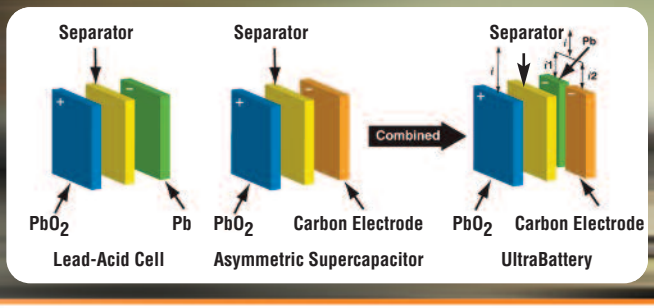
A CLOSER ANALYSIS OF THE ULTRABATTERY®



What Is The UltraBattery®?

The UltraBattery is unique from a traditional lead-acid battery design. The UltraBattery combines the advantages of an Advanced VRLA (a carbon-enhanced Valve Regulated Lead-Acid) battery with the advantages of an asymmetric supercapacitor. This enables the optimal balance of an energy storing lead-acid battery with the quick charge acceptance, power discharge, and longevity of a capacitor.

While capacitors accept and deliver high levels of power, they can't store much energy, and therefore, are quickly depleted. They are often used in conjunction with batteries to provide both power and energy. Using the two together usually requires electronic controllers and complex algorithms to balance power and energy between both units. The UltraBattery eliminates the need for additional electronic control and multiple energy storage devices since both energy storage and capacitor functions are integrated into one battery unit.

How Does The UltraBattery® Compare To Traditional Automobile Batteries?

Traditionally, lead-acid batteries for automotive use are designed to provide power for cranking the engine. The vast majority of time the battery is maintained in a high state of charge so that it will have enough engine starting power.

However, as traditional vehicle designs evolve to rely on an electric motor to meet peak acceleration needs while recapturing the energy from braking, the battery is required to operate under different power demands and recharging capabilities. Conventional lead-acid batteries, even those of an Absorbed Glass Mat (AGM) or Gelled Electrolyte VRLA design, will have limited longevity when operated under these conditions.

The UltraBattery is designed to operate at a Partial State of Charge (PSOC). From start-stop features to regenerative breaking and power assistance, the UltraBattery is required to accept and deliver large current pulses in PSOC conditions.

The UltraBattery enhanced design extends the battery's longevity in a type of service that would severely shorten a traditional battery's life due to sulfation. Under laboratory evaluation, the UltraBattery meets or exceeds the targets of power, available energy, cold cranking, and self-discharge set by the US FreedomCar for both minimum and maximum power-assist HEV systems.

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Figure 1. Shows the UltraBattery test vehicle when it went over 100K miles without a conditioning charge on January 15, 2008. The UltraBattery demonstrated better cycle life performance than the replaced Ni-MH battery pack.

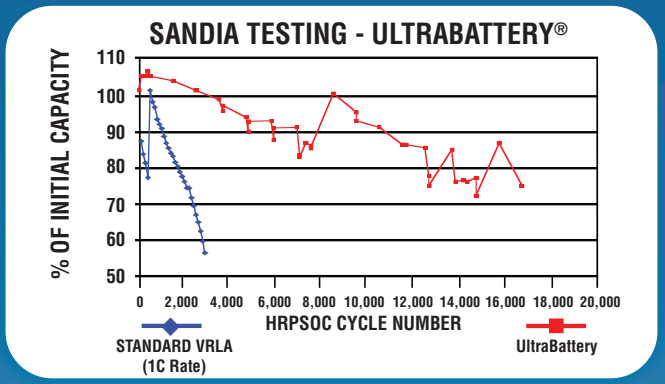
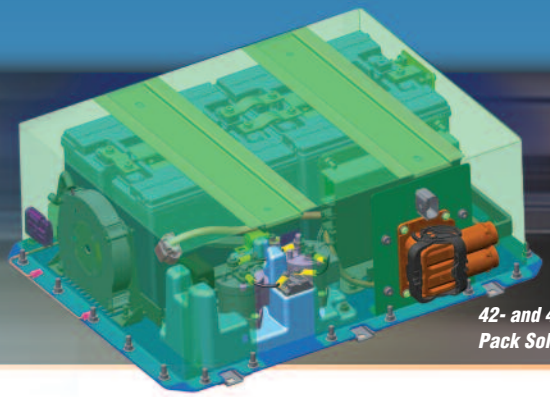


Figure 2. Shows East Penn's UltraBattery performance in simulated wind application tests at Sandia National Laboratories. The UltraBattery lasts 14,000 cycles longer than a standard VRLA battery and maintains a higher capacity rating.

