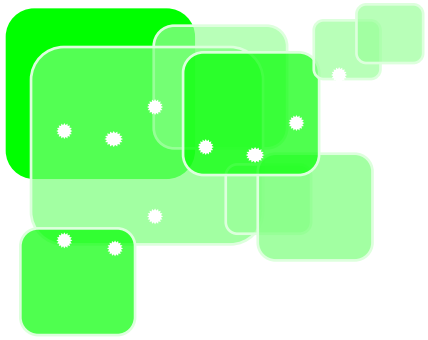


# Power You Can Depend

C&D Proprietary Information





# Company Overview

**We concentrate on what we do best ...**



C&D Proprietary Information

*Power You Can Depend On*

# Our heritage - more than 100 years of history

21<sup>st</sup> century

Making finest power storage and conversion systems as one of the largest providers in the world.

20<sup>th</sup> century

Produced hand-made automotive starter batteries and starter motors.  
Turned to stationary reserve power systems (Lead Acid Batteries)

19<sup>th</sup> century

Founded in 1906 by Frank Carlile & Leon Doughty and known as C&D Electrical.  
Brought new concept 'electric lighting'.



C&D Proprietary Information



Power Solutions



## Our mission and values



### Mission

Provide the most **reliable, innovative, and cost effective** energy storage products for customer 'mission critical' applications.

### Core Values

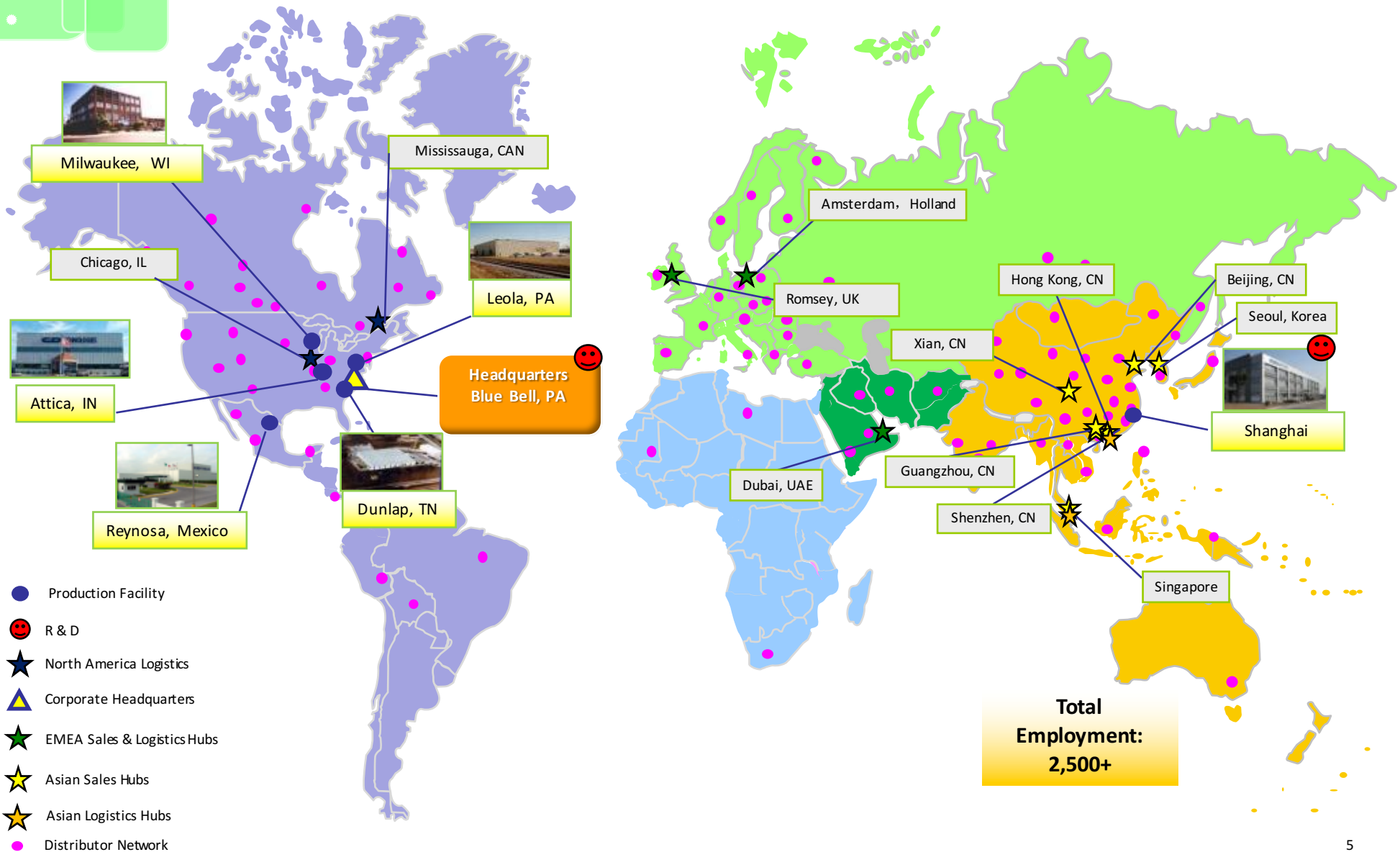
- Customer Focus
- Customer Satisfaction
- Technology Innovation
- Environment Protection
- Diverse Teams
- Individual Accountability
- Flawless Execution







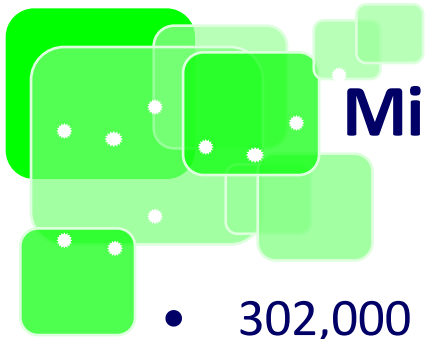
# Global footprint and production facility



