew Cell system is totally different from others?

Can equalize and balance each cell from mono block battery to battery bank.

Can restore **0 volt, short, open,** or **surface charging** status by EC-D mode

Can charge and optimize battery much faster than others

Can know health and energy status of battery at real time

Can show error status promptly; open, short, help

Can operate **multi units in series** depends on cell or battery quantity

Can greatly save electric power cost for charging and regenerating

Can works in 1 to 3 steps, each of which is programmable

Can do boosting for faster charging by linking additional unit

Can restore **1 to 8 cells** depends on cell status

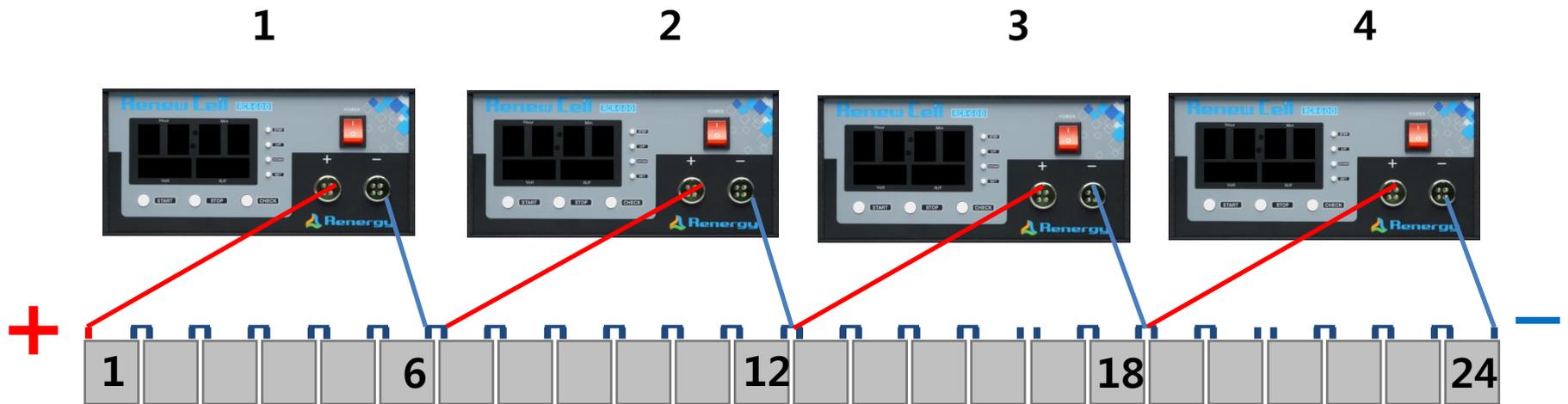
## Technical Specification

- ❑ **Size:** 14.5cm(H) x 30cm(W) x 30cm(L)
- ❑ **Use Temperature:** 0° C to 45° C
- ❑ **Stored Temperature:** -20° C to +65° C
- ❑ **Case Material:** Metal and Aluminum
- ❑ **Color :** Black
- ❑ **Charging Method :** 3 Step Constant Current ( Reflected Pulse )
- ❑ **Input Voltage:** 100 ~ 240VAC / 47 ~ 63Hz / Max 3.7A 1-phase
- ❑ **Time :** 0 ~ 99 Hour 99 Minutes, Volt : 0~30Volt, R/F : 0~300F
- ❑ **Output Voltage and Current:** 2.0V ~ 16VDC / Normal 300 Ah ,Max 1,000Ah
- ❑ **Regeneration Time :** 300Ah → within 6 hours, 600Ah → within 10 hours
- ❑ **Weight:** 9 kg
- ❑ **Power Consumption :** 600W (Max 400Ah Battery Base)
- ❑ **Applicable Battery:** Lead Acid (Flood, MF, AGM, Gel, VRLA), NiCd, NiMH

★ Next Generation of Battery Regenerator, Renew Cell

# How to connect Renew Cell to batteries?

Traction & Stationary Battery –24 cells

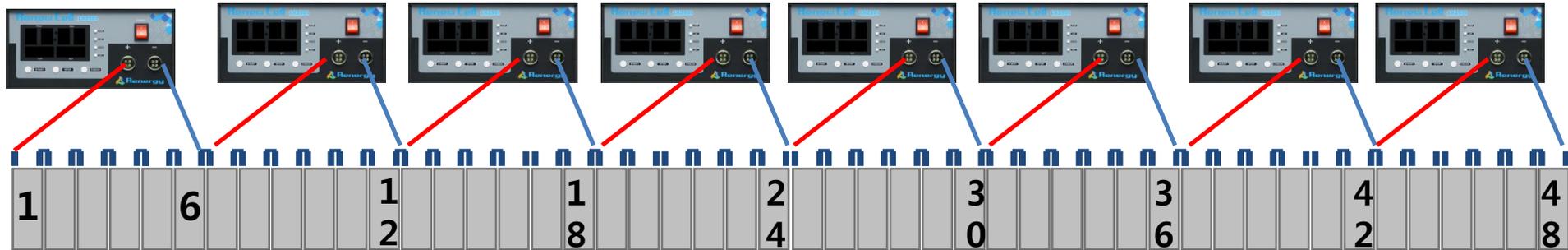


If we have 1 unit, we can operate it 4 times.