UltraBattery Hybrid Test Vehicle



42- and 48- Volt Pack Solutions

What Applications Benefit Most From The UltraBattery® Design?

The UltraBattery is ideal for HEVs which utilize regenerative energy breaking events to help recharge the battery and power assist functions to help conserve fuel consumption. The UltraBattery can accept and deliver higher current pulses than an Advanced AGM VRLA battery product, and performs better under High-Rate Partial State of Charge (HRPSOC) conditions.

In fact, UltraBattery prototypes were tested by the Advanced Lead Acid Battery Consortium (ALABC) on the General Motors' Millbrook Proving Grounds in England (see figure 1). The battery pack of a Moderate HEV, was replaced with an UltraBattery pack. The UltraBattery pack's volume was no greater than the Nickel-Metal Hydride (Ni-MH) battery pack that was replaced. The UltraBattery pack performed exceptionally well with no maintenance or module balancing. Measured fuel economy and CO_2 emissions were essentially equal to the traditional Ni-MH battery pack.

Two moderate hybrid UltraBattery cars with modified UltraBattery packs are also making significant inroads toward the hybrid electric vehicle market.

One of these UltraBattery cars, supported by the DOE and ALABC, has reached over 100,000 miles in some of the country's hottest conditions in Phoenix, Arizona. Not only has it performed exceptionally well with an over 2-year old pack in high heat, but it is also running in a fleet operation that creates extreme severe service conditions with no significant loss in module capacity.

A second UltraBattery car undergoes consistent road testing and battery system analysis at East Penn's manufacturing complex in Lyon Station, PA. The 3-year old battery pack, with over 75,000 miles, was recently evaluated during its milestone of 50,000 miles. The battery pack showed no performance degradation. In fact, the individual module voltages actually converged as they aged. This further proves UltraBattery technology can diminish the complexity and expense of other battery technologies and their battery monitoring systems.

East Penn is also developing other UltraBattery pack solutions for 42- and 48-volt systems. This pack is being designed for easy integration. Its Battery Management System is characterized for optimized use with the UltraBattery design. As a complete custom system integrator, East Penn has the experience and resources to develop other types of special packs and voltage configurations for customized needs.

Renewable energy sources like wind and solar are currently being tested with the UltraBattery product because of its ability to perform well under a High-Rate Partial State of Charge (HRPSOC). Wind and solar energy generation applications may have constraints on power generation including maximum generation levels and rates of change of power generation. The power storage management enabled by the UltraBattery helps to maximize the efficiency of its energy generation. The UltraBattery has been under evaluation in a simulated wind application test at Sandia National Laboratories. It performed exceptionally well in terms of extended cycle life and power capacity (see figure 2). More testing is currently being performed at Sandia National Laboratories showing promising result for the UltraBattery in other wind and photovoltaic applications.

The UltraBattery provides the most effective technology (cost and practicality) to build storage solutions to support electrical grid stabilization. The UltraBattery's superior performance under HRPSOC conditions is ideal for providing frequency regulation ancillary and demand management services to optimize grid efficiency.

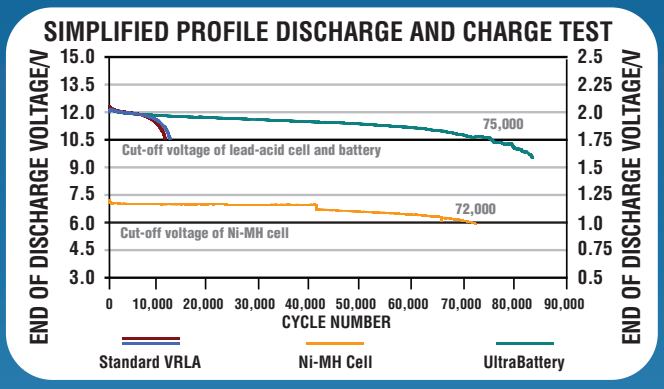


Figure 3. Demonstrates the cycling performance of standard VRLA cells, the UltraBattery, and a Nickel-Metal Hydride (Ni-MH) cell. The UltraBattery reaches the cut-off voltage at 75,000 cycles, which is about 5.8 times longer than that of the VRLA control cells.

