MUN HEAN

MH Solution Newsletter
Issue# 001/16

Protecting Modern Offices from Harmonics & Reactive Power Factor Swing

Power Quality has been linked to several high profile power interruption cases. On 17 Apr 2015, Bloomberg suffered a major system crash lasting 2½ hours, £3bn transaction deals were impacted. On 5 Nov 2014, Singapore Stock Exchange (SGX) had a power interruption lasting over 3 hours, all trading were interrupted during that time. Unplanned downtime contributed to over USD 1.7 Trillion global data losses in a survey by EMC Corp in Dec 2014.

Harmonics is a by-product introduced to the electrical supply network when non-linear electrical loads are used. Inverter drive, LED lighting and computer equipment are all non-linear loads that contribute to harmonics pollution. More than 70%-80% of a commercial building consumption load are non-linear and this can pose serious issue to the reliable supply of electricity.

The presence of harmonics will impact the network in the following ways:

1. Increased thermal stress on cable termination joints which leads to dangerous hot spot formation
2. Higher operating temperature of power capacitor that shorten their functional lifespan and in severe cases fire outbreak
3. Damaged to traditional directly connect motor of by breaking down winding insulation which leads to sudden motor failure
4. Intermittent nuisance tripping of protection relay at main switch board
5. Reduced transformer full load capacity due to circulating zero order harmonics at its Primary Winding

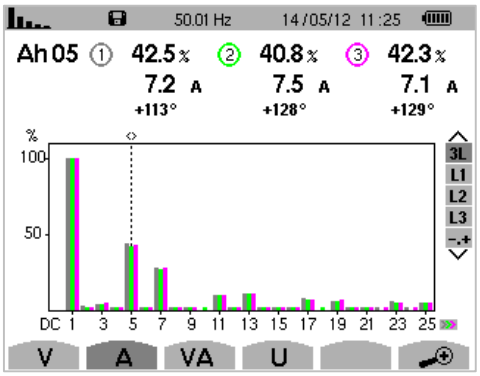

Fig 2. Harmonics profile of a typical VFD driven HVAC motor load

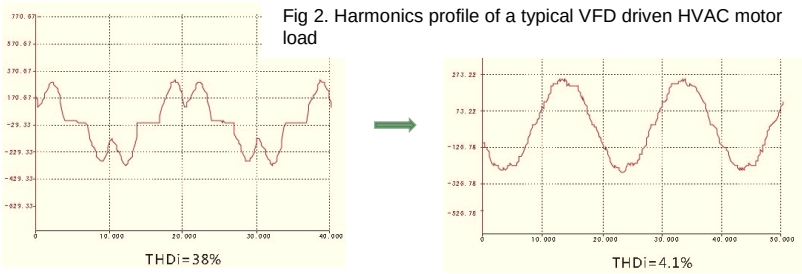

Fig 3. Harmonics current waveform distortion seen on typical 6-pulse VFD load before and after harmonics filtering

Ref: MH-PQ2016-MKT

Fig 4. Typical Line-Interactive UPS used in datacenter

Power Factor swing is produced when a reactive load switches from inductive to a capacitive type. One such scenario is line interactive UPS popular in datacentres of medium to large capacity, delivering supply to modern blade type servers. These highly energy efficiency blade servers are equipped with capacitive switching mode power module which present as a Leading Power Factor load towards it supply source.

In the situation when utility power supply fails, the backup generator will start-up and initiate switch-over. These genset operates with a feedback control (AVR) which rely on monitoring the load line voltage and frequency that controls the engine throttle regulator. However, with Leading PF condition, the line voltage will rise and this is seen by the AVR as over excitation. The consequence is a reduction in generator output voltage which result in an engine stall. The UPS will try to re-initiate another switch-over cycle. If the genset AVR is unable to adapt to the Leading PF condition, a switch-over will fail which lead to the eventual total exhaustion of the UPS battery.

IGBT enabled PQ Solution The application of power quality solution product such as **Active Harmonics Filter (AHF) and Static VAr Generator (SVG)** will resolve these issues. Based on IGBT power electronics technology, AHF and SVG do not operate with constrains of traditional passive inductor/capacitor PQ solution.

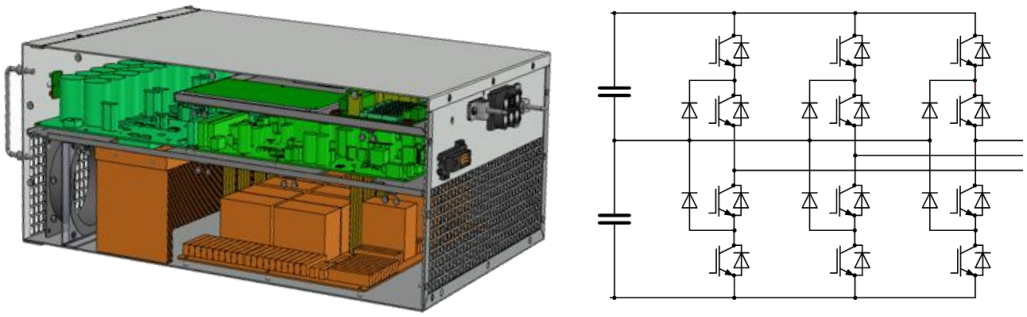

Fig 5. AHF and SVG are IGBT technology product designed to solve harmonics and PF swing problem in critical facility

Ref: MH-PQ2016-MKT

AHF will continuously monitor the network harmonics level and brings it down to the set target level without any human intervention. The system measures the line harmonics up to 50th Order and ensure harmonics voltage and current levels are brought to defined industrial standard such as IEEE519. The reduction in heat at cable joints, capacitor and transformer will be evident immediately. Improving the overall network reliability and reduced thermal loss in the system.

SVG unlike conventional switched capacitor bank is able to correct power factor in both Leading and Lagging PF condition. This is the single most important function where SVG will be able to prevent UPS genset switch over failure due to Leading PF condition. In addition to that, SVG also resolves phase load unbalance situation which cause Triplen order harmonics flow that create genset vibration and transformer over-heating.

Both AHF and SVG are designed for automated operation that require no user adjustment during its operation. Remote monitoring from a 3rd party Building Management System can be accomplished by interfacing to the device Modbus RS485 communication port. Realtime information on the load, compensation effect and other operating conditions can be recorded for performance audit purpose.

For further information on how Mun Hean can help you with your power quality issues, please contact our sales team at:

Jimmy Lim or Desmond Loh
Tel: +65-6250 0522
Email: munheansing@munhean.com.sg

About Mun Hean Power Quality Division:

With 30 years of experience in providing power quality solutions, Mun Hean boasts an extensive range of expertise from Power Quality Management & Power Factor Correcting Solutions; Filter Reactors, Active Harmonic Filters to Dynamic Fast Switching Power Factor Solutions. The products and services that Mun Hean offers are tied with exclusive partnerships with leading manufacturers internationally. Notably, Janitza, Vishay ESTA, Sinexcel and Hans Von Mangolt. Our Power Quality Division has been delivering solution to satisfied customers across Asia. Some of our project references are HSBC Bank, Google, ABN Amro, NORD LB, China Citic Bank, Volvo, Jaguar.

Ref: MH-PQ2016-MKT