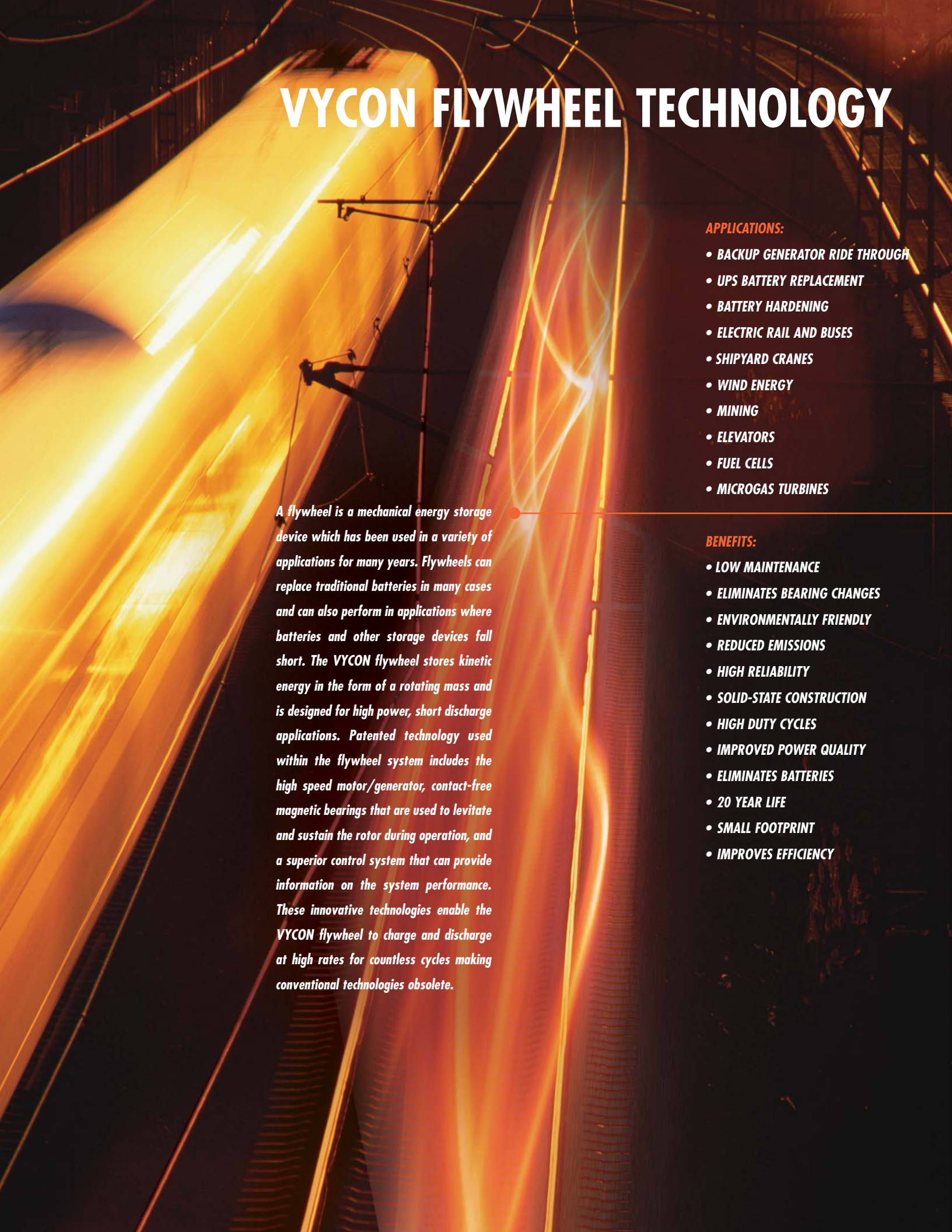
SUPERIOR FLYWHEEL ENERGY STORAGE SOLUTIONS

IT'S TIME TO EXPECT MORE FROM AN ENERGY STORAGE SOLUTION

VYCON

POWER. REDEFINED.

