

MORE POWER – LESS SPACE®



An Analysis of 12-volt VRLA Cabinet Solution versus 2-volt Flooded for UPS Applications

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“The Deka Unigy VRLA Cabinet Solution is the optimal choice for UPS applications.”

The Deka Unigy Valve-Regulated Lead-Acid (VRLA) Cabinet Solution reduces floor space by over 69% providing over 2X more power per watts / ft² than any 2-volt flooded product on the market. In a standard five-system configuration it provides lifetime savings in excess of \$659,000.

Data is a crucial component of business operations and protecting that data has never been more important to day-to-day operations. The Uninterruptible Power Systems (UPS) that support them are critical and these systems are only as dependable as their battery backup. This requires battery systems that are high-quality, use advanced technology, and are above all else, reliable.

Flooded battery designs have traditionally been the option for these applications. While flooded technology is effective, they require regular maintenance, elaborate spill containment, sophisticated monitoring equipment and vast amounts of premium space, all adding up to increased cost, time, and labor.

East Penn, highly proficient at manufacturing VRLA designs, developed a front-access 12-volt product line specifically for UPS applications. East Penn's VRLA technology has many proven advantages such as space savings, increased safety, ease of installation, and less maintenance. This is especially beneficial in the data center market where extended cost projections and space premiums are an essential part of the decision making process.

The Deka Unigy Cabinet Solution with VRLA batteries is designed specifically for the UPS market. It provides an extremely advantageous solution and complies with the exacting and stringent guidelines and specifications of data centers and web hosting environments. Considering all factors, using a Total Cost of Ownership (TCO) analysis illustrates that the Deka Unigy VRLA Cabinet Solution is the optimal choice for UPS applications.

TCO ANALYSIS: MAINTENANCE AND SAFETY

Deka Unigy VRLA batteries Have the Advantage

THE MAINTENANCE-FREE DESIGN ADVANTAGE

Deka Unigy VRLA: This battery is a **maintenance-free** design, requiring **no handling** of electrolyte or hydrometers. This eliminates excessive labor and training costs associated with flooded products. A maintenance-free design does not require frequent checks, drastically reducing the potential for human error or damage that could significantly affect the battery's performance and life.

Flooded: A flooded battery consists of a free flowing electrolyte. This requires periodic maintenance to check and maintain the specific gravity and electrolyte level of each cell. Should the electrolyte fall below the plate level, it would expose the negative plate to oxygen, which reduces the plate's capacity, and eventually decreases the capacity of the entire battery.

THE SAFETY ADVANTAGE

Spill Containment

Deka Unigy VRLA: Deka Unigy batteries have **no free flowing electrolyte**, and the only spill containment requirement is a small wall-mounted pack. The typical pack usually contains a 10-15 gallon container with gloves, face shield, neutralizing solution, and absorbent material, which can all be disposed of in the container.

Flooded: When using a flooded battery in a UPS application, excessive spill containment is a necessary requirement for the battery room. Regulations require that a 2" inch perimeter of space exists around the entire battery module with surrounding absorbent pillows designed to soak up and neutralize acid. These pillows are only required to handle 8 gallons of acid, which is the equivalent of the acid found in only one cell. A typical 710 kilowatt per battery (kWB) system has approximately 240 cells that contain 1,900 gallons of acid. Should something happen to even a few of the battery cells, the pillow's spill containment capabilities would soon be inadequate.

Ventilation

Deka Unigy VRLA: Deka Unigy batteries feature an **exclusive one-way pressure relief valve** to allow very small amounts of gas to vent to the atmosphere, when utilizing recommended charging procedures. Rooms with Deka Unigy batteries **require only standard office ventilation equipment** eliminating the need for expensive systems.

Flooded: Additional ventilation is a requirement of flooded batteries in UPS applications. When a flooded battery is charged it generates oxygen at the positive plate and hydrogen at the negative plate. One hundred percent (100%) of these gasses are released into the environment through the battery

vents. With flooded batteries, the battery room requires an elaborate hydrogen detection and evacuation system to disperse all of these gasses that are released into the air. Should this ventilation system fail, it would contaminate air quality.

Exposure to Acid and High Voltage

Deka Unigy VRLA: Its maintenance-free design means that **adding water is not required** over the entire life of the battery, and does not require the more manual and time consuming use of a hydrometer. A front terminal design prevents the user from having to reach over top of the battery around high voltage cables and contacts to perform routine maintenance checks. These aspects **protect employees** from harmful acid or unnecessary prolonged exposure to a high voltage environment.

