AUSTRALIA

Hybrid var compensators for shopping center loads

Few types of retail and leisure facilities have a higher energy demand than shopping centers. The enhanced lighting in retail stores, electronic signage, lifts, escalators and the large space to heat and cool increase the energy consumption and together with it the risk for power quality problems to appear.

With high energy costs and the requirements to convert traditional buildings into green buildings, shopping center owners and managers across the world are looking for solutions to improve the power quality and energy efficiency of their installations.

Background

A shopping center in Australia has gone through several expansions over time due to growth and population in the area. The quality of the electrical supply has gradually declined along with changes in the load profile. This all came to a head in 2018 when there was a noticeable detrimental effect on the installation and equipment. This resulted in many power interruptions in the shopping center which resulted in loss of revenue, trading hours, inconvenience to tenants and customers, security and OH&S issues.

The shopping center loads (mainly the lifts, escalators, LED lamps and HVAC system) were affecting the power quality of the installation. The target of this project is to improve the operation of the shopping center by improving the power factor to at least 0.95 and reducing the harmonic distortion to comply with THDi under 5%. By doing this, it is expected to avoid the weekly tripping of the protection relays and the power interruptions.

Proposed solution

Based on the analysis of the measurements, it was possible to dimension a solution for the shopping center that would comply with customer's requirements of improving the power factor to minimum 0.95 and reducing the amount of harmonics to be able to comply with THDi under 5%. It was decided to use seven different hybrid var compensators (HVC) installed on each feeder of the shopping center.

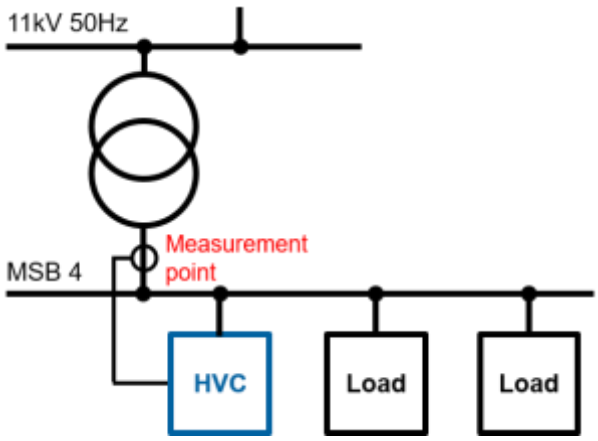

Fig. 1: Connection proposal

HVCs combine the technical advantages of active harmonic filters (AHF) or static var generators (SVG) with the cost-effectiveness of conventional contactor or thyristor switched detuned filter capacitor banks to form an economical stepless real-time compensator with a single controller. They can take of several power quality problems and grid ancillary services by combining different functions in a single device.

Results

Seven HVCs were installed at the switchboard room of the shopping center, one on each feeder.

Fig. 2: Four HVCs at switchboard room

Fig. 3: HVC 415 V 50 Hz -72/+222 kvar located at feeder four

Conclusions

Rise of nonlinear and other challenging loads in electric power systems present unique power quality challenges. Active power filters like HVCs provide a quick and effective response to power system disturbances enabling longer equipment life, higher process reliability and reduced energy losses, complying with most demanding power quality standards and grid codes.