A CLOSER ANALYSIS OF SYNERGY® BATTERIES

How Does Synergy® Compare To Standard VRLA Batteries?

VRLA (VALVE REGULATED LEAD ACID) BATTERIES are sealed and use special pressure valves with a recombination reaction to prevent the escape of hydrogen and oxygen gases normally lost in a flooded lead-acid battery. These batteries are maintenance-free and completely spillproof . VRLA technology encompasses both gelled electrolyte and Absorbed Glass Mat (AGM) batteries. Both types are valve-regulated and can have significant advantages over flooded lead-acid products in some applications.

SYNERGY (ADVANCED CARBON AGM) BATTERIES integrate a special carbon additive to the negative electrode and have other design enhancements. This increases the ability of the battery to accept electric current and to discharge current while at a Partial State of Charge (PSOC). This carbon enhancement protects the negative electrode from accelerated deterioration, while performing multiple cycles of recharge and discharge.

How Does Synergy® Compare To Traditional Automotive Batteries?

Traditional 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 include more electronic enhancements such as start-stop features and regenerative breaking, the battery will become an integral part of the vehicle's energy management system. This new role will require it to operate under PSOC conditions.

Synergy batteries are designed to operate at a PSOC. Start-stop features, regenerative breaking, and other electrical enhancements require batteries that can meet certain performance and longevity expectations during PSOC service.

While operating at a PSOC the battery will accept higher electrical currents and recharge efficiently. It also needs to discharge current very quickly. Synergy batteries are designed to meet the performance requirements necessary under PSOC conditions (see figure 1&2). Their enhanced negative electrode extends the battery's life in a type of service where life would be severely shortened due to negative plate sulfation.

Laboratory and field-testing have shown that batteries with this special carbon enhancement have five times the longevity of a standard VRLA battery in PSOC applications.

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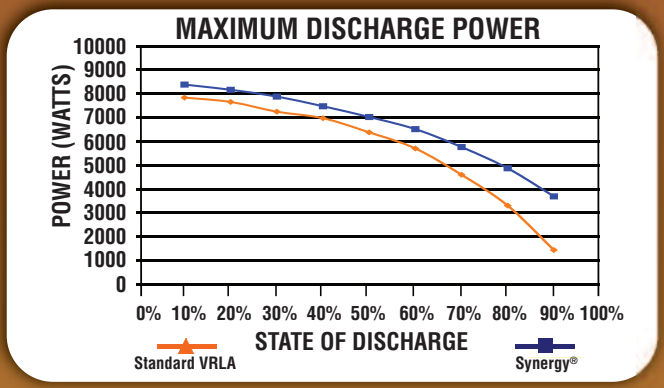

Figure 1. Shows that Synergy batteries deliver maximum discharge power at a lower state of charge than standard VRLA batteries.

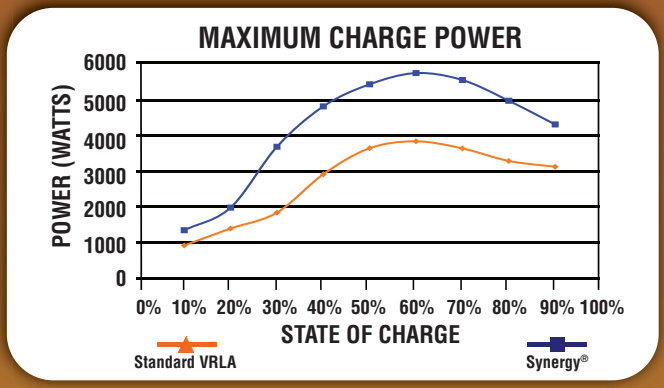

Figure 2. Shows that Synergy batteries have maximum charging power at a lower state of charge than standard VRLA batteries.

What Applications Benefit Most From The Synergy Battery Design?

Synergy batteries are ideal for Micro or Mild HEVs. They provide one of the most cost effective alternatives to power enhanced electronic controls like start-stop technology, electric power steering, electronic valve control, regenerative breaking, intelligent alternator control, and an electric water pump. These easily integrated energy saving solutions lead to significant fuel savings and large reductions in CO_2 emissions (see figure 3).

Transit systems will also benefit from the Synergy product. Laboratory tests in conjunction with an Advanced Lead Acid Battery Consortium (ALABC) project have shown five times the cycle life in a HEV bus (see figure 4).

