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HHE 泓越能源

Honghui Energy

Beijing Honghui International Energy
Technology Development Co., LTD

■ Future of Turning

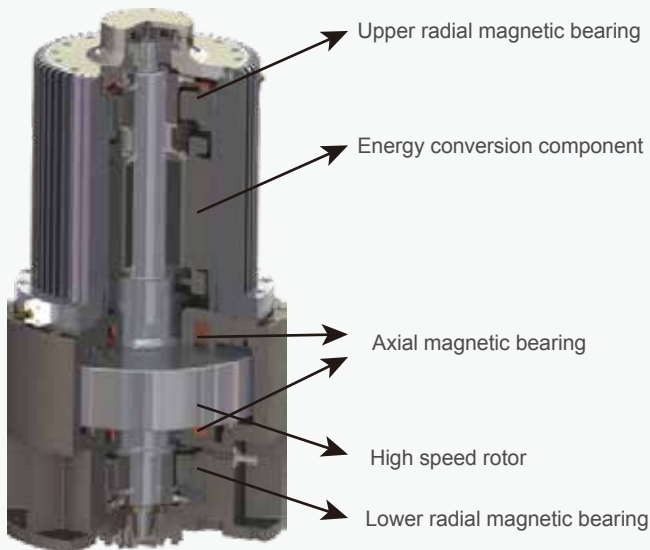




Introduction

In a world prioritizing sustainability and efficiency, Honghui Energy Technology Co., Ltd. stands out with its advanced flywheel energy storage solutions. As a leading innovator in China, Honghui provides high-power vacuum magnetic levitation flywheels energy storage system and supports a wide range of applications, including frequency regulation, microgrids, data centers, and high-power industries. Partner with us to drive a sustainable future through cutting-edge energy technology.

What is Flywheel?



$$E_k = \frac{1}{2} J \omega^2$$

- Improving speed is the only viable energy storage solution for FESS.
- The rotor material properties determine the upper limit of the speed.
- Reducing resistance (vacuum) and reducing friction (magnetic levitation) are ways to reduce energy loss.

Principle

A flywheel energy storage system stores kinetic energy in a large rotating mass –the flywheel. Electrical to kinetic energy conversion is performed by a motor/generator coupled to the flywheel rotor shaft; the motor/generator accelerates the flywheel rotor when charging the system and decelerates the flywheel when discharging.

Other key components include a bearing system to support the rotating mass, a vacuum system to minimize windage losses inside the enclosure, a compliant suspension to manage the vibrational modes of the structure, and power electronics to connect the motor/generator to the grid.

Products Benefits

- Instantaneous high-power response speed
- Wide operating temperature range
- Low loss and less maintenance
- Long cycle life
- High energy conversion efficiency
- Accurate measurement of energy

Application Scenarios Of FESS

Flywheel Energy Storage Systems (FESS) are used to store and release energy through the rotational motion of a flywheel. These systems offer high power density, fast response times, and long cycle life. Here are some application scenarios where flywheel energy storage can be particularly useful:

FESS – UPS

Utilizing the short-time, high-power and environmental adaptability of the FESS UPS, the FESS and power electronic devices are combined to form a strong power source.

- Emergency Power Supply for Critical Systems
- Telecommunications infrastructure with sensitive equipment
- Data centers
- Off-Grid Power Systems

Energy recycling

urban rail of FESS transit energy-saving system can alleviate the frequent impact of rail vehicle starting and braking, instantaneous high power, and impact on the voltage of electric traction grid

- Regenerative Braking in Vehicles
- Energy recovery and balancing of oil rigs, natural gas power generation

Large-scale energy storage

As the proportion of new energy access increases, the fluctuation of the grid becomes more and more important. While participating in power grid auxiliary services, FESS also smooths new energy output and gains revenue.