VYCON FLYWHEEL TECHNOLOGY



A flywheel is a mechanical energy storage device which has been used in a variety of applications for many years. Flywheels can replace traditional batteries in many cases and can also perform in applications where batteries and other storage devices fall short. The VYCON flywheel stores kinetic energy in the form of a rotating mass and is designed for high power, short discharge applications. Patented technology used within the flywheel system includes the high speed motor/generator, contact-free magnetic bearings that are used to levitate and sustain the rotor during operation, and a superior control system that can provide information on the system performance. These innovative technologies enable the VYCON flywheel to charge and discharge at high rates for countless cycles making conventional technologies obsolete.

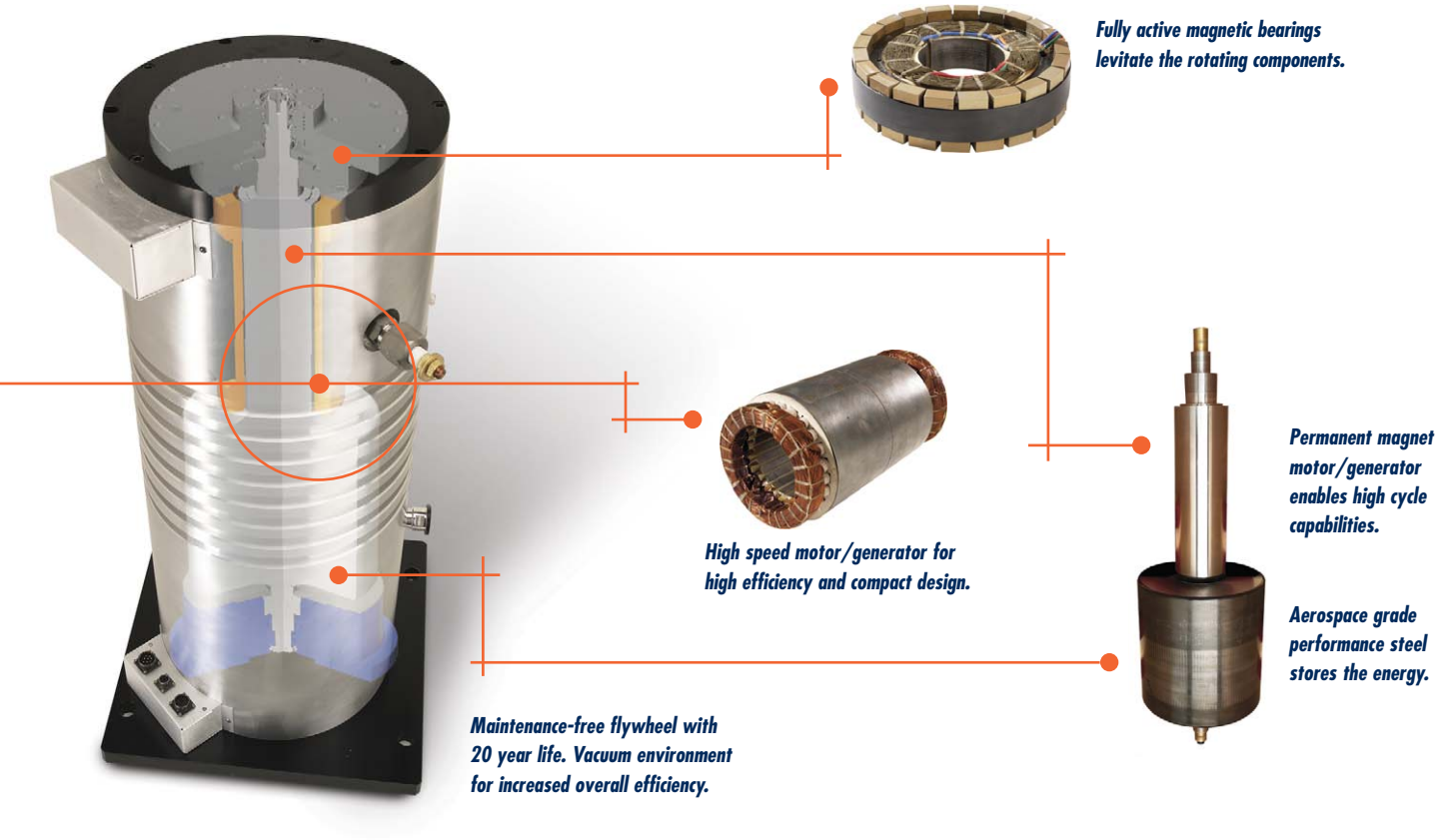
APPLICATIONS:

