Firefly International Energy

About the company

- Firefly was started in 2003 by Kurt Kelley (Technical) & Few Others
- Kurt Kelley is the inventor of the technology
- This technology was developed in the labs of Caterpillar
- Considering the potential of the technology, Caterpillar spun of this technology to form Firefly
- In 2010 New Management bought assets of Firefly Energy

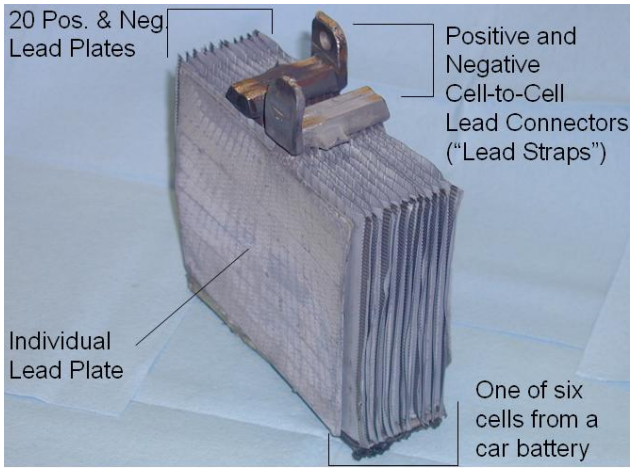
firefly® international energy

Objective of Research - Firefly

1) Maximize specific energy (energy storage per unit of weight, measured in watthours per kilogram) over designated discharge scenarios
2) Maximize the specific power (power per unit of weight, measured in watts per kilogram) over designated high rate discharge scenarios
3) Maximize battery life, not only in environmental durability but most importantly in cycle life (number of possible charges and discharges)
4) Do it all at extremely low costs

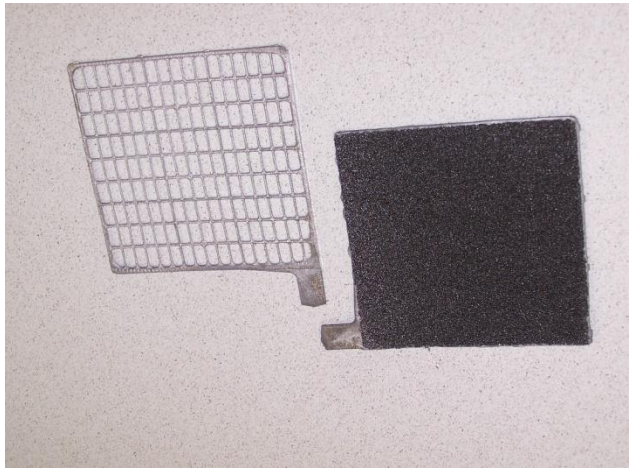
Problems of Existing Battery Technology

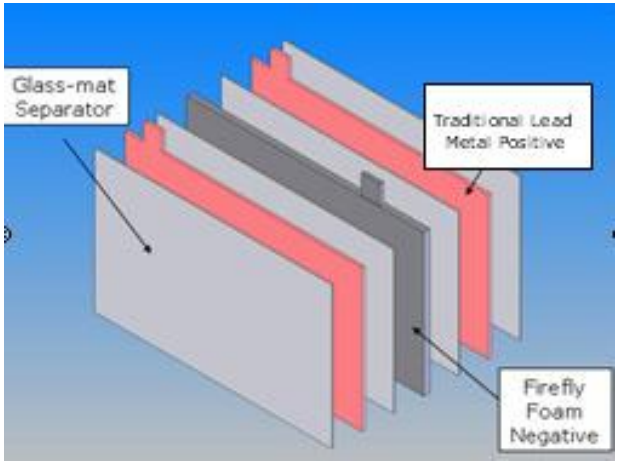
- Service Life
- Cycle life
- Recharge time
- Size & Weight



Technology-Microcell foam based batteries

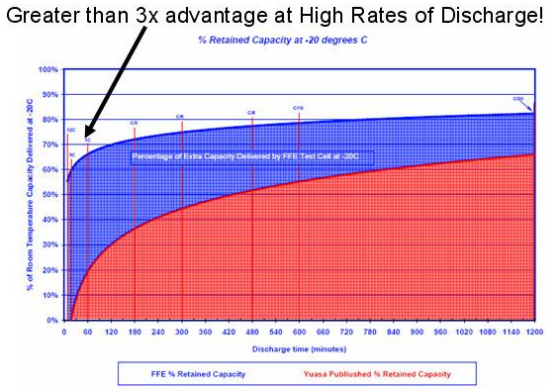
- During research Kurt discovered that much of the lead in the grid structure of conventional batteries can be replaced by a totally new type of material
- Carbon was found to have the requisite physical and chemical properties
- It was used in negative plate first for optimum configuration and “architecture” within the battery itself