- Grid Stabilization
- Peak Shaving
- Frequency Regulation
- Microgrid Support
- Power Quality Improvement

Products



Venus No. 1-FW2503 **Venus No. 2-FW2503A** **Venus No. 3-FW2503B**

Rated power: **250 kW**
Rated voltage: **400/480/690 V AC**
Maximum speed: **10500/10500/9000 rpm**
Appearance size: **Φ690 x 1475 mm**
Maximum stored energy: **3 kWh**
Weight: **2000 KG**



Venus No. 4-FW3303A

Rated power: **330 kW**
Rated voltage: **690 V AC**
Maximum speed: **10500 rpm**
Appearance size: **Φ690 x 1475 mm**
Maximum stored energy: **4 kWh**
Weight: **2200KG**



Jupiter No. 1-FW1M50

Rated power: **1000 kW**
Rated voltage: **690 V AC**
Maximum speed: **9500 rpm**
Appearance size: **Φ1380 x 2430 mm**
Maximum stored energy: **50 kWh**
Weight: **12000 KG**



Jupiter No. 2-FW5M25

Rated power: **5000 kW**
Rated voltage: **690 V AC**
Maximum speed: **5000 rpm**
Appearance size: **Φ1520 x 2280 mm**
Maximum stored energy: **25 kWh**
Weight: **18000 KG**



Saturn No. 1-FW2550B

Rated power: **50/200/250 kW**
Rated voltage: **480 V AC**
Maximum speed: **6500 rpm**
Appearance size: **Φ1520 x 1550 mm**
Maximum stored energy: **40 kWh**
Weight: **7800KG**



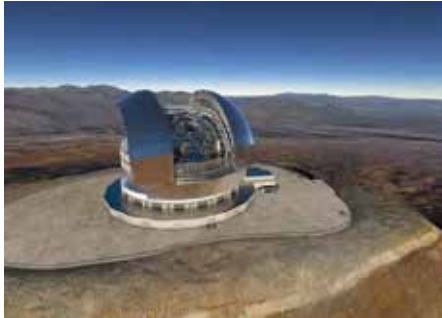
Saturn No. 2-FW50160

Rated power: **500 kW**
Rated voltage: **690 V AC**
Maximum speed: **5000 rpm**
Appearance size: **Φ2200 x 2500 mm**
Maximum stored energy: **160 kWh**
Weight: **21000 KG**

Flywheel Selection List

Application Area	Application Scenario	Flywheel Model Selection
Frequency Modulation of Electrical Energy Storage	1、Primary Frequency Modulation Of Power Supply Side/grid Side 2、AGC Frequency Modulation Of Power Supply Side/grid Side 3、Independent Energy Storage Power Station Of Grid Side 4、Micro Power Station	Jupiter No.1-FW1M50 (Primary frequency modulation) Saturn No.1-FW2550B (AGC frequency modulation) Saturn No.2-FW50160 (AGC frequency modulation)
Critical Power Supply	Emergency Electricity Conservation, Big Data Center, Precision Instrument Production, Hospitals,Airports	Venus No. 1-FW2503 Venus No. 3-FW2503B
Energy Recovery	Oil Exploration/exploitation, Ports And Docks,Steel Industry, Rail Transit,charging Station	Venus No. 2-FW2503A Venus No. 4-FW3303A Jupiter No. 1-FW1M50

Case Study



Chile Observatory UPS
power supply Protection
project



Provide primary FM
service for Erenhot
99MW wind farm

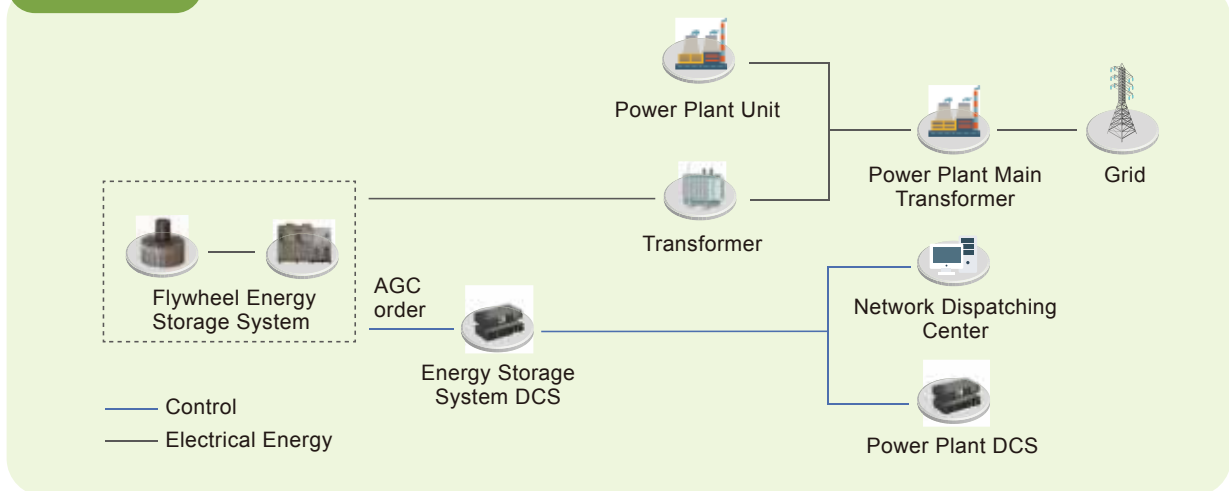


GlobalFoundries
Chengdu Project
(16MVA flywheel
large-scale application
case)