- BACKUP GENERATOR RIDE THROUGH
- UPS BATTERY REPLACEMENT
- BATTERY HARDENING
- ELECTRIC RAIL AND BUSES
- SHIPYARD CRANES
- WIND ENERGY
- MINING
- ELEVATORS
- FUEL CELLS
- MICROGAS TURBINES

BENEFITS:

- LOW MAINTENANCE
- ELIMINATES BEARING CHANGES
- ENVIRONMENTALLY FRIENDLY
- REDUCED EMISSIONS
- HIGH RELIABILITY
- SOLID-STATE CONSTRUCTION
- HIGH DUTY CYCLES
- IMPROVED POWER QUALITY
- ELIMINATES BATTERIES
- 20 YEAR LIFE
- SMALL FOOTPRINT
- IMPROVES EFFICIENCY

TAKING ENERGY STORAGE BEYOND THE LIMITATIONS OF EXISTING TECHNOLOGIES



ABOUT VYCON

VYCON is a manufacturer of flywheel-based energy storage systems that was established in 2002. VYCON employs the latest technologies in rotating machinery to provide equipment that is reliable, long-lasting and essentially maintenance free. VYCON's mission is to deliver energy storage technology to industries that require safe, reliable and green solutions for the reduction of power consumption and the increased availability of power quality.

The VYCON VDC System serves the UPS industry by eliminating or supplementing lead acid battery systems. With the VYCON REGEN System, peak power demands are greatly reduced, resulting in lower fuel consumption. VYCON REGEN systems also produce energy savings in electric motors and diesel generators on shipyard cranes, rail power substations and wind power generation systems. VYCON's products are ideal to meet the needs of the constantly changing power quality market, today and well into the future.

VYCON has developed an innovative flywheel energy storage system that provides high reliability, low maintenance, long life and adaptability to a wide variety of power applications. VYCON flywheel systems are robust and durable, cost-effective to run and maintain and environmentally friendly, making them a viable alternative to batteries and other technologies for energy storage.

VYCON PROVIDES RELIABLE ENERGY STORAGE FOR AN UNCERTAIN WORLD.

Whatever your need, wherever your application, VYCON deserves your first look. VYCON flywheel energy storage systems are designed to meet power needs in many applications.