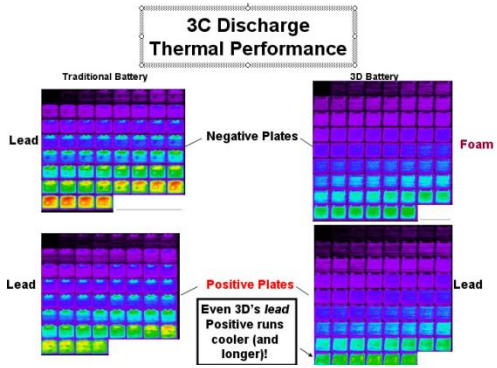




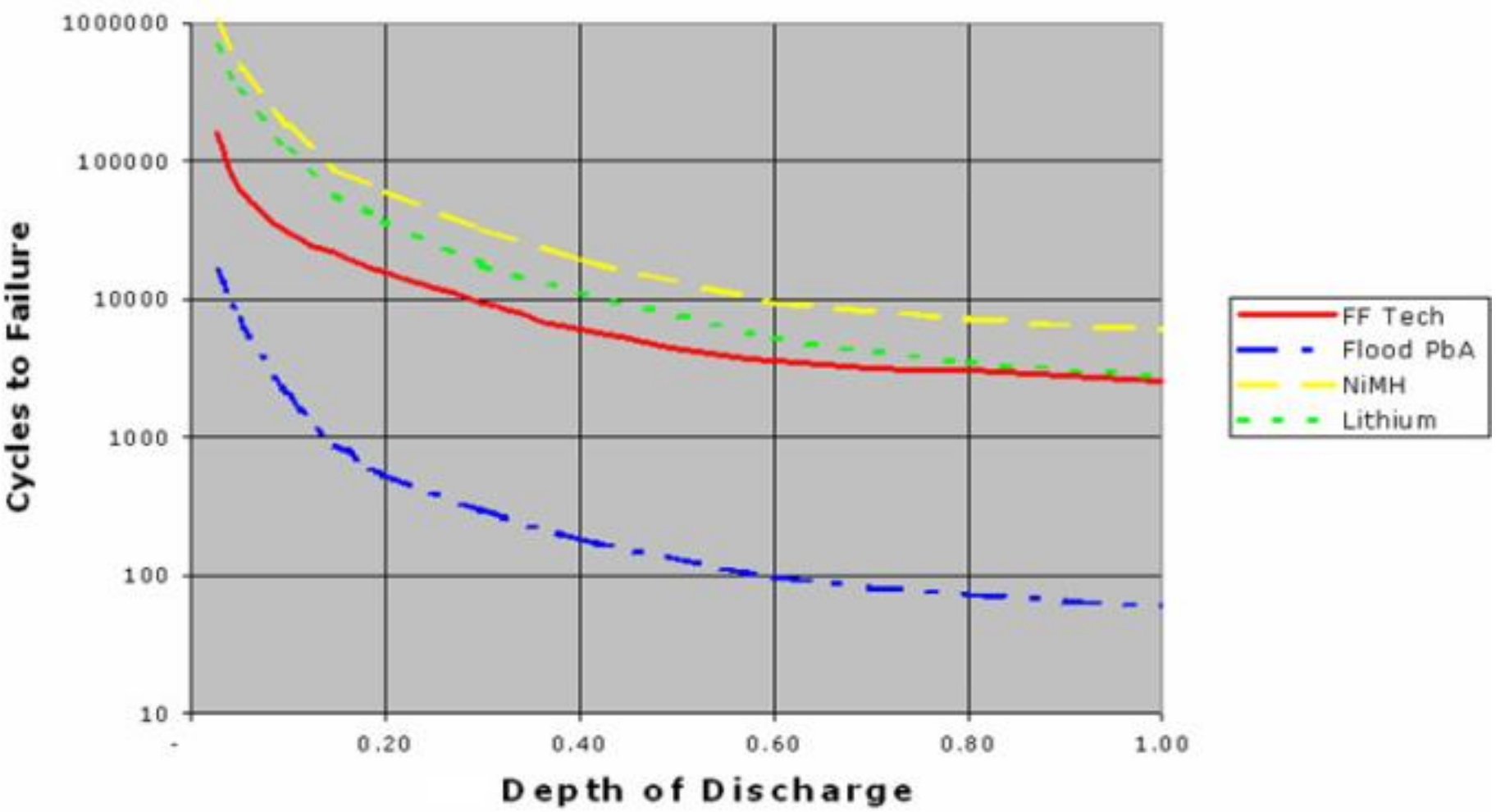
Advantages of Technology

- Larger surface area for utilization and spatial efficiency
- Lower and higher temperature advantages
- Cycle life improvements





Cycle Life Report



This report is released by an independent test agency. Corroborated by US Army

In summary,

The 3D cell architecture results in numerous attributes:

- Instantaneous Power (2 hours and faster run-time rates)
- Fast recharge capability
- Continuous power through discharge process
- Recovery to full capacity after off-season storage
- Excellent cold temperature capacity utilization
- High temperature resiliency
- Recovery to full capacity after discharge
- Higher cycle life

Application Areas

- Deep-discharge applications in:
  - Railways
  - Telecom
  - Defense
  - RVs/ Marine Boats
  - Offices
  - Residential Areas

Achievements

- US Army approval for supply of batteries
- More than 7 patents in its fold
- 23 Patent Applications pending
- First Major Development since AGM Batteries

Winner of the Wall Street Journal 2007 "Technology Innovation" Award

Winner of the 2007 "R&D 100" Award

The Company & Progress: Facilities

53,000sf facility

Research, Engineering, Manufacturing, Admin

- $8M+ invested in research lab, electrical testing, and pilot manufacturing equipment
  - Over 200 battery test channels with full temperature control

