ACTIVE VOLTAGE CONDITION AND RIDE-THROUGH DURING MOMENTARY POWER OUTAGES OR DEEP VOLTAGE SAGS

Introduction

Electrical utilities use reclosers on medium voltage supply to isolate faults caused by events such as lightning strikes, tree branches across lines, or animals making contact with live wires. The result of a recloser operation is a momentary power outage lasting for up to a few seconds. These outages can cause an unplanned production stoppage which can be very costly.

When momentary outages occur, energy storage is required. Usually, the plant will have backup generators to provide power during a power interruption. However, the momentary outage and generator synchronization duration are generally not fast enough. The AVCRTS bridge the time gap during the energy transfer or generator synchronization with the load. Additionally, the AVCRTS will also provide backup power during short interruptions that are too fast to start up a generator.

Active Voltage Conditioner Ride Through System (AVCRTS)

The Active Voltage Conditioner (AVCRTS) is an inverter-based system that provides voltage sag and blackout protection. The AVCRTS is specifically designed for industrial loads and is a single-conversion UPS. Industrial limitations refer to frequent high inrush currents, harmonic currents, and poor power factor.

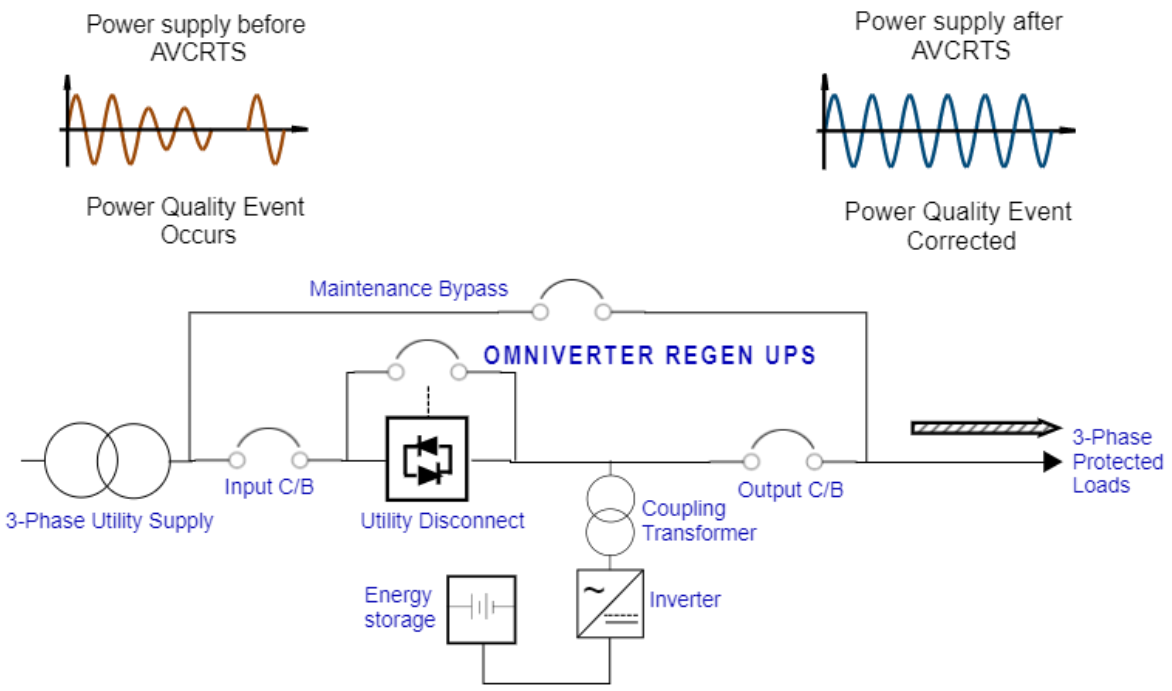

Figure 1: AVCRTS principle of operation

How the AVC Works

The AVCRTS is an off-line device and comprises an electrical storage power source, either batteries or super-capacitors, with IGBT inverters and a static switch to connect to the utility. The static switch is closed under normal conditions; this is stand-by mode. When the utility voltage drop below a preset threshold, typically 90% of nominal voltage, the static switch opens in less than ¼ cycle and power the energy source via the inverter to the load.