Frequency Regulation Application in Thermal Power Plant

With the integration of new energy, wind, PV aggravate the energy imbalance of the power grid for a period. Traditional thermal power unit have long frequency modulation response delay, low power climbing speed, low stability accuracy and poor frequency modulation performance. And after the unit participates in AGC regulation task, the power generation cost increases and the equipment is worn. Flywheel energy storage has the advantages of millisecond accurate control of charge and discharge, high adjustment precision, fast response speed and bidirectional adjustment. Therefore, it is a very good frequency modulation resource. Combined frequency modulation of thermal power+ energy storage system can effectively improve Kp value and benefit of power plant in practical application.

Solution



Solution Features

- Provide inertia support.
- Improve the performance of thermal power units.
- Reduce the wear of thermal power units.
- Provide climbing assistance function
- Reduce power grid impact and improve the grid stability.

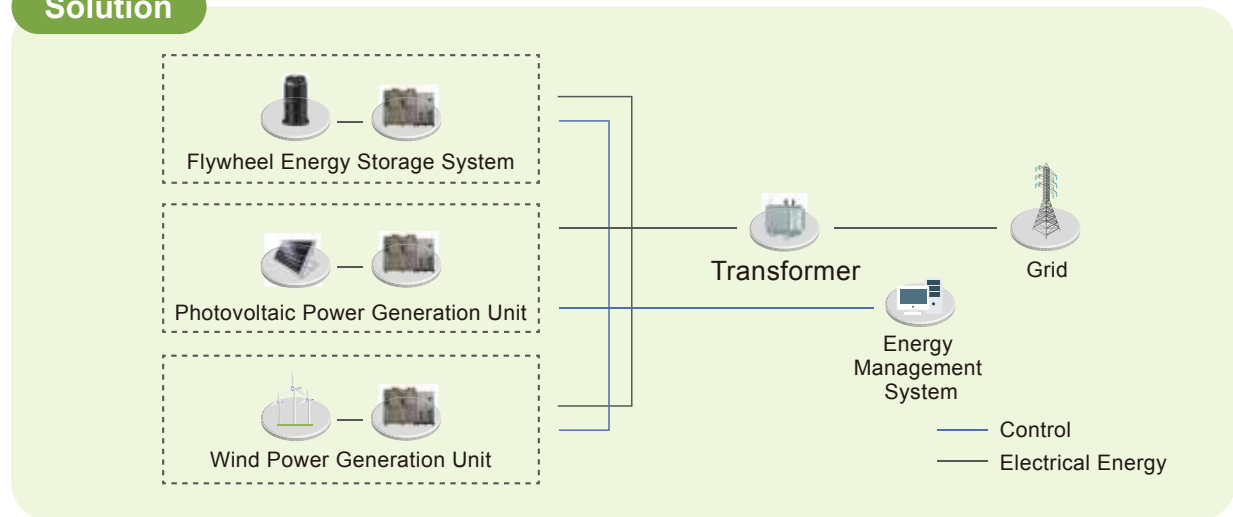
Recommend Products

- Saturn No. 1-FW2550B
- Saturn No. 2-FW50160
- Box-type energy storage series and system supporting accessories and equipment, etc.

Renewable Energy Solutions

With the increasing proportion of renewable energy, mainly wind energy and photovoltaic power generation, in the power supply structure, it is difficult to adjust the power grid, which increases and causes a lot of problems of waste of renewable energy. It is very important to increase the support for a high proportion of new energy to be connected to the grid, improve the safety and reliability of the grid operation, as well as the flexible regulation ability of the power system, which is directly related to the balance and safety of power system, and can solve the problem of new energy consumption and utilization.