Global Reach and Strategically Localized Production

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# Milwaukee, Wisconsin Facility

WELCOME TO  
MILWAUKEE

- 302,000 sq. ft. construction area
- Built in 1950's as Globe Union Battery Facility
  - Since 1999
- Headcount: 250+
- Products
  - VRLA Batteries
  - TRUE Front Access
  - Lead Carbon
  - GEL type
  - Lithium
  - other new technologies
- End Markets
  - UPS
  - Telecom
  - Government



Energy and infrastructure

C&D Proprietary Information



# Attica, Indiana Facility

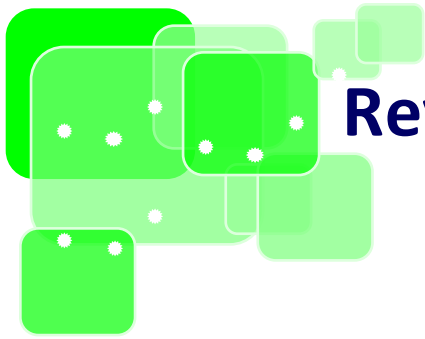
WELCOME TO  
ATTICA

- 235,000 sq. ft.
- Since 1986
  - Book value \$5.6MM
- Headcount: 350+
- Products
  - Flooded batteries
  - D, J, DJ, K, L, XT, and M series
- End Markets
  - Telecom
  - UPS
  - Energy & Infrastructure
  - Stationary Engine Starting



C&D Proprietary Information

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# Reynosa, Mexico Facility

WELCOME TO  
REYNOSA

- 240,000 sq. ft.
- Since 2003
- Headcount: 200+
- Products
  - msEndur II
  - High Rate MR
  - Liberty MSE
- 20 minutes from Allen, TX
- End Markets
  - Telecom
  - UPS
  - Government
  - Energy & Infrastructure



C&D Proprietary Information

8  
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# Shanghai, China Facility

WELCOME TO  
SHANGHAI

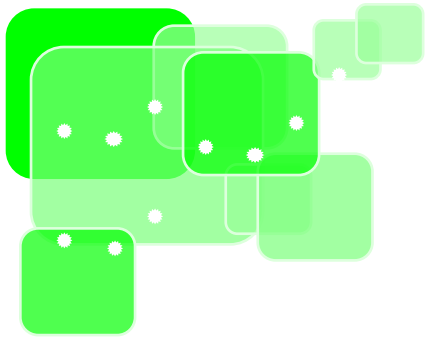


- Total Investment: USD\$50 millions
- Location: Shanghai Spark Development zone
- Factory site area: 775,000 sq.ft, factory building area: 350,000 sq.ft
- Factory capacity: 5 production lines, 1,500K batteries per year
- Total number of employees: 550 +
- R & D center : 37 engineers



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# Our Markets

## Market Leader Across Multiple Sectors





## Our Market - UPS

- **UPS Market**
  - Critical data networks
    - Banking, Insurance, B2B, Internet, Commerce, Government, Military, Transportation, Data “Hotels”
  - Industrial applications
    - Manufacturing, Oil and Gas
- **Product lines**
  - Large flooded batteries
  - Large and small Valve-regulated batteries
  - Chargers, racks, cabinets, electronic monitors

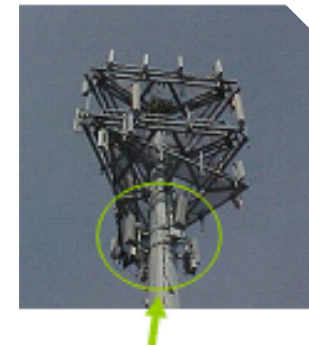


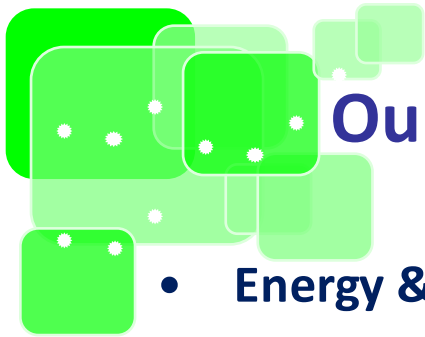




# Our Market - Telecommunications

- **Telecom Industry**
  - Wireless
  - Wireless Infrastructure
  - Wire line telephone service
  - Emergency services communications
  - Government / Military communications
  - Cable TV
- **Product lines**
  - Large flooded batteries
  - Valve-regulated (VRLA) batteries
  - TRUE Front Access batteries
  - Chargers, racks, electronic monitors





# Our Market - Energy & Infrastructure

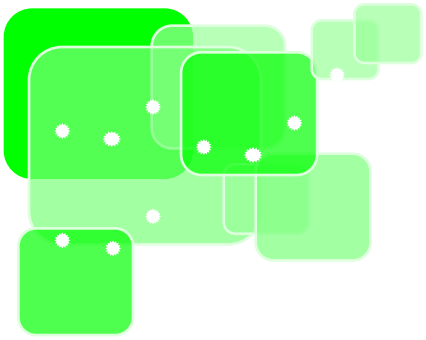
- **Energy & Infrastructure**

- Power Generation
  - Conventional : Coal, Oil, Nuclear
  - Renewable: Solar, Wind etc.
- Alternative Energy Storage
- Power distribution and switching
- Macro energy storage
- Oil and gas
- Railways

- **Product lines**

- Flooded batteries
- VRLA batteries
- Lithium Ion batteries
- Associated system components





# Technical Strength

Over 100 years of experiences in  
batteries manufacturing

*Technology*



C&D Proprietary Information

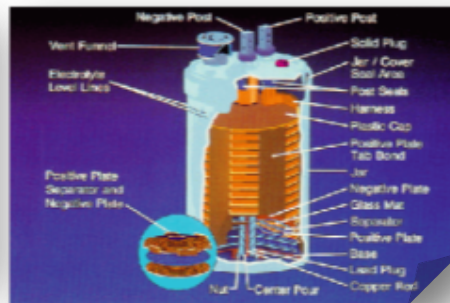
14

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# C&D Battery Technical Strength