FIGURE 1—REGEN CRANE SYSTEM

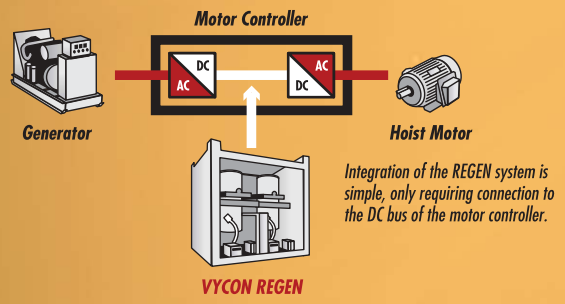


FIGURE 2—REGEN RAIL PEAK SHAVING AND VOLTAGE REGULATION

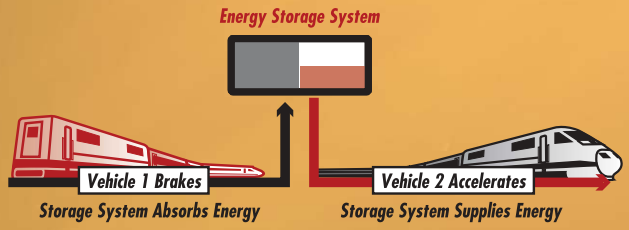
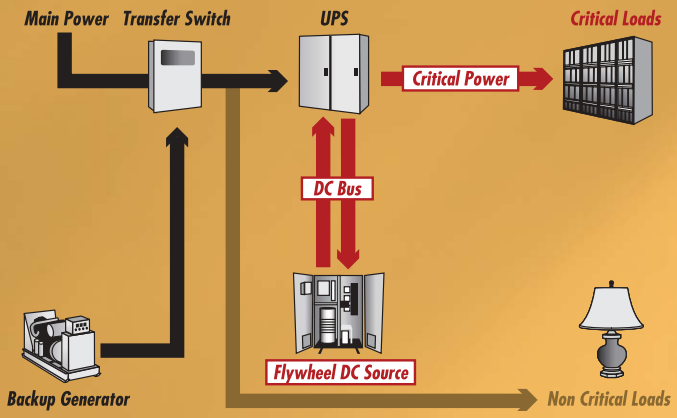
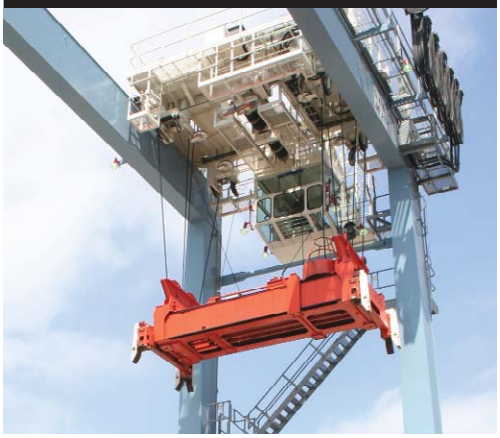


FIGURE 3—VYCON DIRECT CONNECT UPS BACKUP SYSTEM



CRANES

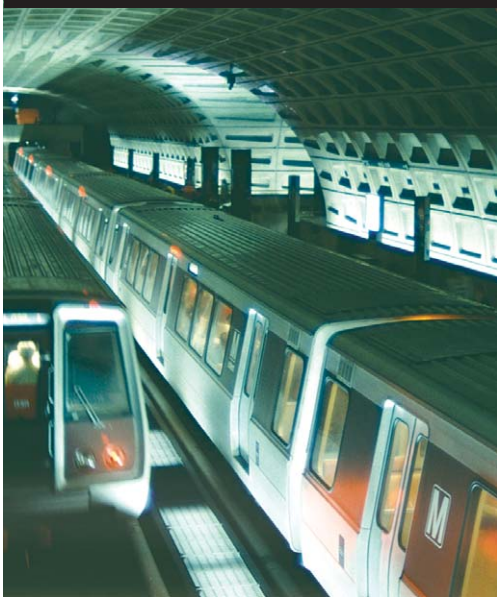


- ***Lower peak power demands***
- ***Energy savings***
- ***Reduced PM, NO_X and CO_2 emissions***
- ***Up to 25% Fuel savings in crane applications using diesel generator power***
- ***Optimized diesel generator operation to maximize efficiency***
- ***Reduce generator set wear and tear***

For stationary cranes that receive power from the utility, the VYCON REGEN system can reduce peak power demands to lower power costs and provide relief to an over-stressed utility. For mobile cranes powered by diesel generators, the VYCON REGEN system can considerably reduce fuel consumption, and more important, reduce emissions by optimizing the diesel generator operation. VYCON's REGEN system provides all these benefits by capturing the regenerative braking energy that is available during the lowering cycle of containers. Currently, this energy is dissipated through resistor banks as there has been no technology that can handle these cycling requirements until VYCON's REGEN. (figure 1)

VYCON's REGEN Reduces and Emissions on RTG Cra

RAIL



- ***Reduction in total energy consumption***
- ***Reduction in peak power demand charges***
- ***Provide voltage support for the local transmission stations***
- ***Cost avoidance in building transmission stations to support demand or increased number of trains***