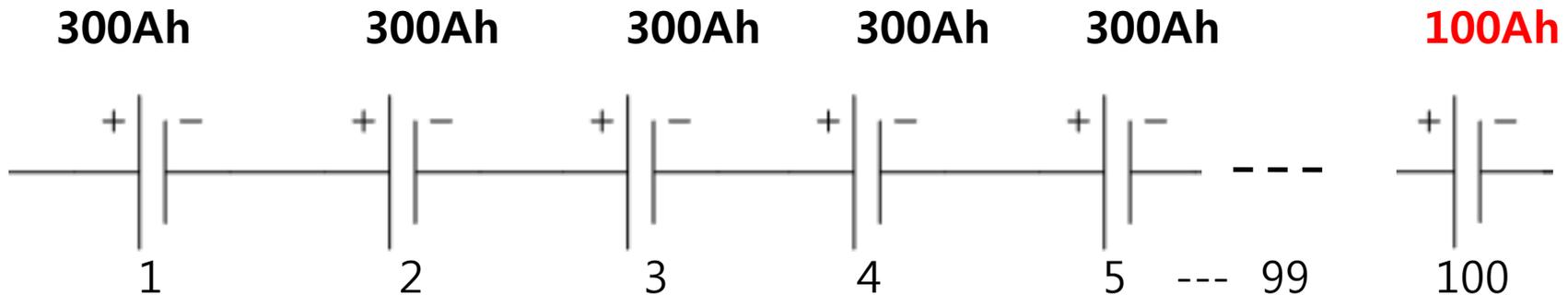
If we have 2 units, we can operate 2 units 2 times.

# Traction & Stationary Battery –48 cells

1 2 3 4 5 6 7 8



# Why Equalizing is the most important at aged battery?



Total Ah from **1 to 99** in series at battery bank? **300Ah**

Total Ah from **1 to 100** in series ?

$$1/\text{Ah total} = 1/300 + 1/100$$

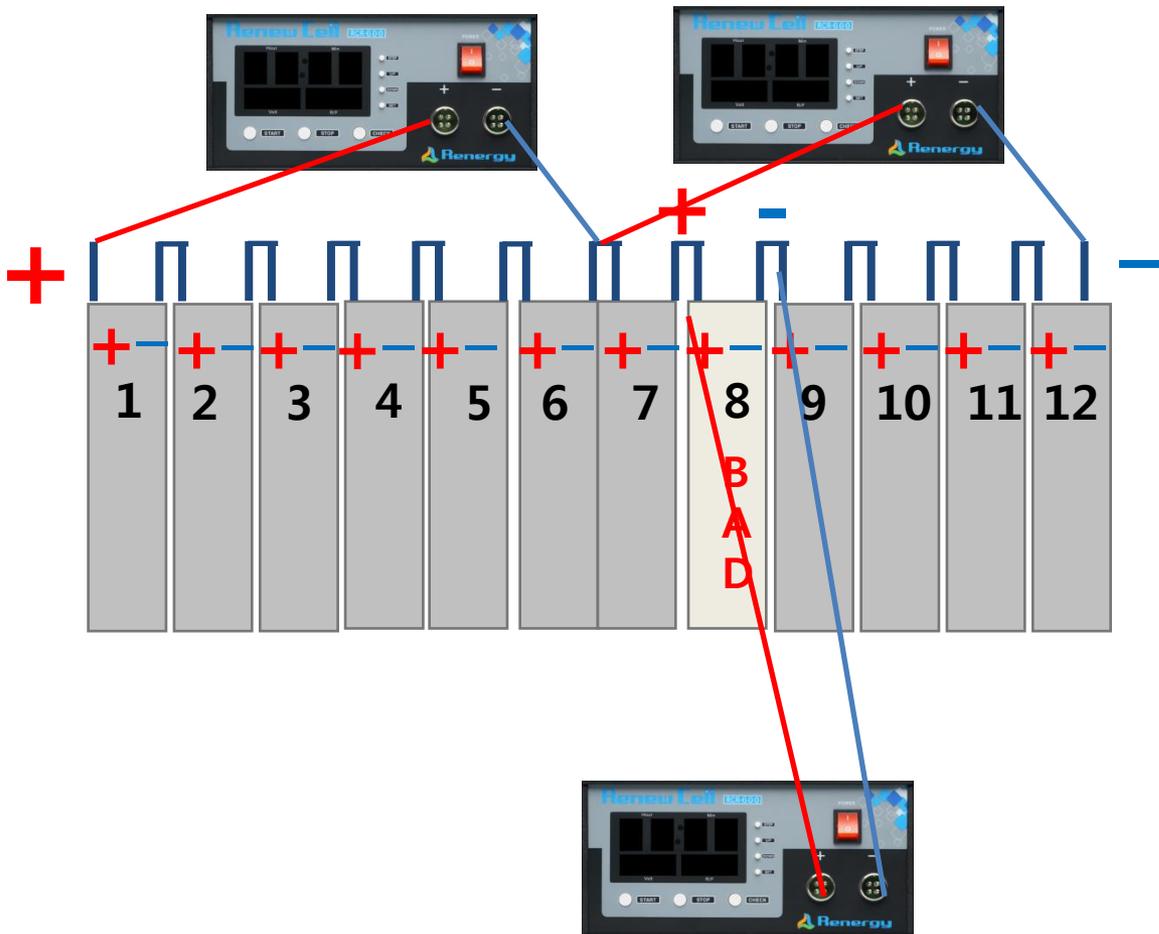
$$\text{Ah total} = 300/4 = 75\text{Ah} < 100\text{Ah}$$