## C&D 'Firsts' in history

- From Glass to Plastic containers
- Lead Calcium technology
- 3rd cell electrode testing
- Suspended positive plates
- Round Cell™ 40 year design life battery



The actual life of a Round Cell Battery could exceed 70-years

## C&D Technology Advantages

- USA technologies with 100+ years experiences.
- Advanced C&D designs in battery construction.
  - grid layout, relief valve, PP, AGM, True front access terminal
- High-tech battery manufacturing equipment and process to produce superior C&D unique VRLA battery.
  - pasting, formation & testing
- High efficient product development process and advanced platform.
- Sophisticated laboratory test equipment to control high quality of raw material.
  - lead, acid, AGM & PP material



C&D Proprietary Information

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# Advanced Product Development Platform and Tollgate Process

## Product Development Organization

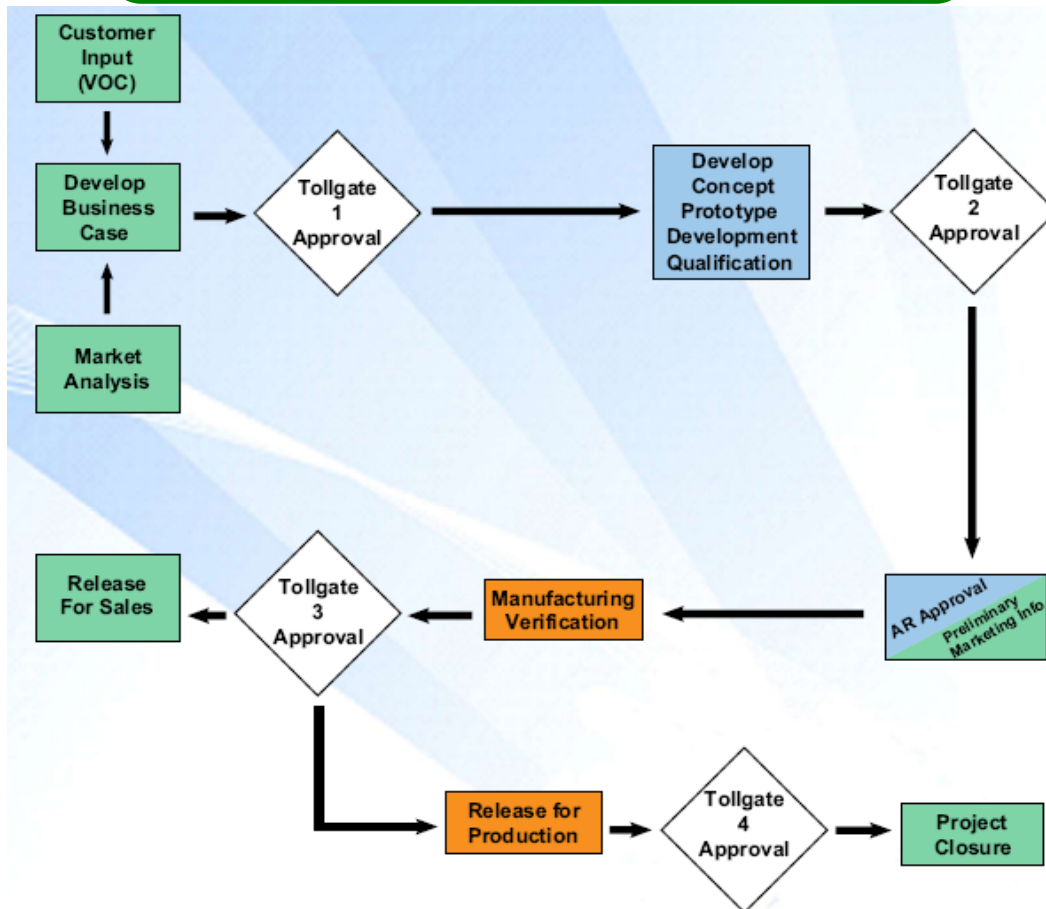
- About 30 Engineers, Scientists and Technicians.

[Click here to see the major team leader's background.](#)



Team Leader

## Tollgate Process



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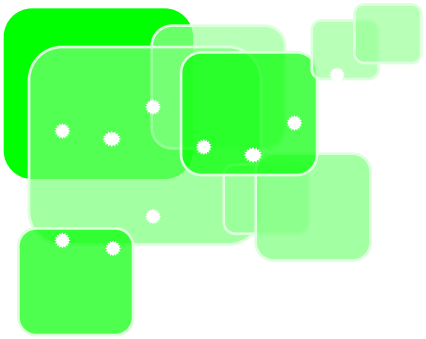
Green Blocks – Product Mgt  
Blue Blocks – Engineering  
Orange Blocks – Operations

## Product Development Facilities

- 6000 sq ft of Materials test lab
- 20,000 sq ft of battery test facilities
- 18,000 sq ft of advanced battery development facilities

## Product Development Tools

- Analytical Tools  
Including physical testing, chemical, micro structural analysis, electrochemical analysis and physical analysis tools.
- Advanced Computational Models  
Including 3D solid modeling, dynamic stress analysis, thermal and potential models.
- Prototyping  
Including 3D printing, active material preparation, electrode fabrication, single cell assembly and test.
- Pilot Manufacturing  
Full scale production lines for development of batteries
- Battery Testing and Analysis  
Including computer controlled test circuits, thermal testing, mechanical testing (DOT, IATA, etc...)