The Company & Progress: Markets

- Military Markets and Aerospace Markets

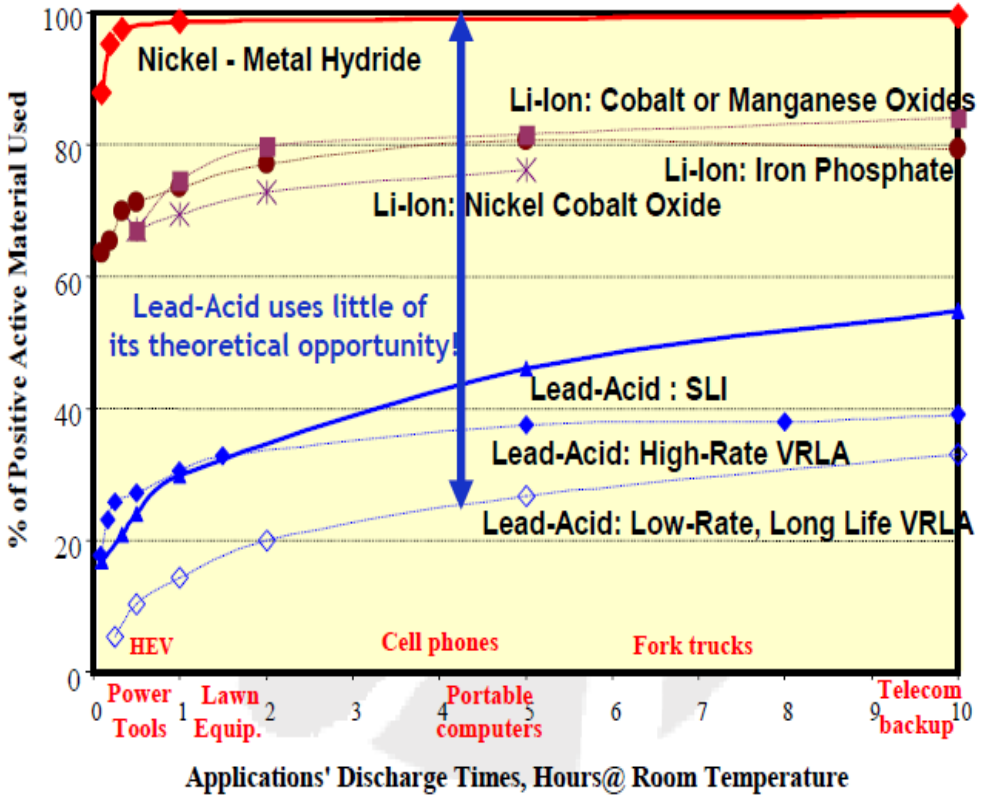
Batteries currently in use by two defense contractors in military applications.

Open orders now being filled from US facility

Strong value proposition for the weight savings, safety, cost, and sustainable capacity of the Firefly technology

- Heavy Hybrid and electric Vehicles
  - 30kWh battery pack currently being installed in hybrid mining vehicle
  - Electric locomotive
- Light Hybrid and Electric Vehicles
- On and Off-Grid Energy Storage
  - Backup, alternative energy, UPS, load shifting

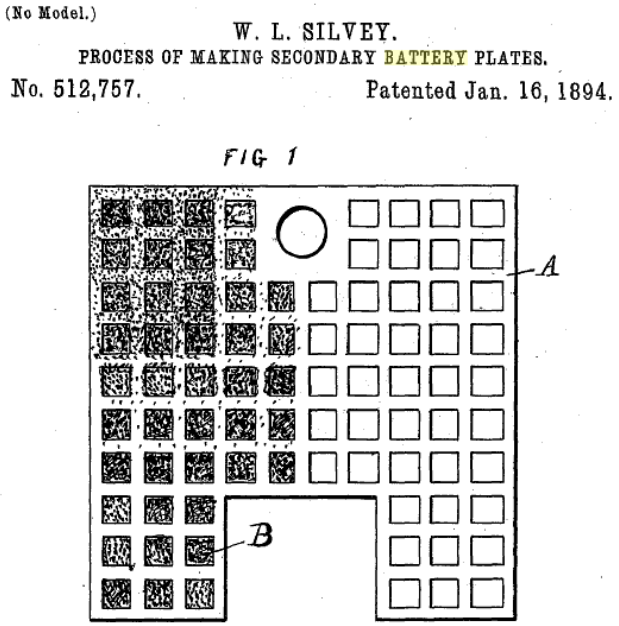
The Technology: Potential



As compared to other energy storage chemistries, Lead Acid Battery Chemistry is currently engineered to only 20%-40% of its potential.

Long-Term Firefly Technology Map moves Lead-Acid battery Chemistry to 90% of its potential.

The Technology: Architecture


(No Model.)

W. L. SILVEY.

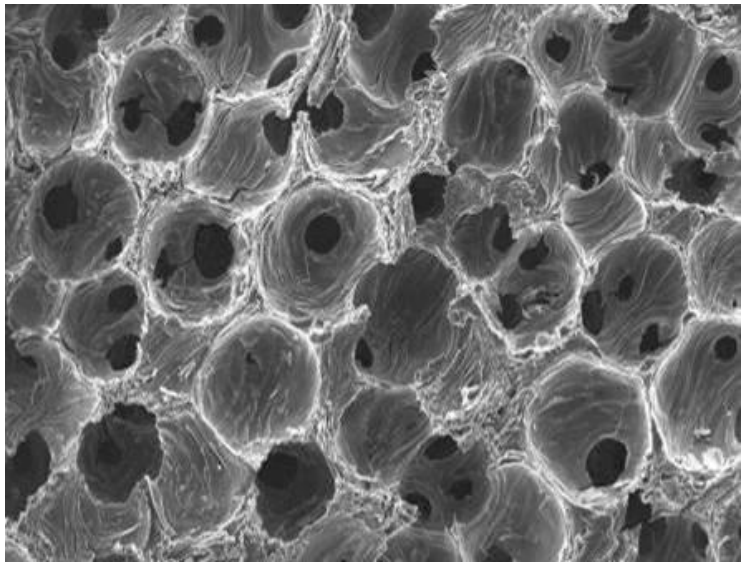
PROCESS OF MAKING SECONDARY BATTERY PLATES.

No. 512,757. Patented Jan. 16, 1894.

