



Supercaps Application in Power Grid

Jinzhou Kaimei Power Co., Ltd. is one of the most professional supercapacitor suppliers from China. We produce a variety of ultracapacitors, which are widely used in many important areas. Ultracapacitor is of small size and has long-using life. It is environmental-friendly and easy to install. We supply the following supercaps with high quality. Our customers can choose the supercap type which best suits their needs.



coin type supercaps



winding supercaps



combined supercaps



module supercaps



high temperature supercaps



hybrid supercaps

Nowadays, people can't live without electricity. Therefore, the development of power grid has become much more important. Supercapacitor is also widely used in power grid.

Application prospect of supercapacitors in smart power grid

The ideal supply voltage should be a pure sinusoidal waveform with nominal amplitude and frequency. However, due to the non-ideality of the supply voltage, the impedance of the line, the various disturbances experienced by the power supply system, the time-varying and nonlinearity of the load, etc., the supply voltage often presents a variety of power quality problems.



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Voltage-type power quality problems typically manifest as amplitude or waveform anomalies: voltage dips, three-phase imbalances, voltage fluctuations and flicker, harmonics, and frequency variations. Among all these power quality problems, the voltage sag and the short-term interruption of the voltage are particularly harmful to the electrical equipment. The voltage sag in just a few cycles may seriously affect the normal operation of the equipment. In developed countries in Europe and America, the economic loss of voltage sag can reach several million dollars, and the consequences of short-term voltage interruption are more serious. Currently, voltage sag has risen to the most important power quality issue. In many complaints about power quality, user complaints caused by voltage sag accounted for more than 80% of the total complaints, while power quality problems caused by harmonics, switching operation and overvoltage were less than 20%. From another point of view, voltage sag and short-term interruptions are very harmful because they are too sensitive to many electrical equipment. Reducing the device's sensitivity to voltage dips and short-term interruptions and increasing its immunity to disturbances allows users to minimize losses and even avoid losses due to voltage dips and short interruptions.

At present, the solution mainly includes installing UPS power, multi-channel power supply, and installing DVR (dynamic voltage restorer). Among these measures, the cost of high-power UPS is too high, and multi-channel power supply cannot completely avoid the losses caused by voltage sag and short-term interruption. The research of DVR (Dynamic Voltage Restorer) has just started in China. From the perspective of improving the anti-interference ability of the load, different devices can be customized according to the needs of the user, which is called user power technology. User power technology is a new technology developed in the 1990s. It refers to the integration of high-power power electronics technology and distribution automation technology. Based on the user's requirements for power reliability and power quality, the user needs to configure the required power. The main products are solid-state circuit breaker + static compensator (STATCOM), dynamic voltage restorer (DVR, DynamicVoltageRestorer), etc., which can solve various kinds of disturbances caused by power system disturbance such as voltage sag, bump, and instantaneous interruption. problem.

Current technology products for voltage compensation mainly include DVR (Dynamic Voltage Restorer) and UPQC (Unified Power Quality Controller, Dynamic Voltage Restorer (DVR) and Active Filter (APF)). The world's first DVR (Dynamic Voltage Restorer) device was successfully developed by Westinghouse, USA, and was put into operation in August 1997 at Duke

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Power Company. The APF is connected in parallel to the line, and the DVR is connected in series. The purpose of this is that the APF focuses on the management of current-type power quality problems, while the DVR focuses on voltage-type power quality issues. The two devices share the energy storage unit and the energy interface, and can be operated separately to achieve their own functions.

The current difficulty is that traditional energy storage devices are difficult to respond quickly to transient fluctuations in such electrical energy. By adding a super capacitor bank, the above technical problems can be solved more smoothly. Therefore, as a solution to the problem of power quality of users at the core port of the smart grid system, the device has broad market prospects. Kamcap has a variety of ultracapacitors for sale. We work hard to produce high-quality supercaps to meet our customers' needs.