# Products Offerings

**Full product range  
with multiple sourcing options**

*Products*



C&D Proprietary Information

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*Power You Can Depend On*

# Existing Product Offerings



## Flooded batteries

- Design Life: 20 years @ 25degC
- Proven, reliable technology
- Requires maintenance
- Wire line Telecom Central Office, Large UPS Systems and Utility



## 12V UPS - Dynasty

- Design Life : 12 years @ 25degC
- Proven technology
- Space efficient
- Lower initial cost
- UPS for all but the largest systems



## 2V - msEndur II

- Design Life: 20 years @ 25degC
- New technology
- Space efficient
- Nearly maintenance free
- Proven that it is as reliable as flooded
- Wireless base stations and switches, Wire line distributed power



## 12V True Front Access

- Design Life: 12 years @ 25degC
- New technology
- Space efficient
- Ease of access
- Almost no maintenance
- Wireless base station batteries and Wire line distributed power





# Existing Product Offerings

## DNT 12V/6V series



25-775W/cell



12 years @ 25degC

(models above 12-100 DNT)



UPS



- Lower Battery Resistance
- Higher Voltage on CP Discharge
- Lower Current on CP Discharge
- Higher Watt per cell
- Increased Watt per kg of Lead.



## LBTY 12V/2V Series



7-242Ah (12V) ; 200-3000Ah (2V)



7 years (> 26Ah) - 12V @ 25degC

15 years - 2V @ 25degC



UPS, Telecom, Utility



- Reliability and best value for money
- Absorbent Glass Mat (AGM) technology
- Multicell design for economy of instl. and maint.



Capacity



Design Life

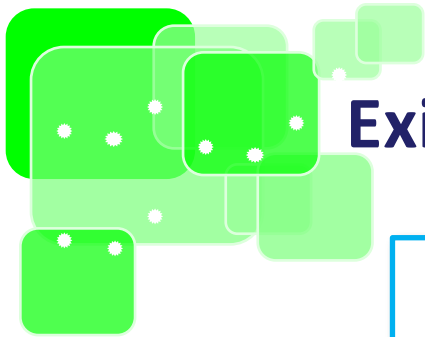


Applications



Features





# Existing Product Offerings

## MRX / MRXF 12V series



100-1000W/cell



12 years @ 25degC



UPS



- Flame-retardant polypropylene case
- Patented Long life Alloy having the lowest calcium levels in the industry
- True Front Access threaded copper alloy inserts. Saving on footprint is significant (MRXF series)



## MPS 12V Series



7-242Ah



10 years (> 26Ah) @ 25degC



UPS, Telecom, Utility



- Good performance for high rate and long back up applications
- Robust plate for extended life.
- Flame-arresting one-way pressure-relief vent for safety and long life.



Capacity



Design Life



Applications



Features



# Existing Product Offerings

## TEL 12V series



86-196Ah



10 years @ 25degC (TFA, FG)



Telecom, Utilities etc. (TFA, FG)

Unstable networks (FGC)



- Save space and fits in most Telecom equipment
- Design for installation on racks or cabinets
- Narrow width for installation on rack and telecom cabinets
- Cost effective connection system
- Largest connection surface to reduce overall circuit impedance
- Total operator protection against electrical contact
- True front access , ease of maintenance
- Specific Ohmic ring for accurate measurements
- State of art US technology.



## Tubular Flooded (OPzS) 2V/6V/12V Series



100-3000Ah



15 years



UPS, Telecom, Solar, Control and Monitoring System



- Low Maintenance
- Quick and simple acid level control
- Economical water consumption
- Appropriate dimensions and weight
- The lowest and constant maintenance current
- The positive armored plate is of a tubular type ensuring a long life time.
- Excellent cyclic performance



# Existing Product Offerings

## GEL 2V&12V series



20-2500Ah



12years @ 25degC -12V  
18years @ 25degC -2V



Electric power, new energy



- Gel electrolyte technology for better wide temperature range performance
- Proprietary Pb-Ca Alloy – minimizing grid growth, reducing gassing, and extending battery life
- Good deep cycle performance
- Lower self-discharge rate (Less than 3% per month)



Capacity



Design Life



Applications



Features

## Tubular GEL (OPzV) 2V Series



200 - 3000Ah



15years



Standby & Cyclic



Applications

- Tubular Positive Plate
- Pasted negative plate
- Separators – extremely high porosity and low internal resistance.
- Electrolyte – Gel structure.



# Existing Product Offerings

## MSE 2V series



200 - 1600 Ah



20 years @ 25degC



Energy, Infrastructure, UPS



- Modular design for ease of Installation and stacking flexibility
- Space saving design for the greatest amount of power in a small footprint
- More flexible choices with various optional tools and accessories.



## Liberty HC 2V series



300-600Ah



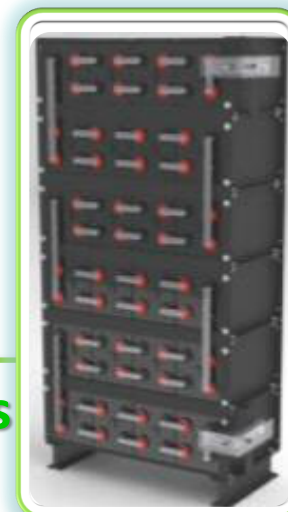
20 years@ 25 degC



Cyclic Applications



- High energy density, space saving design for greatest amount of power in small footprint.
- New terminal design for ease of maintenance readings.