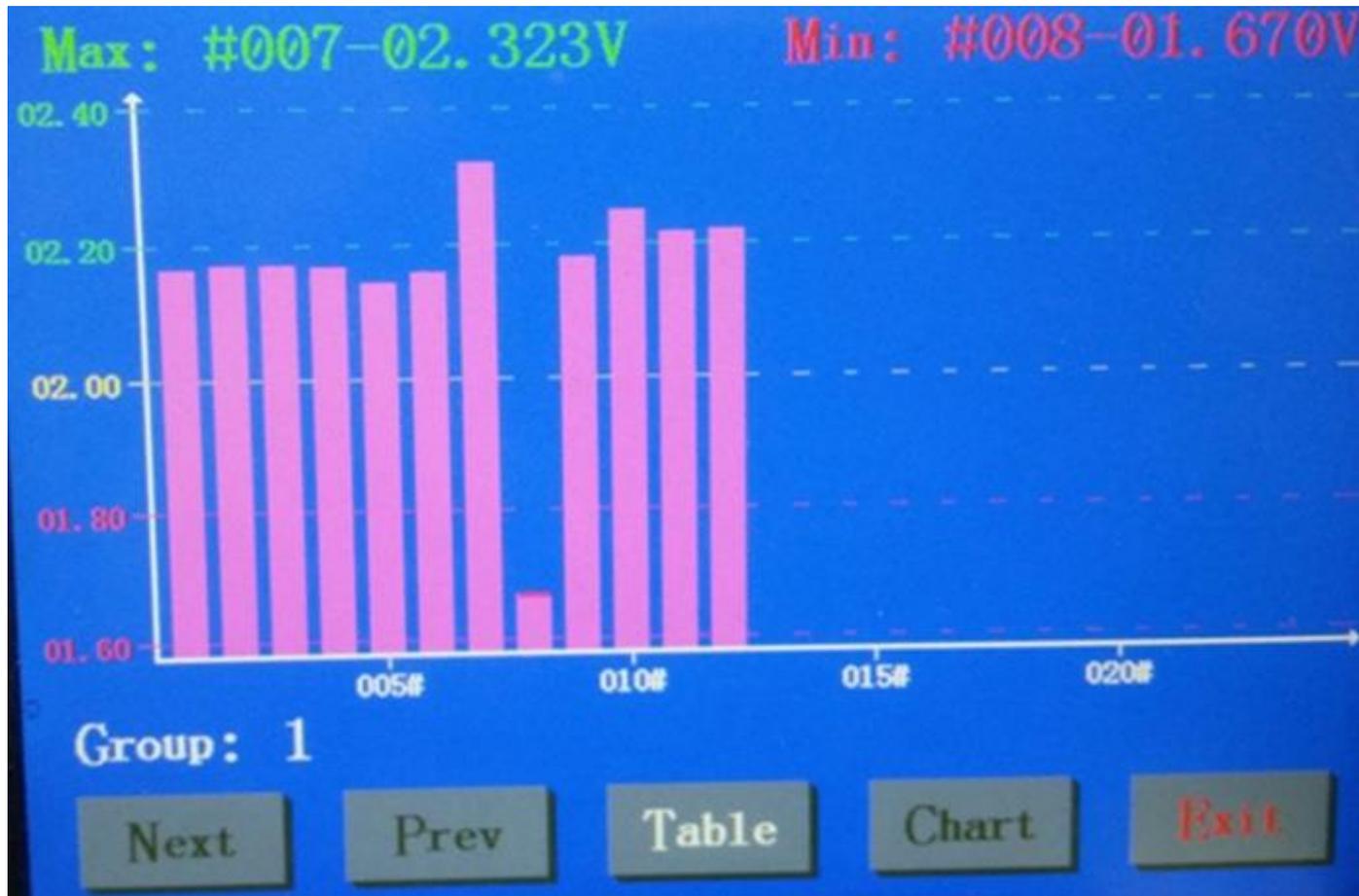
If there is bad cells among cells in series, its total capacity is about **75%** of capacity of bad cell and **25% of 300Ah**.

Therefore battery can only work for **1 hour** only in case of folk lift.

# How to restore (connect system to battery bank?

Battery bank – in case of 12 cells  
- Cell 8 is bad cell among 12 cells





In this case we need to equalize cell 8.

In order to equalize we can do boosting for charging by additional unit.

And we have special mode, **EC-D** mode for worst cell such as SHORT, OPEN, and 0 Volt.

Refer to next pages for connecting cells to Renew Cell.