Renewable wind and solar applications are currently being tested with Synergy products because of their ability to perform well under a PSOC. Wind and solar power generation applications may have constraints including maximum generation levels and rates of change of power generation. The power storage management enabled by Synergy helps to maximize the efficiency of its energy generation. An East Penn Synergy battery has been evaluated 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 5).

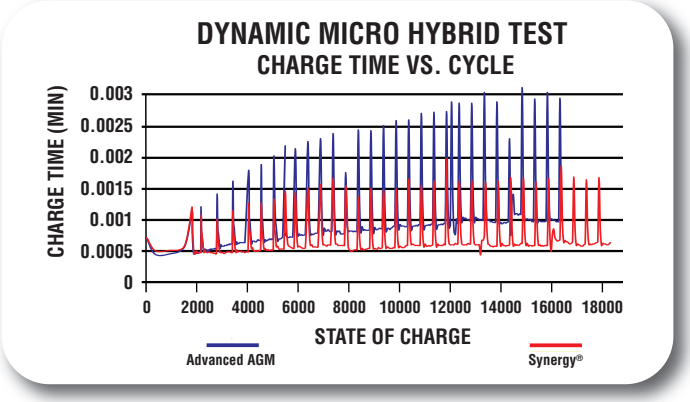

Figure 3. The Synergy has a faster charge time in the Dynamic Micro Hybrid Test profile, which enables a start-stop vehicle to perform the stop-start function more frequently. Synergy charge time does not significantly increase over battery life so it will perform much longer than traditional AGM batteries.

Synergy batteries are ideal to support electrical grid stabilization such as demand management services to optimize grid efficiency.

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 Synergy battery design will improve the longevity of Motive Power batteries that are used under higher current charging regimens for shorter durations.

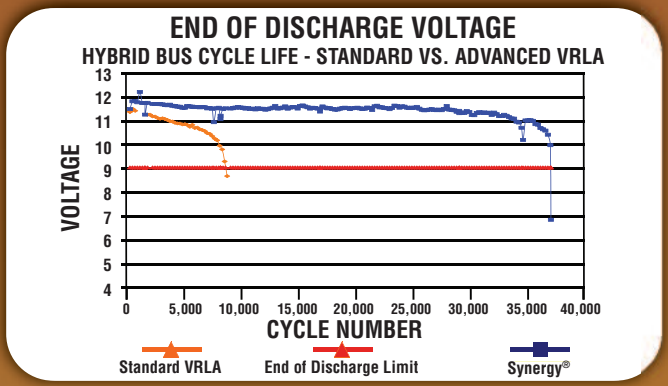

Figure 4. ALABC test shows that the Synergy battery has five times the cycle life of a standard VRLA battery in a simulated hybrid bus.

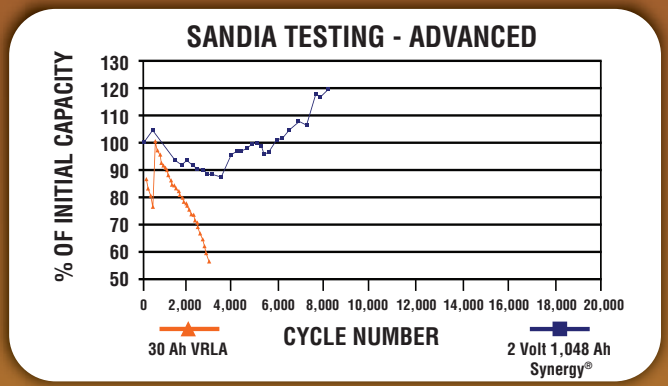

Figure 5. Shows East Penn's Synergy battery performance in simulated wind application tests at Sandia National Laboratories. The Synergy battery actually increases capacity by 20% after 8,000 plus cycles.

Why Use Synergy Over Other Alternative Battery Chemistries?

Synergy batteries are very "Green." Green in an environmental sense because they can be recycled the same way as any other lead-acid battery product, and green in a monetary sense because they have one of the lowest cost-per-power ratios. In fact, the cost is significantly less than Lithium Ion and Nickel-Metal Hydride products. This enables one of the most cost effective battery solutions for many HEVs, renewable energy 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 newer advancements of carbon-based, advanced lead-acid technology 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.

Synergy battery 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. Synergy battery 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 use of Synergy batteries as the company continues to experiment with different carbon materials, load levels, and innovative non-standard battery fabrication techniques. Synergy's ability to serve HEV, renewable energy, Motive Power and grid service applications has the potential to have immediate impacts on cost effective energy conservation and environmental protection efforts.

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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