Capacity



Design Life



Applications



Features



# Existing Product Offerings

## Battery Accessories

Cabinet

Rack

Cable

Copper Bar

Terminal Cover

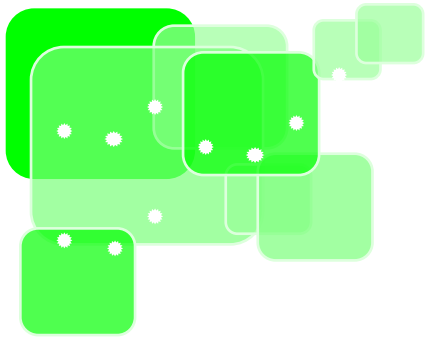


## Battery Monitor System

- Real-time online monitoring followings :
  - every single cell voltage
  - internal resistance of the cell
  - cell temperature
  - battery voltage / current, temperature, etc.
- To ensure system reliability work, early detection of weak batteries.
- Reduce the risk of fire, so as to effectively improve the security of equipment.
- Reduce the overall operation and maintenance costs (TCO)
- Battery monitor system solutions for :
  - data center UPS battery
  - data center HVDC battery
  - industrial UPS battery
  - telecommunication power battery
  - power supply system battery







# Carbon Battery

## Valve Regulated Lead Acid Battery With DCS and Carbon Technology







# Features and Benefits

## **Long life cycle service design:**

- Proven C&D DCS plate technology
- Maximum cycle life for deep cycle & hybrid applications
- Good PSoC cyclic performance

## **Maximum performance:**

- Using exclusive positive plate design, improve the cyclic performance
- With Carbon enhanced negative plate, improve charged acceptance, and slow down the sulfating speed in PSoC operation, extended battery life.
- Superior output due to direct terminal connection,
- Low internal resistance.

## **Excellent wild temperature compatibility**

- Operation temperature can be range from -20°C to 60°C
- With Lead-Carbon technology, maximum increase low temperature performance

## **High charging acceptance ability**

- With Carbon enhanced negative design, improve higher charging acceptance ability. Maximum shorter recharge time, suitable for rapid recharge, increase reliability for those frequently discharge applications.

## **High rate discharge ability**

- Carbon as the capacitor to accept or release current, significant increase high rate discharge ability

## **Compliant to major global specifications**

- BS 6290: Part 4:1997
- IEC 60896-21/22
- Telcordia SR-4228
- Bellcore GR-63-CORE & GR-1089-CORE
- UL 94 V-0 Flame Retardant Polypropylene