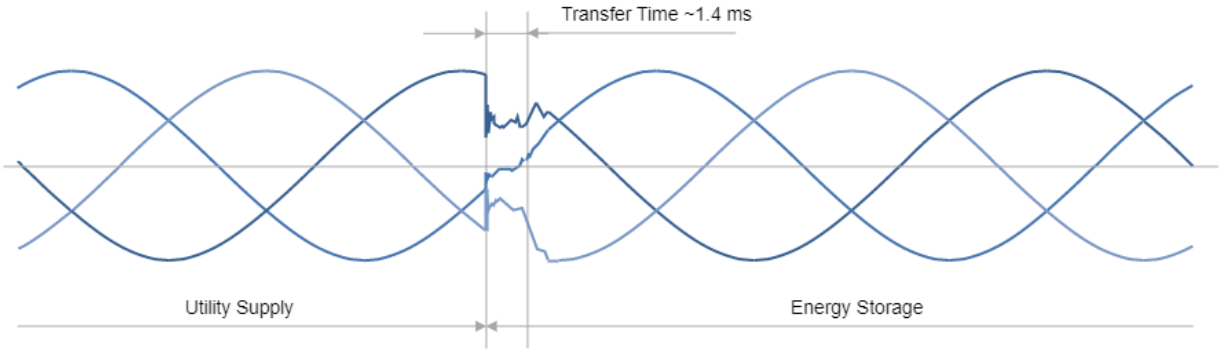

Figure 2: Transfer time from a preset voltage sag or momentary interruption toward voltage conditioning

When the source voltage is restored, either from the utility or from a generator, the AVCRTS will synchronize the load with the supply, close the static switch, and the inverter will revert to stand-by mode.

In the case of hardware failure or during maintenance, the load current will be automatically transferred to the safety maintenance bypass switch.

See the AVC product offering when only voltage sag protection is required.

Why not use a commercial UPS

Industrial loads are often associated with high power consumption, specifically with high inrush currents caused by starting of large motors. Inrush currents can exceed six times normal full load currents.

Power electronic loads such as rectifiers and VFDs can produce a wide range of harmonic currents. Conventional double-conversion UPS devices may need to be derated to come with these situations. The AVCRTS static switch and inverters are designed to handle high inrush current and environments with high harmonic currents.

Capacity Range

The AVCRTS capacity ranges from 30kVA to 3MVA at a low voltage level, and the medium-voltage units go up to 15kV.

Key Features

The operation of the system is specifically designed to meet the demanding requirements of industrial load protection where the following features are essential:

- Highly energy efficient. The much lower ongoing cost of ownership than traditional UPS solutions.
- High levels of fault-clearing capacity (typically 20 times short-term current) allow for the discrimination of protection systems.
- Ability to cope with dynamic loads. Such as motor drives high in harmonic distortion, large starting inrush currents, and loads that may regenerate power.
- Extremely fast response time. The static switch opens in less than a ¼ cycle.
- High reliability. Build-in N+1 redundancy on the inverters.

Typical Applications

Industries with continuous high-value production lines where unplanned production stoppages can be very costly, like:

- High-Value production
- High-Speed manufacturing
- Continuous processes
- Critical loads
- Seamless Diesel generator transfer
- Protection from momentary loss of electrical power

AVC & AVCRTS Combination

When combined with the AVC, the two units will provide momentary outage support, continuous voltage regulation, voltage balancing, flicker reduction, sag mitigation, or peak shaving.

WHERE TO FIND SOLUTIONS FOR ACTIVE VOLTAGE CONDITIONING?

Omniverter voltage conditioning ranges are used by the leading pharmaceutical, semiconductor, high-speed manufacturing, robotic and automated warehouses, water treatment plants, and many more. Visit www.omniverter.com for a comprehensive set of solutions to support the end-user of electricity in all power quality-related concerns.

They are available for discussion on detailed technical specifications of voltage sag/swell mitigation, harmonic filtering, fast reactive power compensation, and high-frequency filtering.