Solution



Solution Features

- Provide inertia support.
- Provide climbing assistance services.
- Accurately track the planned output of the grid.
- Reduce the power fluctuation of wind power/photovoltaic output
- Realize the primary frequency modulation response of wind power/photovoltaic
- Replace the standby capacity of wind power/photovoltaic and reduce the waste of wind or light.

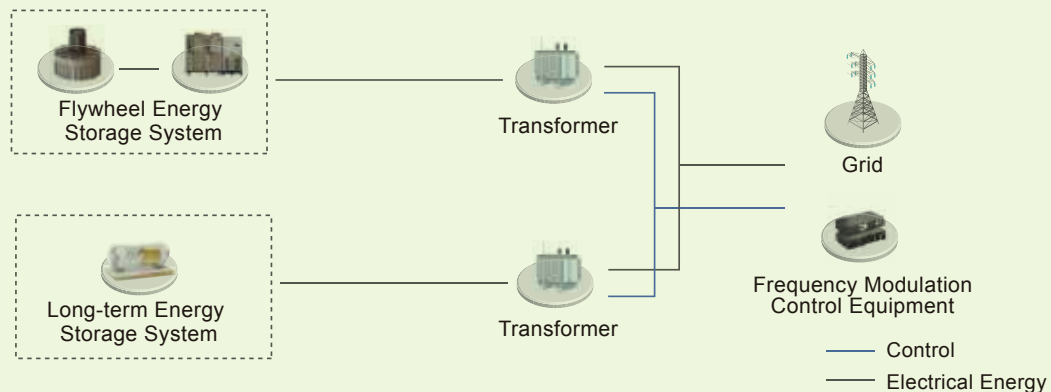
Recommend Products

- Jupiter No. 1-FW1M50
- Saturn No. 1-FW2550B
- Saturn No. 2-FW50160
- Box-type energy storage series and system supporting accessories and equipment, etc.

Hybrid Energy Storage Application in Frequency Modulation

Hybrid energy storage system is to use flywheel energy storage system and long-term energy storage system in a certain proportion. When the grid frequency is frequently disturbed, the flywheel energy storage system bears most of the output. When the flywheel energy storage system cannot meet the requirements, the long-term energy storage can supplement the power or energy. Hybrid energy storage system can minimize the actions of electrical devices, improve the service life and safety of the overall system, and realize the economy of the energy storage system under the double rules.

Solution



Solution Features

- Improve power quality
- Provide inertia support
- Provide AGC frequency modulation service
- Provide capacity leasing service
- Provide climbing assistance services

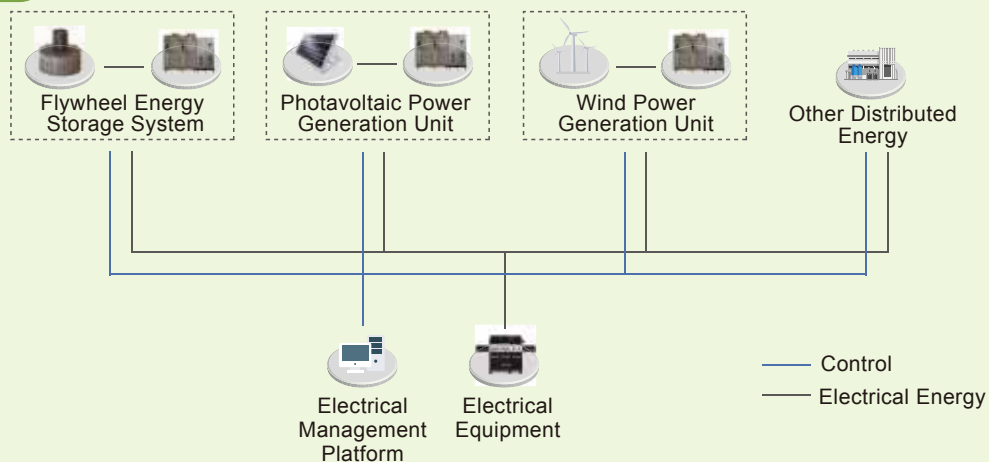
Recommend Products

- Jupiter No. 1-FW1M50
- Saturn No. 1-FW2550B
- Saturn No. 2-FW50160
- Box-type energy storage series and system supporting accessories and equipment, etc.