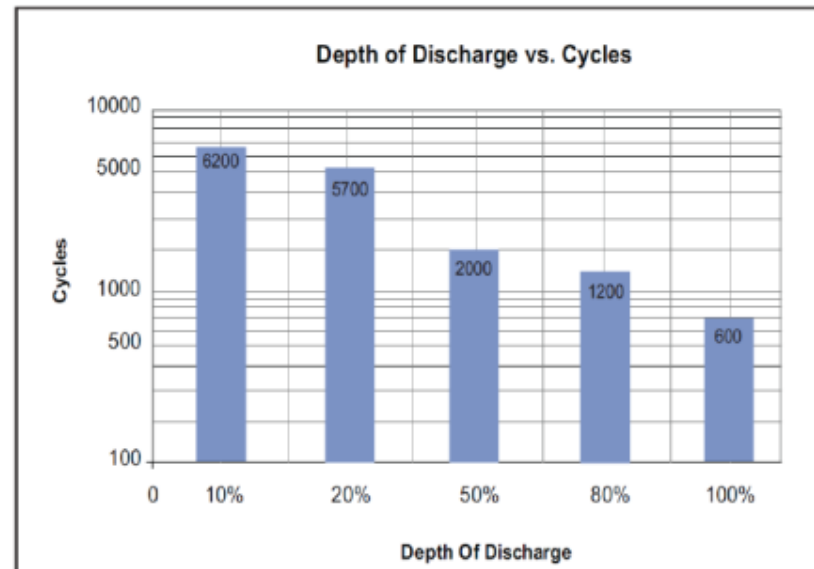


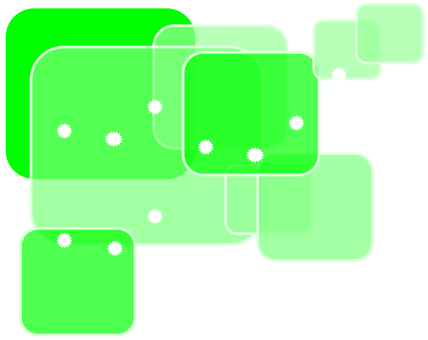
## Applications

- Unstable Grid
- Hybrid Systems
- Renewable Energy
- Energy Storage



## Industry Leading Cyclic Life



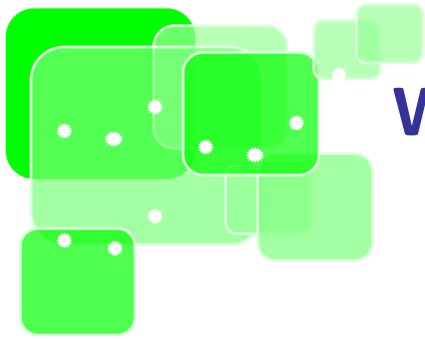


PURE Pb<sup>+</sup>

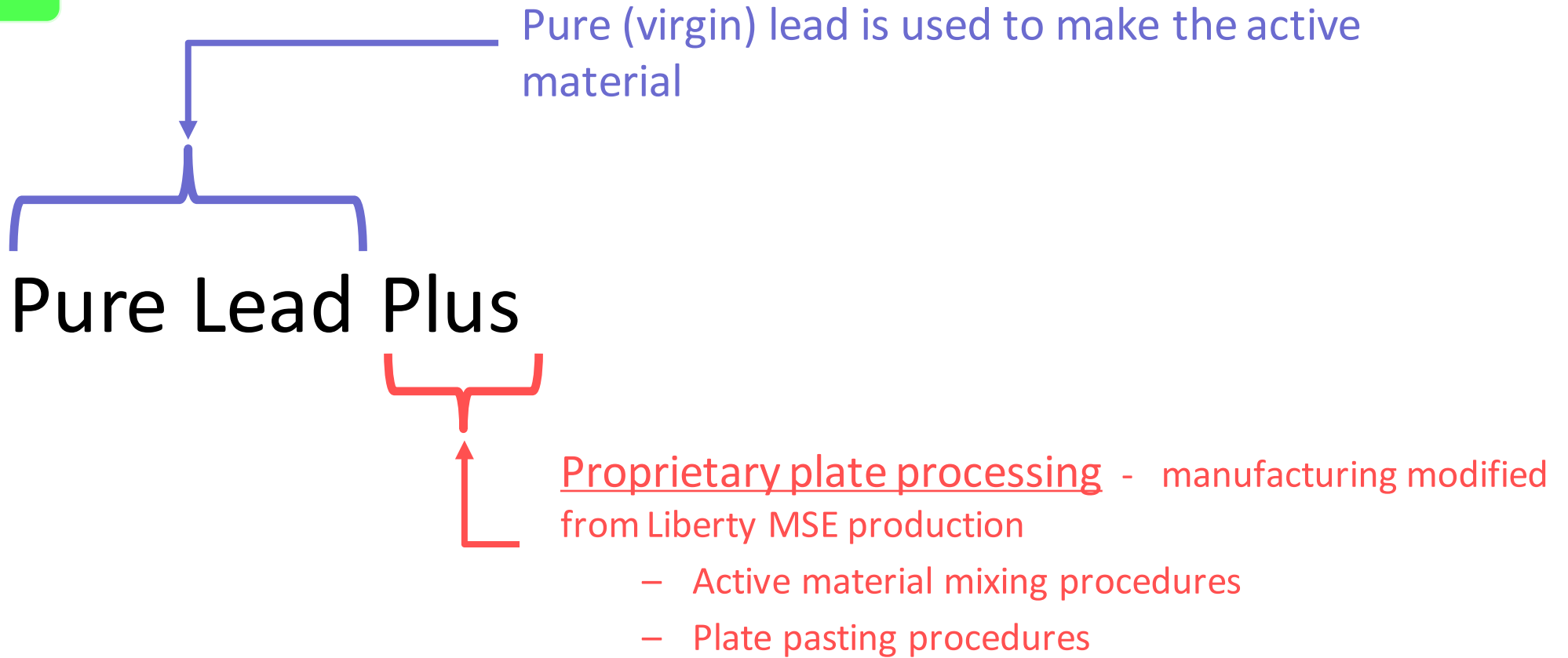
## Pure Lead Plus Designed for the UPS market

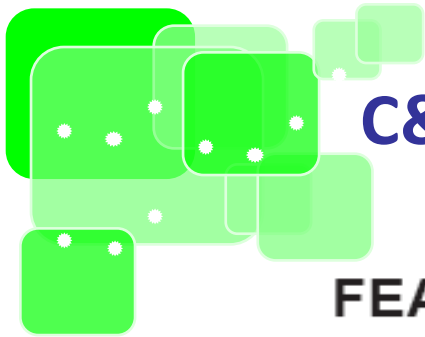


C&D Proprietary Information



## What is Pure Lead Plus?



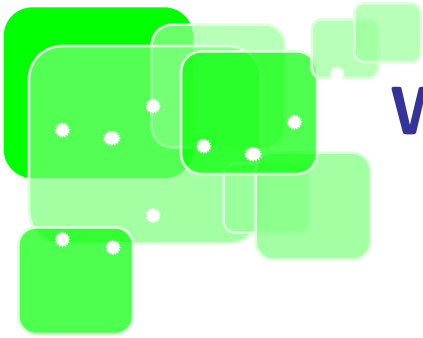


## C&D Pure Lead Plus

### FEATURES & BENEFITS

- Pure Lead Paste for long life and stable performance
- Industry Leading Warranty
- Extended life at elevated ambient temperatures
- 10 year design life @ 25°C
- Absorbent Glass Mat (AGM) technology for efficient gas recombination of up to 99% and freedom from electrolyte maintenance
- Patented Long Life Alloy having the lowest calcium levels in the industry - minimizing grid growth, reducing gassing, and extending battery life
- Patented UL Recognized Flame-arresting vents in each cell for safety and long life
- Designed with the same recombination, thermal runaway prevention, gassing and flame retardant characteristics of the Bellcore 4228 compliant Dynasty Telecom products
- Flame retardant polypropylene case and cover compliant with UL94-V2
- Advanced proprietary plate processing technology for high active material utilization - results in high energy density and low float currents
- Thermally welded and helium leak tested case-to-cover bond to ensure a robust leak proof seal
- Can be operated in any orientation. Upright, side or end mounting recommended
- Not restricted for air transport - Complies with IATA/ICAO Special Provisions A67
- Not restricted for surface transport - Classified as non-hazardous material as related to DOT-CFR Title 49 parts 171-189
- Not restricted for water transport - Classified as non-hazardous material per IMDG Amendment 27





# What are the Advantages of Pure Lead Plus

## 1. Longer service life

- Fully tested - average life increase of 3 years above standard MR product

## 2. Better ability to accommodate higher temperatures

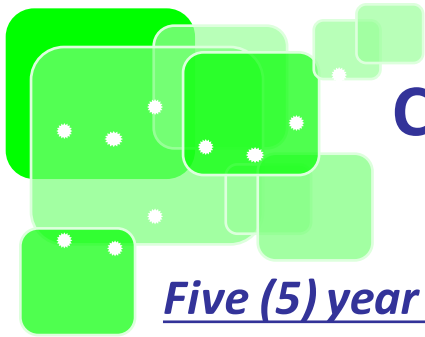
- 5 yrs warranted life at 77°F
- 2 ½ yrs warranted life at 92°F