Flooded: Scheduled maintenance to check and maintain the specific gravity and electrolyte level of each cell is required. Operators must reach over the top of the battery to open a vent cap and check the acid with a hydrometer and add water if the electrolyte level is low. Many stacked systems (3-tier rack) require an employee to use a ladder and reach over high voltage connections just to make routine checks. This is a potentially hazardous situation that can be avoided with a front access, Deka Unigy VRLA design. ■

TCO ANALYSIS: OPTIMIZING ESSENTIAL FACILITY SPACE

More Power – Less Space®

More Power

The more power compressed into a smaller space, the greater the benefit in UPS applications. The Deka Unigy VRLA Cabinet Solution clearly offers “More power – Less space.” It has a clear advantage over any flooded product on the market and outperforms flooded competitors by over 206% in watts/ft² and over 137% in watts/ft³.

Single System Product Comparison

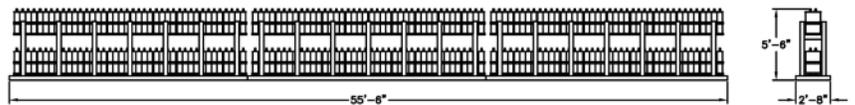
UPS 710 kWB

Product Type	Watts /ft ²	Watts /ft ³	Width	Depth	Height
2-volt flooded 2 Tier	4,711	869	55'6"	2'8"	5'6"
12-volt Deka Unigy VRLA 4 strings of 40-HR7500ET	14,419	2060	17'10"	2'9"	7'

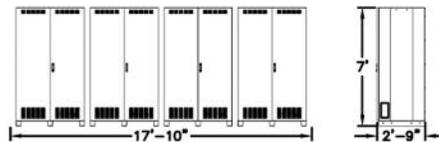
Less Space

A rapidly growing cost in the UPS market is the overall footprint or size of space needed for battery systems. The footprint of the Deka Unigy VRLA Cabinet Solution compared to flooded products on the market can save over 69% in space. Whether real estate costs are \$5 or \$500 per square foot, the savings are substantial. For example, if real estate costs are \$500 per square foot, the savings realized by using the Deka Unigy VRLA Cabinet Solution is over \$532,000. ■

2-volt Flooded Two Tier



Deka Unigy VRLA HR7500ET



TCO ANALYSIS: Extended Cost Savings

While floor space and power density are critical, there are also many other related cost factors to consider such as spill containment system and preventative maintenance costs that make up a TCO analysis. When comparing the Deka Unigy VRLA Cabinet Solution to a flooded system, savings reach thousands of dollars a year. Based on the example for five 710 kW systems over a 10 year period, **(the Deka Unigy VRLA Cabinet Solution would provide lifetime savings of over \$659,000).**

As a 12-volt battery has half the design life of a 2-volt, the user will have to replace their 12-volt batteries during the same life period. This analysis details all the costs involved when replacing 12-volt batteries. Even with this additional step, the Deka Unigy VRLA Cabinet Solution still produces more significant savings for a much lower TCO. ■

Description	2-volt flooded two tier			12-volt Deka Unigy VRLA		
	Materials	Labor	Total	Materials	Labor	Total
INITIAL COSTS						
Real Estate Cost (@ \$500 / Square Foot) 36" Isles	825 sq. feet		\$412,500	245 sq. feet		\$122,500
Real Estate Cost (@ \$500 / Square Foot) Batteries	710 sq. feet		\$355,000	225 sq. feet		\$112,500
Battery Cost	\$793,500		\$793,500	\$336,000		\$336,000
Rack/Cabinet/Open Rack	\$32,067		\$32,067	\$154,560		\$154,560
Hydrogen Detection System	\$6,000		\$6,000	\$3,750		\$3,750
Hydrogen Evacuation System	\$12,500 (est.)		\$12,500 (est.)			
Spill containment system	\$21,600		\$21,600	\$750		\$750
On Site Battery Installation		\$76,000	\$76,000		\$24,000	\$24,000
TOTAL INITIAL COSTS	\$865,667	\$76,000	\$1,709,167	\$495,060	\$24,000	\$754,060
ONGOING COSTS						
Preventative Maintenance (Annual-10 years)		\$180,000	\$180,000		\$120,000	\$120,000
Scrap Value				(\$33,600)		-\$33,600
Replacement Cost Batteries				\$336,000		\$336,000
Replacement Battery Removal/Install					\$24,000	\$24,000
Replacement Battery Acceptance Testing					\$25,000	\$25,000
Replacement Project Management Costs					\$3,750	\$3,750
TOTAL ONGOING COSTS PER UPS		\$180,000	\$180,000		\$120,000	\$475,150
Number of years			10			10
Total Cost over lifetime		1,889,167	\$1,947,560			\$1,229,210
Cost per annum		188,916	\$194,756			\$122,921
Deka Unigy 10-year savings = \$659,957						

QUALITY ANALYSIS: VRLA Product for UPS

East Penn manufacturing is on the forefront of the latest technology with its leading-edge VRLA design. The company's extensive background with over 65 years of experience in the battery industry and over 25 years of manufacturing VRLA batteries support the company's advanced UPS battery product. Detailed workmanship, proven manufacturing

processes and the finest raw material resources results in batteries that deliver the industry's most reliable service in UPS applications.