FIG 1

From decades-long use of metallic lead plates with limited surface areas…
30% - 40% Utilization

To *micro-cellular* based Foam plates with much greater surface areas…
80-90% Utilization

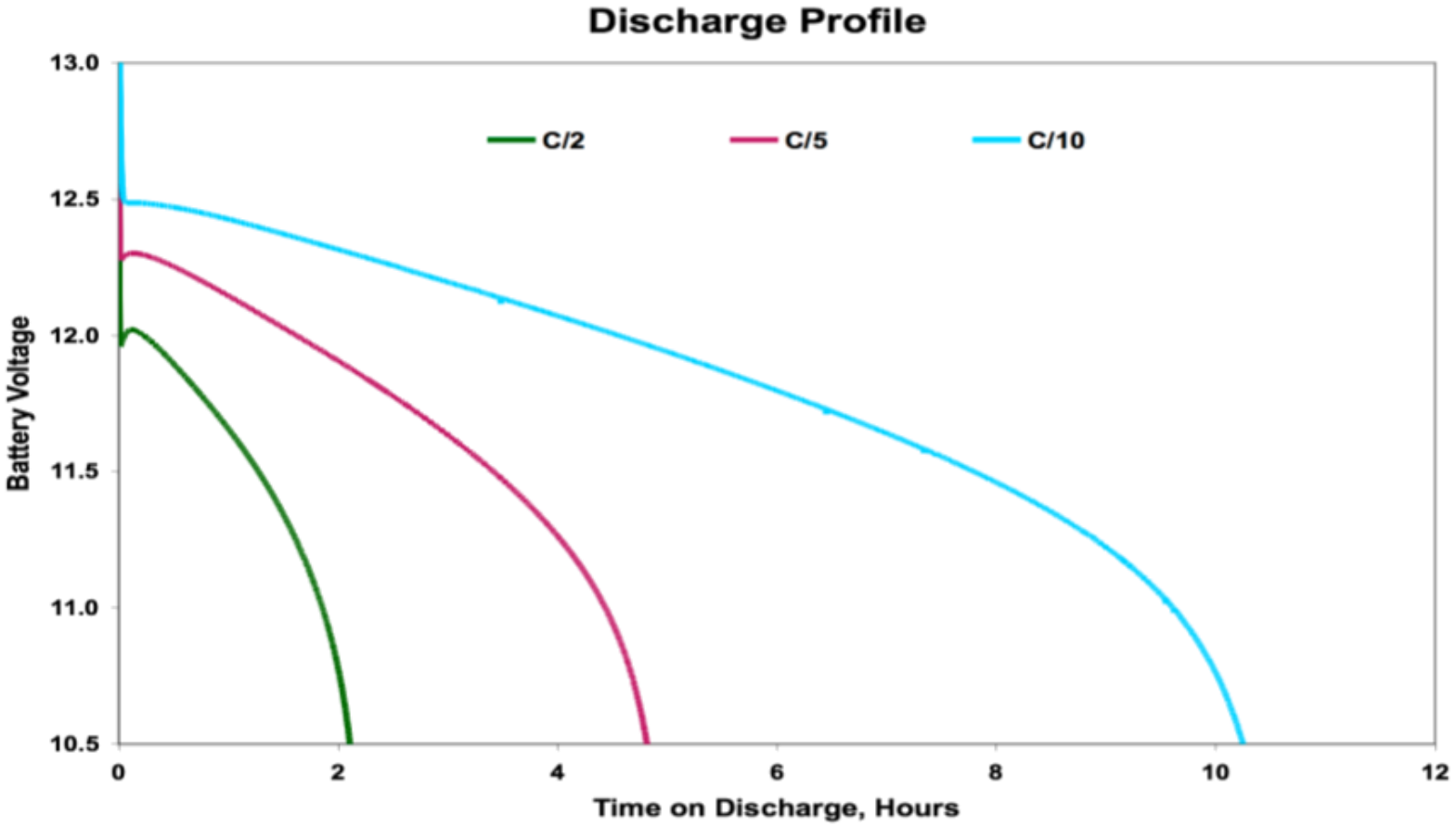


Oasis Group 31 Specification

- Specifications:
  - Group 31 Dimensions
  - Non-Spillable
  - Weight: 34.5 kg
  - C/20: 110 Ah
  - C/10: 905 Ah
  - RC: 215 min - SAE J537
  - CCA: 625 A - SAE J537
  - CA: 800 A
- Cycle Life:
  - 600 cycles @ 80% DoD (warranty)
  - 702 J-2185 Cycles
  - 126 hrs J-930 Vibration

Target market/application for the Group 31 Oasis battery was long runtime (10 hour discharges) daily cycling applications.