## 3. Longer shelf life

- Same 2 year shelf life

## 4. Performance

- 1 to 1.5% higher performance



# Customer Advantages

Five (5) year full product warranty

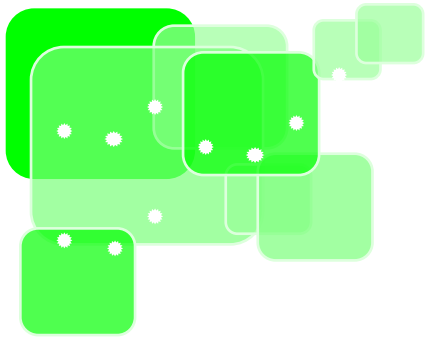
Performance increase

MR	MR Watts/cell	PLP Watts/cell	PLP
UPS12-300MR	300	305	UPS12-305PLP
UPS12-350MR	350	355	UPS12-355PLP
UPS12-400MR	400	405	UPS12-405PLP
UPS12-490MR	488	495	UPS12-495PLP
UPS12-540MR	537	545	UPS12-545PLP

*(15 min to 1.67 vpc)*

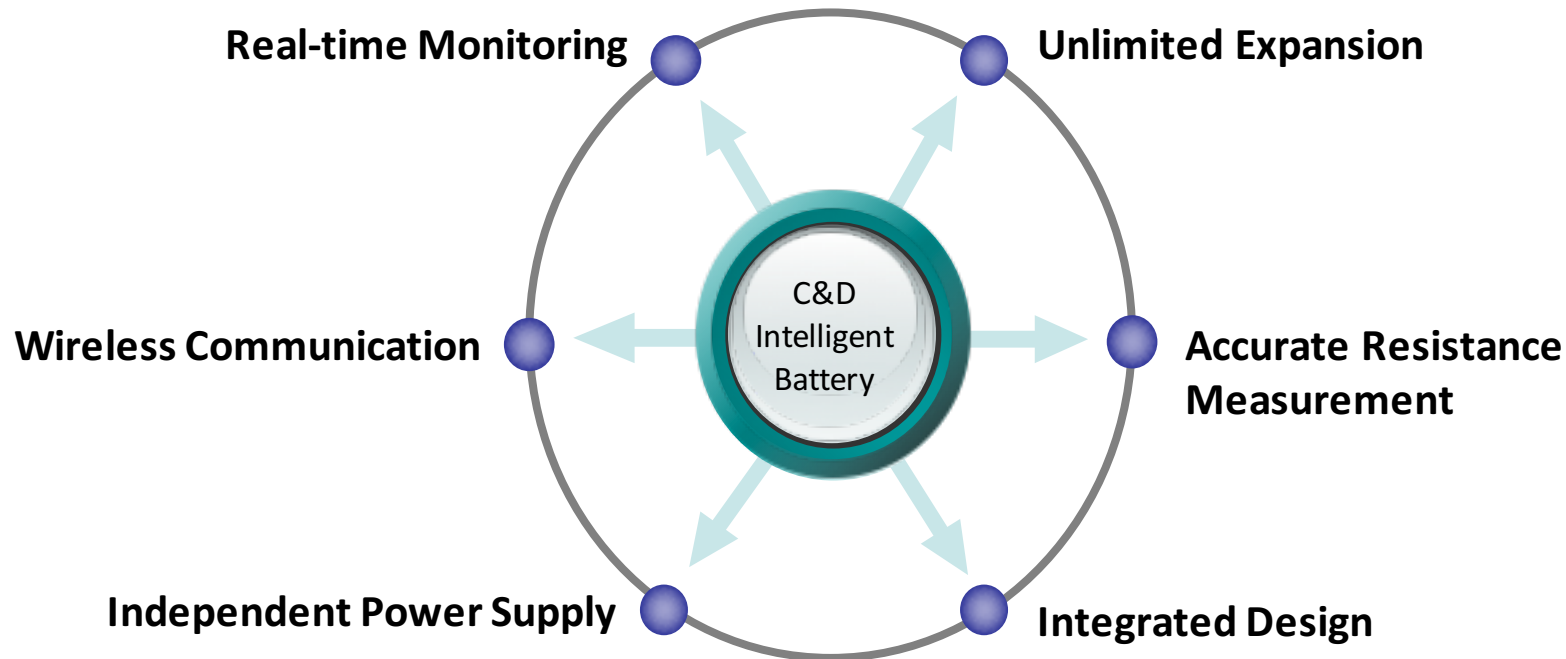


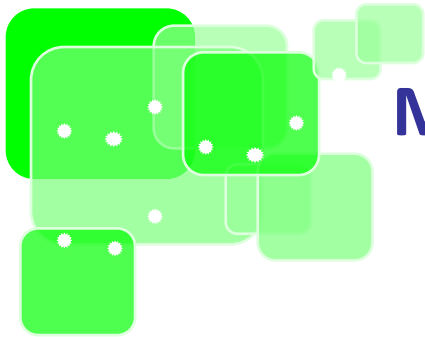




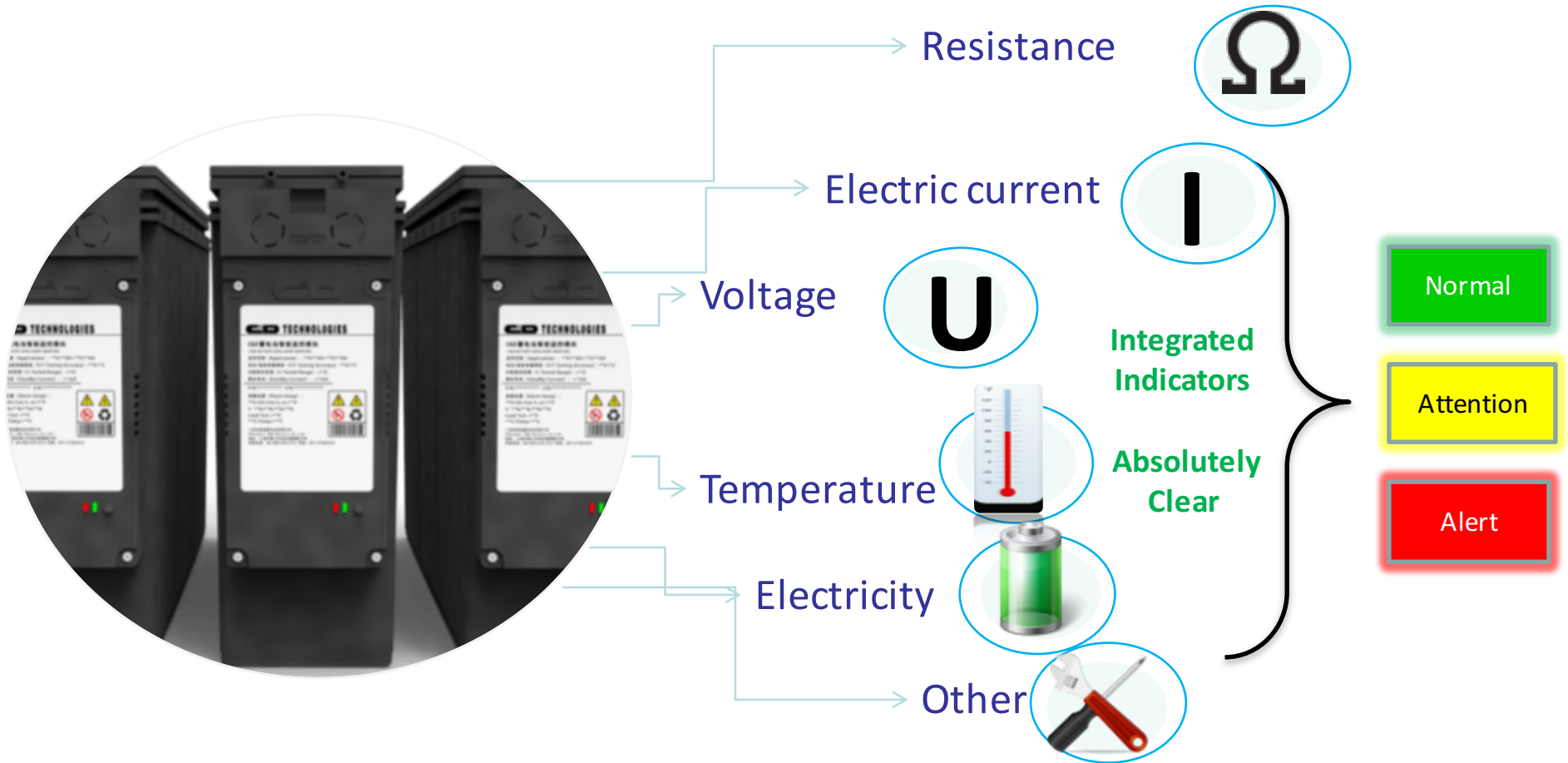
# C&D Intelligent battery

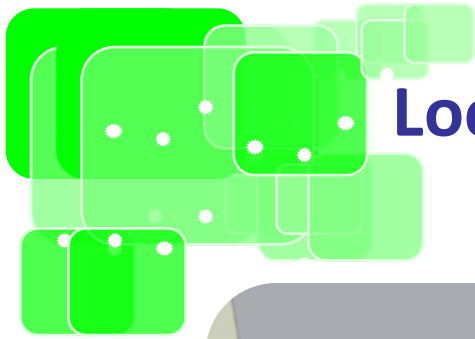
—Upgrades and alternatives of Battery Monitoring





# Measurable parameters





## Local details of C&D Intelligent battery



- The intelligent battery located in the battery cabinet, without the traditional battery monitoring cable!
- Smart battery is extremely easy to install and maintain!
- Absolutely stable, secure, and reliable!



C&D Proprietary Information

# Advantages

## Integrated design

1

2

## Object & Convenient

3

## Customization

4

## 100 years Experience

5

## Cost-effective

6

## Smart protection

8

## Easy maintenance

7