Grid Casting

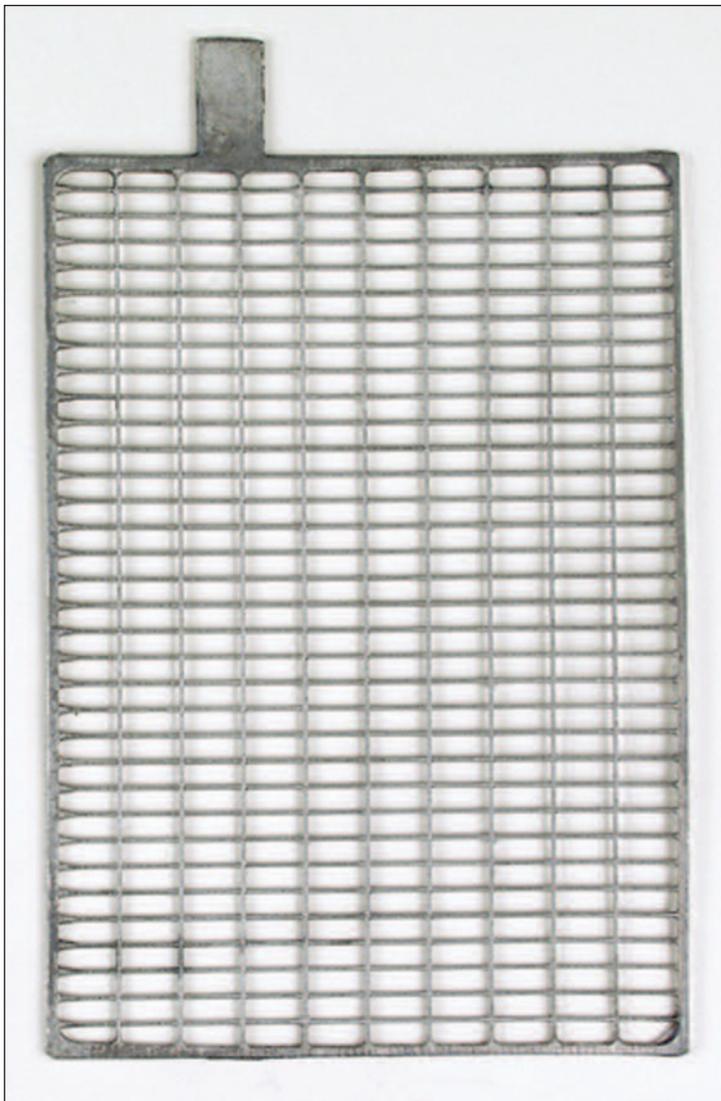
The internal supporting framework of the battery is called grids. Grids serve as a path for transferring electrical current. The positive grid contains a pure virgin

lead (99.99%), high tin alloy. The negative grid is also alloyed with a premium lead calcium blend. The amount of pure virgin lead in the positive grid increases the battery's conductivity capabilities and resists internal corrosion to extend battery life. The grids precise alloy blends and tested structural integrity withstands the naturally corrosive action of the acid to ensure reliable performance and optimize battery life.

Pasting & Curing

East Penn's paste is composed of a mixture of sulfuric acid, water, and a specially formulated lead oxide. Made with pure virgin lead (99.99%) and manufactured with a proprietary and exclusive formula on-site at its own oxide mills. A unique computerized mixing system allows the combination of these materials to be precisely mixed into a paste-like consistency. The paste is uniformly and automatically applied to the grid by computer-integrated pasting machines. East Penn's exacting process for applying the correct amount and density of paste is critical for capacity and life.

The plates are then moved into state-of-the-art hydrosetting chambers, which rigidly control time, temperature and humidity, all crucial factors to proper plate curing. The exclusive curing process paired with the unique crystallization structure of Deka's paste optimizes the plate's performance and extends life. ■



Deka Unigy Grid

IPF® Technology Formation

Deka plates go through an exclusive two-step formation and charging process to provide performance and consistency. First, each Deka Unigy plate is formed individually with IPF (Individual Plate Formation) Technology. East Penn is the only manufacturer in North America to use IPF Technology. After formation, each plate is visually inspected to ensure the plate is completely formed. IPF Technology optimizes power capacity, cell consistency, and long term reliability.

The second step is placing the bat-

tery through a boost charging phase where the cells are charged and optimized for long use. This exclusive formation technique minimizes potential equalizing, saving the customer both time and money.