Energy Saving and Peak Shaving— The VYCON REGEN system is capable of capturing generated braking energy, effectively reducing the peak power demand and total energy required for the train as it accelerates away from the passenger station. The VYCON REGEN system can provide relief to utility companies from these high power and infrequent short duration demands, while also delivering a short return on investment to the operator. (figure 2)

Voltage Support— The VYCON REGEN system is capable of providing voltage support in sections of track where the existing traction power substations may not be able to support the demand. Typical low voltage effects on the rail system can create schedule delays and in some cases, a full shut-down of the track.

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UPS

- ***Higher reliability than traditional battery backup power***
- ***No hazardous materials***
- ***No disposal issues as with batteries***
- ***Lower maintenance costs***
- ***First line of defense for 98% of all utility disturbances***
- ***Extends battery life***
- ***High duty cycle***
- ***20 year life***

UPS Backup— Preventing voltage drops by maintaining the DC bus on an UPS system allowing continuous operation without interruption. Traditionally, lead-acid battery backup systems have filled this need. The VYCON VDC system provides a safer, more reliable and viable alternative. (figure 3)

Battery Hardening— An Electric Power Research Institute (EPRI) study indicates that 98% of all utility disturbances last less than 10 seconds. The VYCON VDC system is the perfect solution for responding to all these short duration disturbances, and by operating in parallel with Lead-Acid (VRLA) batteries you can achieve the highest level of reliability possible.

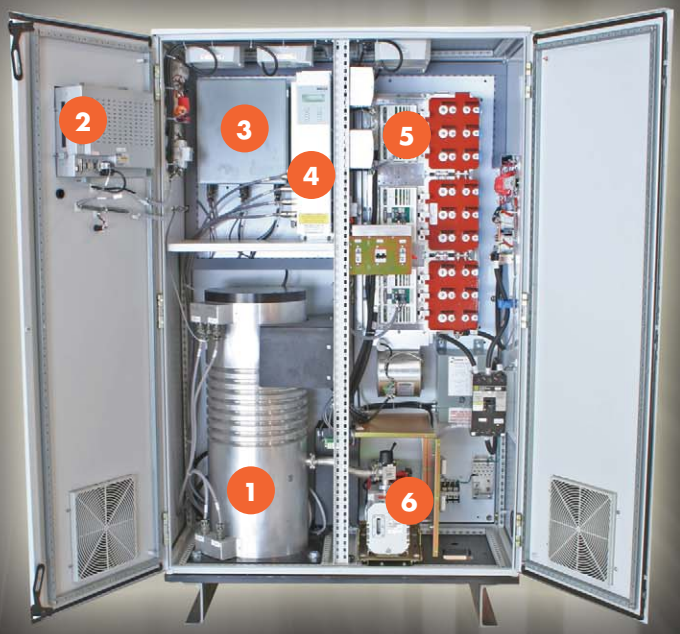
Diesel Generator Set Ride-Through— In Emergency Power System situations, the NFPA99 stipulates that diesel generators must assume load within 10 seconds. Traditionally, batteries have been used with UPS' for this purpose, however, batteries are unreliable and require high maintenance. Today, the VYCON VDC system delivers a superior power solution during these short duration power requirements. Higher reliability. Lower maintenance. Simply stated, it's a better UPS power choice for diesel generator set ride-through during utility outages.

WIND POWER

- ***Smooth output power***
- ***Improved grid stability***
- ***Greater useable energy***
- ***Fuel savings in hybrid wind/diesel generator applications***
- ***Lower PM, NO_X and CO_2 emissions***
- ***Minimized load fluctuations on diesel generators resulting in less wear and tear***
- ***Increase wind penetration***

Given the unpredictable nature of wind, the output of the wind turbine generator will fluctuate. The VYCON REGEN system is designed to stabilize and smooth that output power for higher efficiency. It is also highly advantageous in hybrid wind turbine/diesel generator applications that provide power to remote sites. By improving the output of the wind turbine generator, the VYCON REGEN system can effectively reduce the load from the diesel generator—providing savings in fuel consumption, while lowering emissions, and extending maintenance cycles to provide a shorter return on investment. The VYCON REGEN system can improve the power quality of the wind turbine and significantly increase wind penetration in wind turbine/diesel generator applications.