Group 31 Oasis Third Party Testing

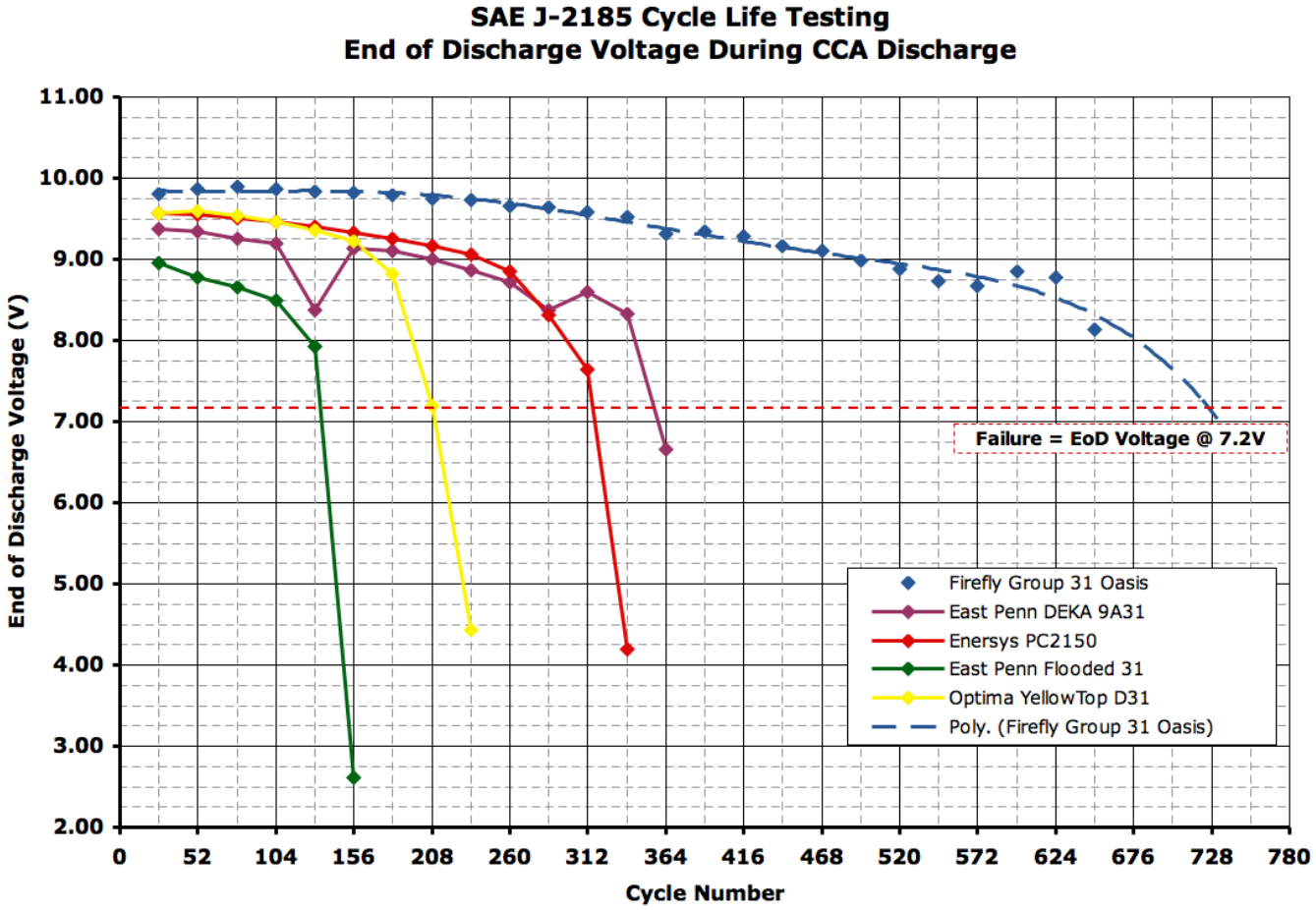


Discharge voltage profiles at three discharge rates

Third party testing

DSE DoppStein Enterprises, Inc.

Group 31 Oasis Third Party Testing



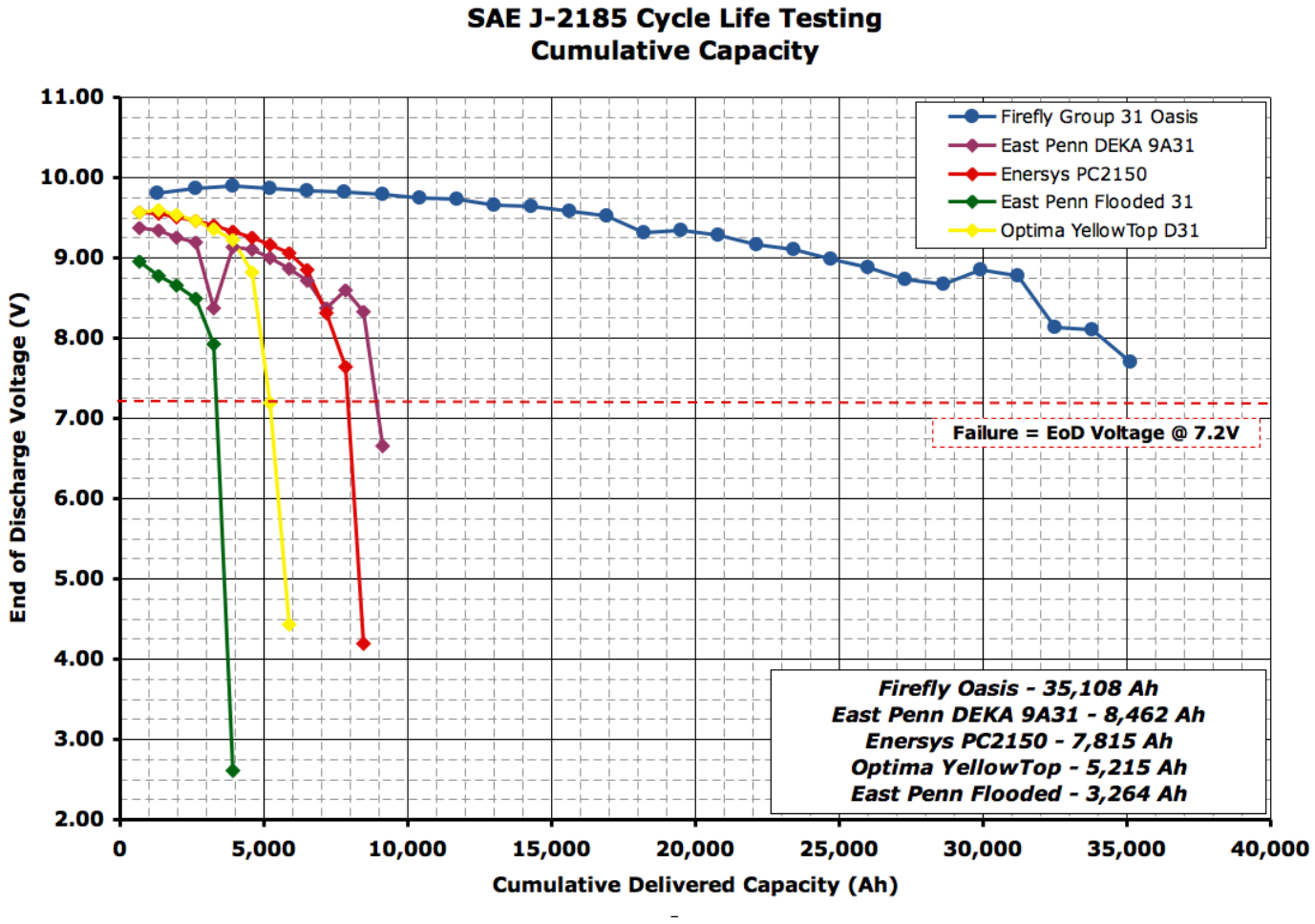
Longest cycle life at elevated temperature cycle testing - projected cycle life > 700 cycles.