Other manufacturers form the fully assembled cell directly in the battery jar. This precludes 100% inspection of plate formation without complete cell destruction. This formation process creates an environment prone to unequal plate formation leading to unequal cell-to-cell voltages. Batteries with unequal voltages require fu-

ture equalize charges adding to the battery's total cost of ownership and the unreliability of the product.

Self Sealing Valve

Another unique advantage to Deka Unigy batteries is its exclusive valve. The valve, manufactured by East Penn, is 100% tested for opening, closing and back pressure. It releases pressure and quickly self seals to prevent oxygen from entering the battery. This eliminates potential oxidation of the negative plate preventing premature voltage loss and product failure. ■

PLATE FORMATION



Fully formed Deka Unigy plate using IPF® Technology. This superior process is exclusive to East Penn in North America.



A plate formed in the battery case. White areas indicate plate is not fully formed.

THE DEKA UNIGY VRLA CABINET SOLUTION

Critical Power for UPS Applications

Quality and Performance

- Exclusive IPF® Technology optimizes power capacity, cell consistency, and long-term reliability
- Case and cover heat sealed and 100% tested to prevent leaks
- Epoxy-sealed posts eliminate leaks
- Puncture resistant micro-porous glass mat separators extend life
- Computer-aided design and manufacturing control processes and standards to ensure quality products

Reduced Maintenance and Added Safety

- Front access design for easy installation and maintenance
- Maintenance-free batteries require no handling of electrolyte or hydrometers
- No elaborate spill containment or ventilation necessary
- Reduced risk to employees by eliminating potentially hazardous checks

MORE POWER, LESS SPACE®

- Advanced VRLA technology for superior high rate, instantaneous power
- Outperforms flooded competitors by over 206% in watts/ft² and over 137% in watts/ft³.
- Reduced floor space by over 69% than any flooded product

Value and Assurance

- Certified to California Building Code 2007 and International Building Code 2006 Category E
- Flame arresting, high pressure, self-sealing valves are 100% factory tested
- All batteries meet or exceed Institute of Electrical and Electronics Engineering 1187-2002 and 1188-2005 requirements at shipment
- Product is supported by one of the industry's most reputable, quality-conscious, and innovative companies

With the highest quality performance, reduced maintenance, increased safety, more power in less space, and the best value in the industry, the Deka Unigy VRLA Cabinet Solution is a perfect fit for UPS applications. Other systems may offer short-term savings, but additional expenses will end up costing much more in years to come. The Deka Unigy VRLA Cabinet Solution combines the high quality performance critical to meet performance needs while providing a lower TCO, which even further increases the value of the advanced battery system. In a marketplace where reliability matters the most, trust the Deka Unigy VRLA Cabinet Solution to deliver superior performance for all UPS backup power system needs. ■

THE VALUE BEHIND THE PRODUCT

Environmental Stewardship and Innovative Recycling

East Penn has a long history of industry leadership with environmental responsibility and good stewardship. Surrounded by thousands of acres of fertile farmland, East Penn strives to preserve the environment.

Since 1946, East Penn has made safe recycling an everyday practice. The company began as a battery rebuilding company, cleaning and repairing old batteries for reuse. More than 65 years later, East Penn operates the industry's most technologically advanced recycling facility where thousands of batteries are recycled

a day. This on-site smelter saves transportation costs of 100,000 tons of lead from off-site locations and allows tighter controls of lead quality. The facility has been selected as a model site by the U.S. EPA.

Its Lyon Station, Topton, and Kutztown facilities are certified to ISO14001 Environmental Management System standards. These standards are recognized worldwide and prove a company's compliance to a complete environmental management system, helping to protect the environment for future years to come.

East Penn's dedication to safe battery recycling means complete commitment to proper battery disposal. The customer will never have to worry about hefty fines, penalties, or paperwork burdens associated with hazardous waste disposal laws. East Penn's modern facilities and good stewardship makes it the most environmentally conscious and proactive battery manufacturer in the world. ■



Since 1946, East Penn has been producing high quality batteries and battery accessories for the automotive, commercial, marine, industrial, stationary, and specialty markets.

Facilities at its 520-acre manufacturing complex in Lyon Station, PA is the world's largest and most modern single-site battery manufacturing

facility and includes four automotive battery plants, an industrial battery plant, a specialty battery plant, a state-of-the-art oxide facility, an innovative recycling infrastructure, and dozens of verti-

cally integrated capabilities and other support facilities. An additional manufacturing facility in Corydon, IA helps accommodate widespread growth. East Penn owns and operates a wire, cable, and battery accessory plant and a multiple facility distribution center just miles away from its Lyon Station complex.

New high-tech facilities and computer monitoring and control systems have made the company an industry leader in advanced battery manufacturing.

East Penn's quality manufacturing 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 committed to the future and dedicated to producing high-class products and service to assure complete satisfaction, above and beyond the industry standard, to its partners and customers worldwide. ■



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