VYCON HAS CREATED A SYSTEM SO ADVANCED, IT IS UNMATCHED ANYWHERE!



VYCON DIRECT CONNECT (VDC) SYSTEM

VYCON REGEN CRANE SYSTEM

1. ***Flywheel*** *—The heart of the system providing a 20 year life with no maintenance*
2. ***Graphical User Interface*** *—Provides system status, navigation paths, and system functionality options*
3. ***Master Controller*** *—Monitors the output demand and controls the various subsystems including charging (motoring) and discharging (generating) of the flywheel*
4. ***Magnetic Bearing Controller*** *—Controls the position of the flywheel rotor via a 5-axis active magnetic bearing system and provides data on system performance*
5. ***Bi-Directional Power Converter*** *—The interface between the DC bus and the variable frequency, variable voltage AC generated by the flywheel*
6. ***Vacuum Pump*** *—Evacuates air within the flywheel to reduce windage losses resulting in increased electrical efficiency*
7. ***Gimbal Mounts*** *—Keep the flywheels level at all times while allowing the support to incline freely in any direction (REGEN CRANE System)*

THE TEST:

VYCON FLYWHEEL VS. OTHER STORAGE TECHNOLOGIES

VYCON FLYWHEEL SYSTEM

- *High reliability*
- *Effectively maintenance-free*
- *Unlimited cycling*
- *Low installation costs*
- *Operates in broad temperature range*
- *Recharges quickly*
- *Small footprint (light weight)*
- *Long life span*
- *No special cooling needed*
- *Viable, reliable alternative*
- *Environmentally friendly*

LEAD-ACID BATTERY SYSTEM

- *No sure way to predict failure*
- *Extremely maintenance intensive*
- *Limited cycling*
- *Costly demands on infrastructure*
- *Air conditioned room required*
- *Very slow to recharge*
- *Large footprint, excessive weight*
- *Frequent replacement required*
- *Significant cooling costs*
- *#1 cause of UPS system failure*
- *Lead/Acid/Hydrogen hazard*

SUPERCAPACITORS

- *Maintenance intensive*
- *Life affected by number of cycles*
- *Costly demands on infrastructure*
- *Toxic materials*
- *Decreased life with temperature changes*
- *Decreased life with voltage variation*
- *Large footprint*

A COMMITMENT TO EXCELLENCE

Research and Development

VYCON's commitment to ongoing research and development assures our ability to anticipate and meet the needs of an ever changing and growing power quality market. Our engineers keep a finger on the pulse of the industry for the latest developments in materials, high-speed components and process controls to ensure that VYCON systems are always on the cutting edge of high-speed rotating technology.

Production

All VYCON products start with a passion—to develop the best possible energy storage solutions for our customers. Every critical component of the system is put through a demanding series of stringent quality,

durability and performance tests to ensure that they meet VYCON's high standards, surpassing market expectations. This ongoing process guarantees the delivery of an environmentally friendly energy storage solution of uncompromised quality, efficiency and value for years to come.

A Global Distribution, Support and Service Network

At VYCON, we know that dependable customer support is the most important value we can add to our world-class line of products. VYCON company operations and its Authorized Distributors are strategically located throughout the world to ensure your requests are quickly identified, analyzed and handled 24/7/365. From site audits to installation to after-market service support, our highly trained and certified team of experts have the capacity and reputation for delivering customer support that is truly world-class.

VYCON…taking energy storage beyond the limitations of existing technologies.

VYCON

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23695 Via del Rio
Yorba Linda, CA 92887, USA
Phone: +1-714-386-3800
Fax: +1-714-386-3891
www.vyconenergy.com