Application of supercapacitors in smart power grid

Today's society has higher and higher requirements for the quality and safety and reliability of energy and power supply. The traditional large-grid power supply method cannot meet this requirement because of its own defects. A new type of power grid capable of integrating distributed power generation – micro-grid emerges as the times require. It can save investment, reduce energy consumption, improve system safety and flexibility, and is the future development direction. Capacitance plays an important role as an indispensable energy storage system in the microgrid. As a new type of energy storage device, supercapacitor has become one of the preferred devices for microgrid energy storage with its irreplaceable superiority. The microgrid consists of micro power supplies, loads, energy storage, and energy managers. The form of energy storage in the microgrid is: connected to the DC bus of the

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micro power supply, the feeder containing the important load or the AC bus of the microgrid. Among them, the first two can be called distributed energy storage, and the last one is called central energy storage. When connected to the grid, the power fluctuations in the microgrid are balanced by the large grid, and the energy storage is in the charging standby state. When the microgrid is switched from grid-connected operation to isolated network operation, the central storage energy is immediately activated to make up for the power shortage. The fluctuation of the load during the running of the microgrid or the fluctuation of the micro power supply can be balanced by the central energy storage or the distributed energy storage. Among them, there are two ways to balance the power fluctuation of the micro power supply, and the distributed energy storage and the micro power supply that needs energy storage are connected to a certain feeding line, or the energy storage is directly connected to the DC bus of the micro power supply.

1) Provide short-term power supply

There are two typical modes of operation in the microgrid: under normal circumstances, the microgrid and the conventional distribution network are connected to the grid, which is called the grid-connected operation mode; when the grid fault is detected or the power quality is not met, the microgrid will be timely The grid is disconnected and operated independently, called the isolated mode. Microgrid often needs to absorb some of the active power from the conventional distribution network. Therefore, when the microgrid is switched from the grid-connected mode to the isolated mode, there will be power shortage. Installing the energy storage device will help the smooth transition of the two modes.

2) Used as an energy buffer

Due to the small scale of the microgrid, the inertia of the system is not large, and the network and load often fluctuate very much, which has an impact on the stable operation of the entire microgrid. We always expect high-efficiency generators (such as fuel cells) in the microgrid to always operate at its rated capacity. However, the load on the microgrid does not remain constant throughout the day. Instead, it fluctuates as the weather changes. In order to meet the peak load supply, peak load adjustment must be carried out using a fuel-and-gas peaking power plant. Due to the high fuel price, the operation cost of this method is too expensive. The supercapacitor energy storage system can effectively solve this problem. It can store the excess power of the power supply when the load is low, and feed back to the micro grid to adjust



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the power demand when the load is high. The high power density and high energy density of the supercapacitor make it the best choice for handling peak loads, and the use of supercapacitors requires only the storage of energy equivalent to the peak load.

3) Improve the power quality of the microgrid

The energy storage system plays an important role in improving the power quality of the microgrid. Through the inverter control unit, the reactive power and active power provided by the supercapacitor energy storage system to the user and the network can be adjusted, thereby achieving the purpose of improving the power quality. Because supercapacitors can quickly absorb and release high-power electric energy, it is very suitable to be applied to the power quality adjustment device of the micro-grid to solve some transient problems in the system, such as instantaneous power failure and voltage swell caused by system failure. Problems such as voltage dips, etc. At this time, supercapacitors are used to provide fast power buffering, absorbing or supplementing electric energy, and providing active power support for active or reactive power compensation to stabilize and smooth fluctuations in grid voltage.

4) Intelligent distributed grid system supercapacitor is essential

From the perspective of the future development of smart grids, intelligent distributed grid systems will be the mainstream of future grid systems. In order to realize the construction of the intelligent distributed power grid system, it is necessary to have a buffer device such as a distributed energy storage device and a central energy storage device. In the case of unstable energy production processes, a buffer is needed to store energy. In the case where the process of energy generation is stable and the demand is constantly changing, it is also necessary to use an energy storage device. A fuel cell is different from wind or solar energy, and as long as it has fuel, it can continuously output stable electric energy. However, load demand varies greatly over time. If there is no energy storage device, the fuel cell will have to be large to meet the peak energy demand, and the cost is too high. By storing excess energy in the energy storage device, it is possible to provide the required peak energy through the energy storage device in a short time.

In distributed grid systems, the transient impact of power systems is inevitable, and the superior performance of supercaps can reduce the impact of transient impact on overall system performance. Therefore, in the future intelligent



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distributed grid system, the ultracapacitor bank energy storage system is indispensable.



Ultra capacitor has a bright future in the application of power grid. It can bring more possibilities to our life. Kamcap will try our best to produce high-quality and advanced ultracapacitors. If you want to know our [ultra capacitor price](#) or other information, you can contact us via our email info@kamcap.com or directly call us!

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