The Ni-MH cell, like the one presently used in Moderate HEVs, reaches the cut-off voltage at about 72,000 cycles.

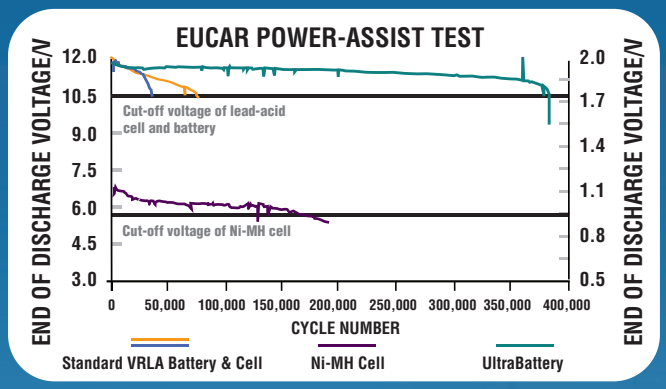
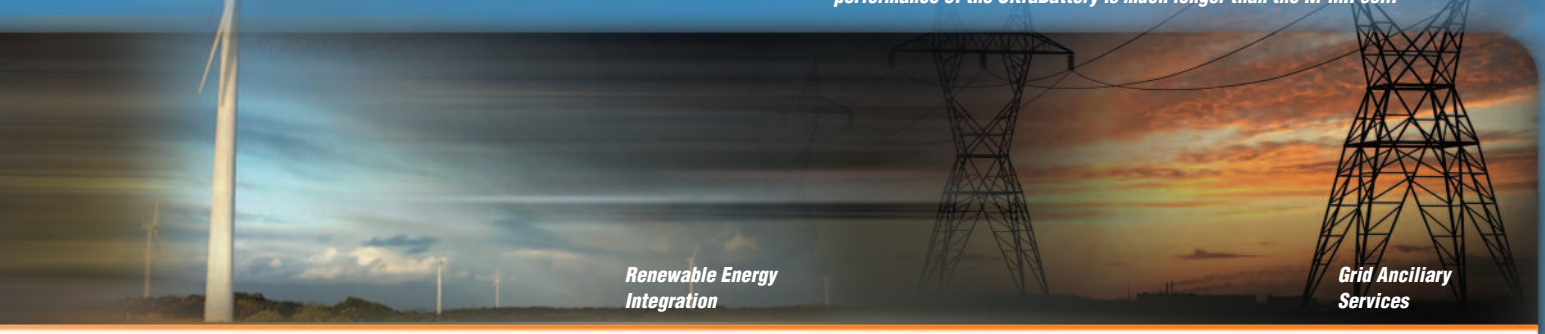


Figure 4. Demonstrates the cycling performance of a standard VRLA cell, a standard VRLA battery, an UltraBattery, and a Ni-MH cell. The voltage of a standard VRLA cell decreases gradually until it reaches the cut-off voltage after 32,500 cycles. The voltage of the standard VRLA battery also decreases gradually until it reaches the cut-off at 73,100 cycles. The Ni-MH cell reaches the cut-off voltage of 0.95V after 180,000 cycles. The UltraBattery reaches the cut-off voltage after 373,000 cycles. The results show that the cycling performance of the UltraBattery is much longer than the Ni-MH cell.



Motive Power applications that rely on fast and opportunity charging are another good example of batteries that undergo PSOC conditions. The positive results found with the UltraBattery design will improve the longevity of Motive Power batteries that are used under these higher current charging regimens for short durations.

Why Use The UltraBattery® Over Other Alternative Battery Chemistries?

The UltraBattery product is very "Green." Green in an environmental sense because it can be recycled the same way as any other lead-acid battery product, and green in a monetary sense because it has one of the lowest cost-per-power ratios. In fact, the cost is significantly less than Lithium Ion and Nickel-Metal Hydride products. This allows one of the most cost effective solutions for many HEV, renewable wind and solar, electrical grid ancillary services, and Motive Power applications.