Third party testing

JBI CORPORATION Independent Battery Testing Laboratory

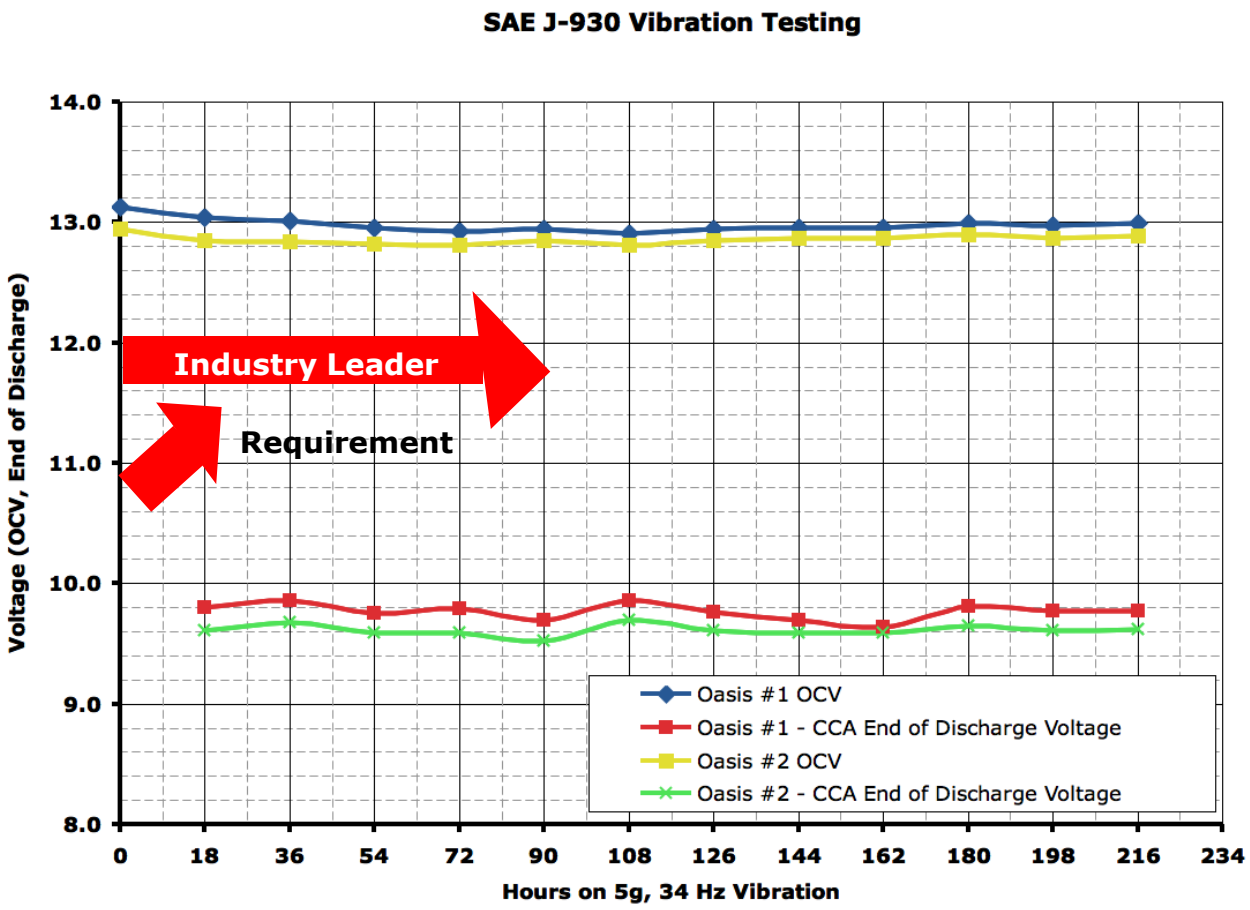
RDECOM TARDEC

Group 31 Oasis Third Party Testing



- Third party, accelerated life, elevated temperature cycle data

Group 31 Oasis Third Party Testing



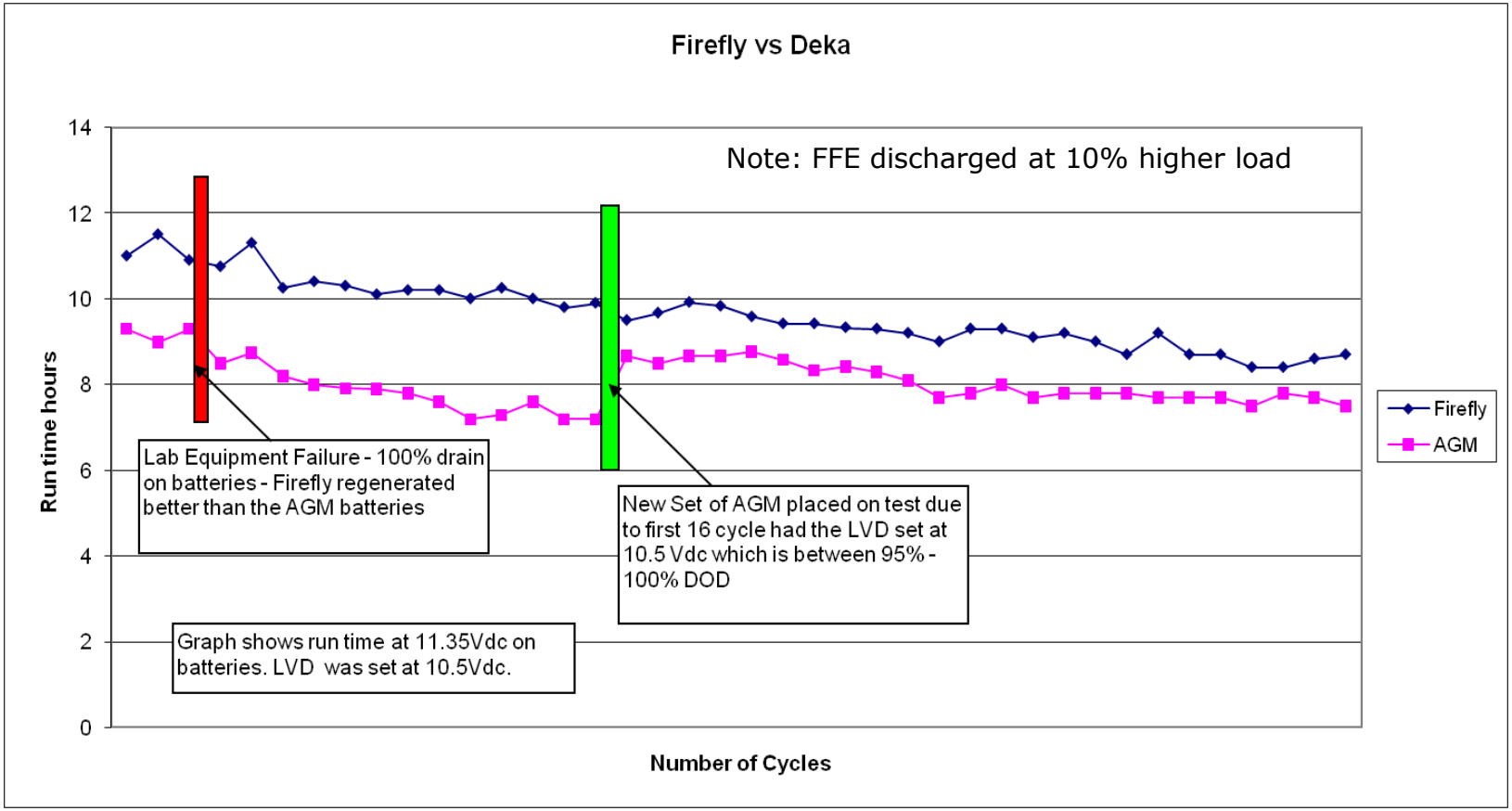
Batteries placed on 5G, 34Hz vibration table with CCA tests every 18 hours. End of Discharge voltage must remain above 7.2V.

12x the industry requirement - Oasis batteries removed from test prior to failure

