

Active harmonic filters for data center loads

Achieving high power quality and reliability in today's energy-constrained world is a huge challenge. This is especially true for data centers. Power quality problems can set out within a fraction of a second and can cost millions of Euros in downtime. Data centers and other critical process facilities rely heavily on quality and reliability of power for their success. Data centers are facilities with a large number of IT equipment like servers and computers that have substantial power requirements and load factors of over 80%.

Data centers should ensure that uptime is maximized but they are highly susceptible to even the most common of power quality problems, a simple voltage sag can be as disastrous as a power interruption.

Background

The largest data center in Asia-Pacific located in South Korea that is the headquarters of several global IT companies was suffering from severe harmonic distortion. The total floor area of the data center is 85,548 m² and the power capacity 165 MW/154 kV.

The owner of the building needed to secure the operations and eliminate harmonic distortions in order to maintain the quality and integrity of the businesses. The target of this project is to improve the operation of the data center by reducing the harmonic distortion to comply with THDi under 5%.

Proposed solution

Based on the analysis of the measurements, it was possible to dimension a solution for the data center that would comply with customer's requirements of reducing the amount of harmonics of the whole installation to be able to comply with THDi under 5%. It was decided to use six different active harmonic filters (AHF) installed on each switchboard panel of the data center.

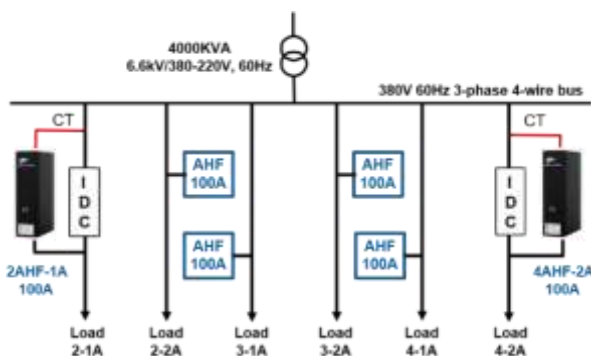


Fig. 1: Proposed solution

AHFs eliminate waveform distortions from the loads like harmonics, interharmonics and notching, by injecting in real-time in the electric power system the distorted current of same magnitude but opposite in phase. They can also work as harmonic generators for harmonic injection testing purposes. In addition, AHFs can take care of several other power quality problems and grid ancillary services by combining different functions in a single device.

Results

Six AHFs were installed at the switchboard panels of the data center, one on each panel, two per floor.



Fig. 2: AHFs at the server room in the second floor



Fig. 3: AHF 380V 60Hz 100A located at 2AHF-2A panel

Conclusions

Rise of nonlinear and other challenging loads in electric power systems present unique power quality challenges. Active power filters like AHFs 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.

Data centers have evolved to become large power consumers. Their supporting infrastructure, such as cooling and power distribution, consumes big quantities of electric power, and their IT equipment generates power quality problems that affect the secure and reliable operation of data centers. Therefore, the power quality and efficiency of data centers are important topics that should be addressed carefully at design stage or during the operation stage.