An innovative recycling infrastructure has been developed to virtually recycle 100% of a lead-acid battery, and regulations ensure that these products are returned to appropriate locations. This applies for the UltraBattery as well. Other battery chemistries can't come close to the recycling advances and developed infrastructure to reclaim the lead-acid product. The innovative processes for recycling lead-acid batteries and the facilities that support it have progressively advanced over the years to become one of the greatest recycling success stories in the global marketplace.

The UltraBattery has proven itself test after test in terms of cycle life performance over Ni-MH batteries. The cycling performance of the UltraBattery was evaluated against Ni-MH cells using a simplified discharge and charge profile to simulate HEV driving conditions (see figure 3). The EUCAR power-assist was used to simulate Moderate HEV driving conditions (see figure 4).

The battery was subjected to each of the tests repetitively until the voltage reached the specified cut-off voltage. These screening tests give valuable insight into the UltraBattery's potential cycle life performance.

The UltraBattery technology is also one of the most cost effective and safest solutions for larger battery installations (like those for renewable wind and solar power generation) compared to alternative battery technologies. The charging and discharging of lead-acid batteries at rates from a few milliamps to many thousands of amps is performed safely on a daily basis. Lead-acid batteries operate safely at wide ranging ambient temperatures and in every geographical location from hot desert conditions to cold arctic environments. These attributes prove that lead-acid chemistry is an abuse tolerant, versatile, and safe technology, which is especially critical when there is a large amount of battery power in one location.

While East Penn continues to explore new alternative battery technologies, the company also strongly believes there is an evolving role for lead-acid technology in a growing number of applications. UltraBattery technology as well as other advancements in new battery technology helps prove that East Penn's beliefs are well founded.

The company is excited to further explore the UltraBattery as it serves the HEVs of today, and the future Electric Vehicles of tomorrow. The UltraBattery's future role in smart electrical grid technology will be a significant asset to the efficiency of its development as well as assimilation of wind and solar power. The UltraBattery is an exciting new power solution that will have the most immediate impact on cost effective energy conservation and environmental protection efforts.

CENTRAL SERVICES

AUTOMOTIVE BATTERY PLANT A-3

SMELTER AND REFINERY


DISTRIBUTION CENTER


SPECIALTY BATTERY PLANT S-1


KELLER TECHNICAL CENTER


CABLE AND WIRE PLANT


INDUSTRIAL BATTERY PLANT


INJECTION MOLDING / FLEET MAINTENANCE


CORYDON, IA BATTERY PLANT A-5

World's Largest and Most Modern Single-Site Battery Manufacturing Facility

Since 1946, East Penn has been producing high quality batteries and battery accessories for the automotive, commercial, marine, industrial, stationary, and specialty markets. A progressive company committed to the future, East Penn operates one of the largest single-site manufacturing facilities in the industry with vertical integration capabilities that encompass every stage of battery production. The company also operates a manufacturing facility in Corydon, IA to help accommodate the company's widespread growth. To keep up with the increasing demand for high quality products, East Penn is pursuing an aggressive expansion plan. In fact, the new high-tech facilities and computer monitoring and control systems have made the company the industry's most technologically advanced battery manufacturer.

Facilities at its 520-acre single-site manufacturing complex in Lyon Station, PA include four automotive battery plants, an industrial battery plant, a specialty battery plant, a state-of-the-art oxide facility, an acid reclamation plant, three modern technical centers, an EPA permitted lead smelter and refinery, a pilot plant, two water purification plants, a fully equipped machine shop, two injection molding plants, a fleet repair and maintenance garage, plus dozens of other support facilities. Just miles away, East Penn owns and operates a wire, cable, and battery accessory plant and a large distribution center complex fully stocked with an extensive inventory of our high-quality products.

The quality of East Penn's products is recognized worldwide and has met the global requirements of ISO 9001 and ISO/TS 16949 certification standards. East Penn is also a leader in innovative recycling and has met global environmental requirements of ISO 14001 certification standards.

Staffed with a long-term management team, East Penn is an independent company dedicated to producing high-class products and service supported by East Penn's exclusive advantages to assure complete satisfaction and beyond to our partners and customers worldwide.

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E.P.M. Form No. 1562 9/13