Third party testing

JBI CORPORATION
Independent Battery Testing Laboratory

Group 31 Oasis Customer Testing

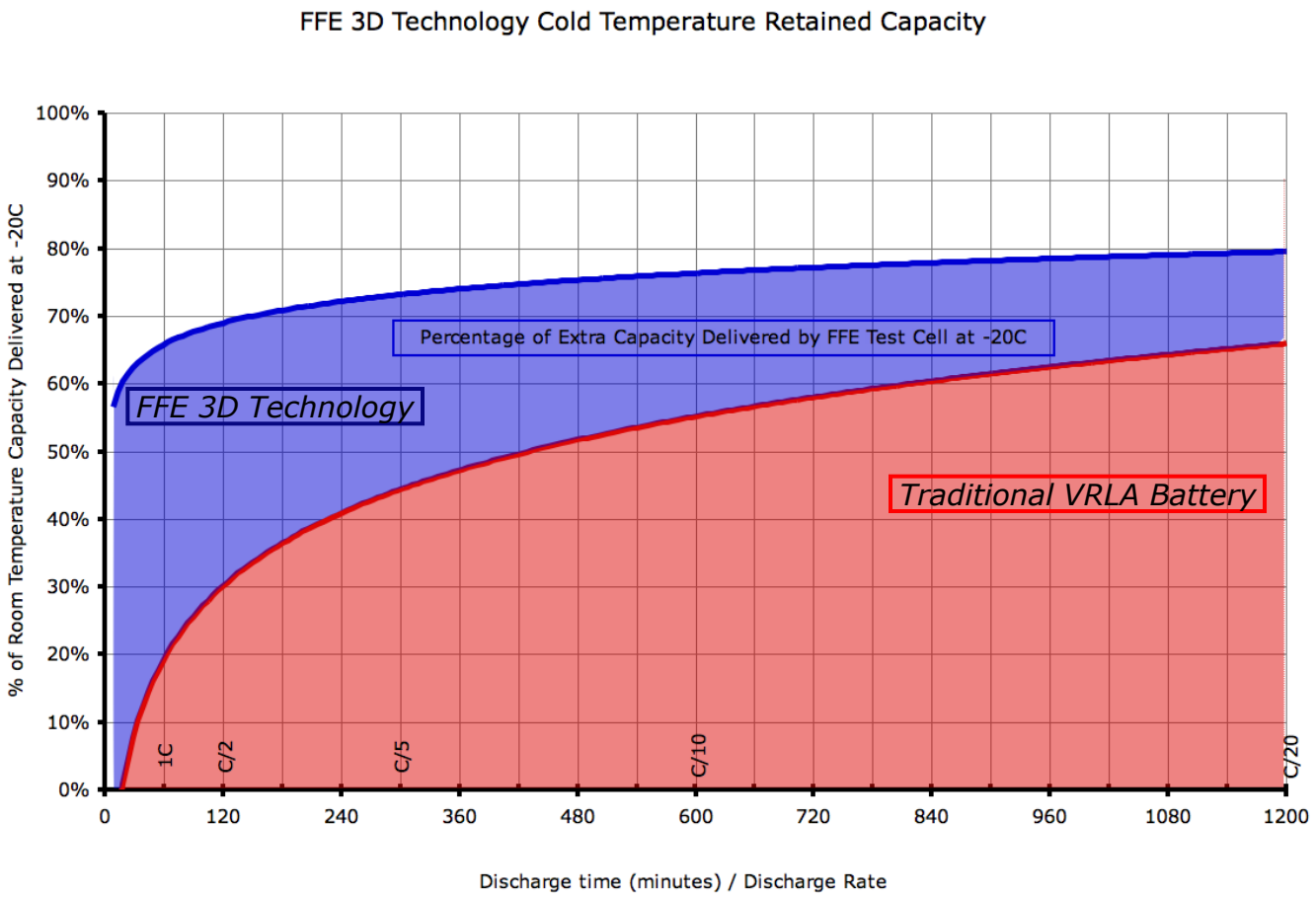


In customer application testing, the Oasis has the longest runtime initially and gap widens. In addition, the Oasis prototypes withstood a sulfation abuse while the traditional batteries required replacement.

Customer testing

Bergstrom Inc