## Extending life

1. Revolutionary integrated design, to avoid the low-end of the application of risk monitoring product itself.

2. Battery health comprehensive index. Integrated resistance, voltage, current, charge and discharge electricity integrated indicators for visually reflect battery health status, the user side may be able to identify simple indicators alone battery is good or bad.

3. Resistance measurement method, AC and DC pulse measurement method (user selectable)

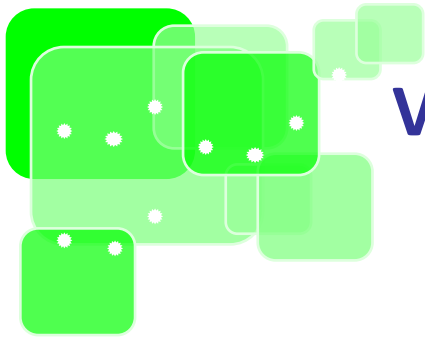
4. Intelligent Battery Service "cloud" platform. C & D combines 100 years of experience in battery management, which is any other battery monitoring product providers do not have.

5. High-end products, the low-end price.

6. Smart protection. Including: overcharge protection and short circuit protection.

7. Pulse repair. Increased by 30% -100% of the battery life.

8. Extremely easy maintenance and installation



## Value to users

1 / **Make the power system more secure, reliable**



2 / **Reduce maintenance cost of the battery**

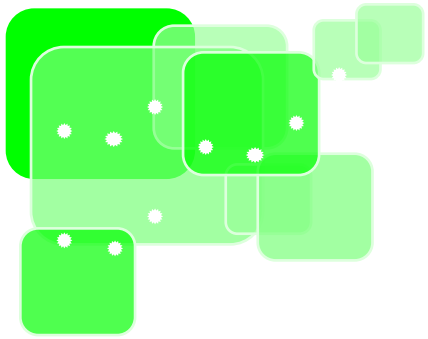


3 / **Extending battery life**



4 / **Expert batteries and related products and services**





**Thank you !**