Energy Storage Application in Microgrid

Distributed power supply mainly includes small hydropower, wind power, photovoltaic power generation and biomass power generation which are generally affected by external environmental factors, such as season, climate, wind power, light and so on. Therefore, this kind of electrical energy is random and unstable, which will lead to poor stability of microgrid. Because of the large capacity of the main network, this influence can be ignored when the distributed power supply is connected to the main network. However, when the microgrid operates independently, the power supply changes with the environment and cannot provide stable output for the load. Flywheel energy storage system applied in microgrid, especially in independent microgrid, can well stabilize the fluctuation of distributed power supply, maintain stable output and improve power quality.

Solution



Solution Features

- Micro-grid frequency modulation resists impact load.
- Stabilize distributed energy fluctuation ensures stable output and improves power quality.
- Discharge in the peak period of power consumption to reduce the load changing rate, smooth the load and improve the stability of distributed power supply.

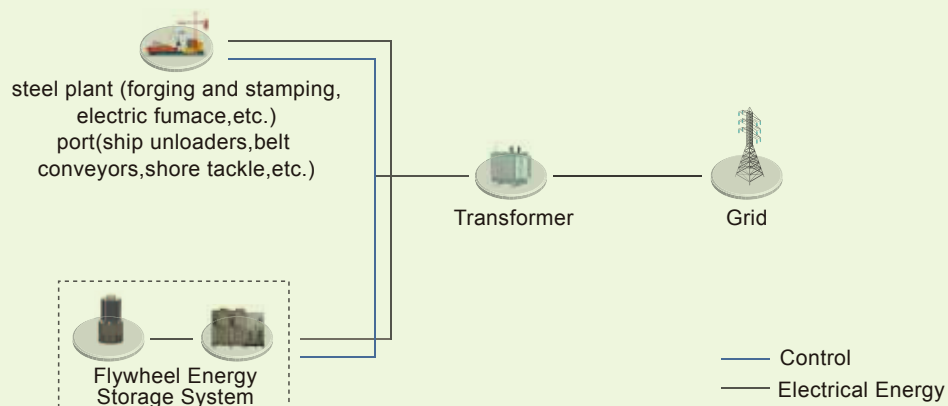
Recommend Products

- Jupiter No. 1-FW1M50
- Saturn No. 1-FW2550B
- Saturn No. 2-FW50160
- Box-type energy storage series and system supporting accessories and equipment, etc.

Energy Storage Application in Steel Plants and Ports

The application of flywheel energy storage in steel plants or ports has important demonstration significance, which can greatly promote the smart and green development of each port and play a positive role in promoting the subsequent application of energy storage in ports. Energy storage technology will become an important technology to meet the busy operation needs of ports and realize energy saving and emission reduction. It is also an important measure to build a "green port" and improve the competitiveness of docks. It is also an important measure to build a harmonious urban area, improve the environmental quality of the port area and coordinate the development of the port and the city, which has great social benefits.

Solution



Solution Features

- Improve the reliability of power supply.
- Improve operation safety.
- Reduce investment in power capacity expansion.

Recommend Products

- Venus No. 2-FW2503A
- Venus No. 3-FW2503B
- Venus No. 4-FW3303A
- Box-type energy storage series and system supporting accessories and equipment, etc.

Genset Hardening – Flywheel Energy Storage Stabilizer

Supporting Off-grid Applications

Challenges Overview

Off-grid microgrids rely on local power sources like diesel/gas generators, solar panels, wind turbines, or batteries, but these solutions face challenges:

- Gas Generators: Struggle with sudden big step load (e.g., motor starting).
- Diesel Generators: Inefficient and damaged at low loads (<30%).
- Solar Panels & Batteries: Limited current capacity, unsuitable for high-demand applications or fault clearing.

These limitations impact microgrid reliability and performance, especially for stable, high-power energy delivery.

Flywheel Energy Storage: The Solution

Flywheel Energy Storage Systems (FESS) combine UPS and Power Conditioner functionalities, ensuring power quality by addressing voltage fluctuations, surges, micro-cuts, and outages. Additional benefits:

- Power Factor Compensation
- Harmonic Filtration
- Load Balancing

As A Stabilizer For Off-grid Systems, Flywheels:

- Support Active Power: Stabilize frequency under load changes.
- Provide Reactive Power: Maintain voltage stability.

By overcoming traditional power limitations, flywheels deliver reliable, efficient energy in demanding environments.

Conclusion

Flywheel energy storage enhances power quality and stabilizes frequency and voltage in off-grid applications, ensuring reliable, efficient, and sustainable energy solutions.





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