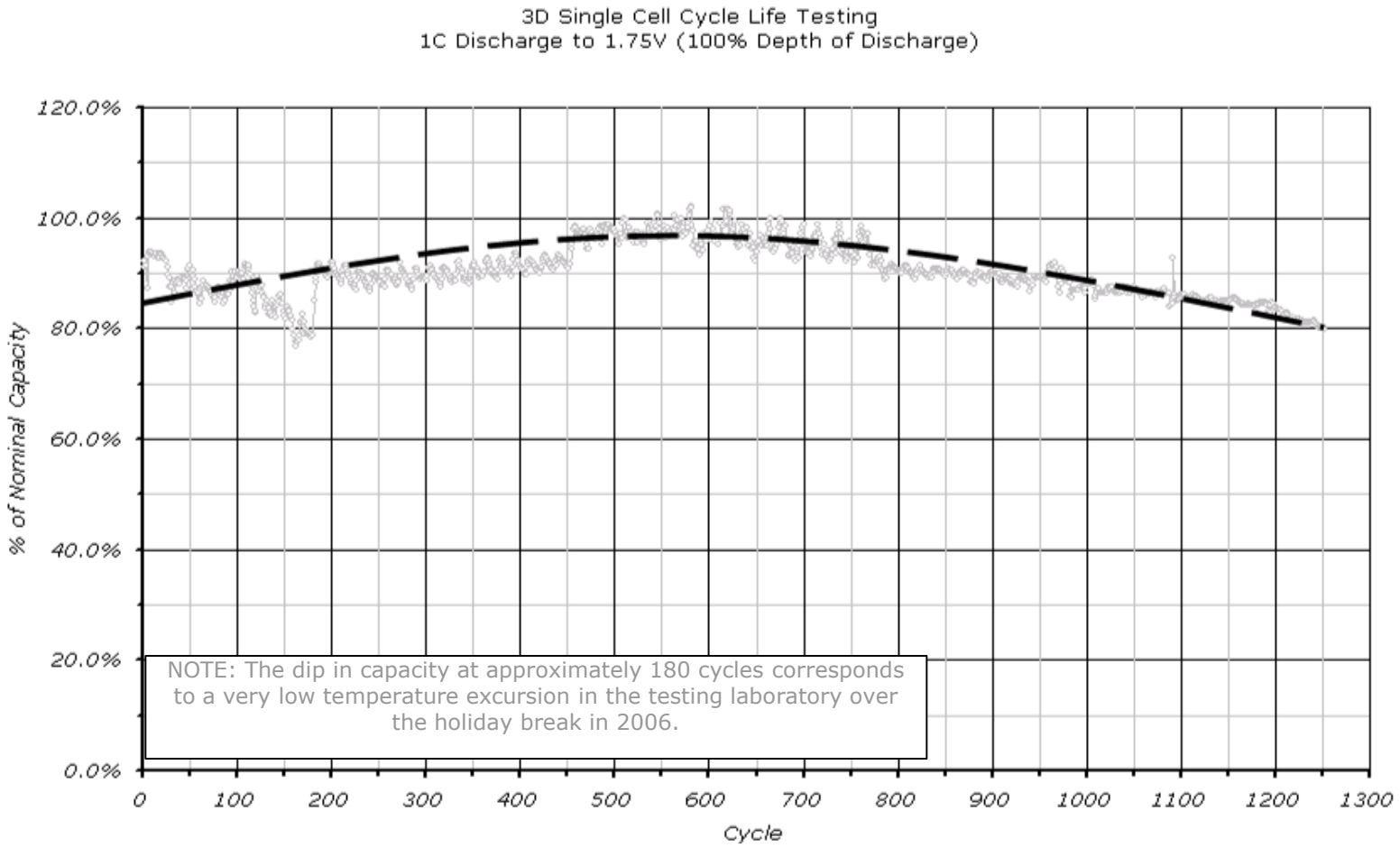
3D Platform Internal Test Data



At -20℃ the 3D platform offers up to 5x the retained capacity as compared to a traditional lead acid battery.

Internal testing

3D Platform Internal Test Data



Traditional lead acid batteries deliver around 200-300 cycles at 100% DoD at the 1C discharge rate - this 3D cell delivered 4-5x the cycles.

Internal testing