



Dairy Processing - Hybrid Solutions to Harmonics Issues

Site

Dairy processing facility producing 100,000 tonnes of dairy powders/annum.

Date

Spring 2015

Key result

Reducing Total Harmonic Distortion

The Challenge

This newly commissioned facility built on a green field site was experiencing some reliability issues and unplanned outages at various locations across the electrical network. The energy efficient design had a high quantity of variable speed drives installed and the client was aware that an elevated level of harmonic currents and voltage was being constantly recorded throughout the plant.

It was identified that those abnormal harmonic levels would have a negative impact on the performance of the facility. A full evaluation was required to ensure that the electrical distribution network would function as required and could reliably support the new milk processing production equipment.

Our Solution

Our power quality and harmonic assessment highlighted significant breaches of the voltage harmonic limits as stipulated by the IEC61000-2-4 standard. Commutation notches and/or voltage transients have been detected at some of the locations. This together with harmonics introduce a ripple (distortion) on the voltage waveform resulting in multiple zero crossings. The main harmonic orders resulting in THD excess were identified and particular higher frequencies known to cause bridge rectifier circuits to fail in VSD's and power supplies of electronic equipment. Secondly, the facility's electrical distribution network was modelled and used to size a filtering solution that would mitigate the issues found.

A hybrid solution, composing of Active Harmonic Filters (AHF) and Passive Harmonic Filters (PHF) was recommended for a number of locations. A staged mitigation plan was recommended, where installation of AHF's be performed initially, as those devices will automatically adapt to existing load conditions and filter harmonic ranges from 2 to 50. Characteristic of existing load and nature of distortion require units with quick response time – 1ms or less. Passive harmonic filters, tuned for 5th harmonic to be subsequently installed. I was advised that exact sizing of PHF's should be carried out post AHF installation, when the full production output has been reached.

The Benefits

The client had a greater knowledge and a detailed model of the electrical network which pinpointed specific vulnerable locations due to the nature and number of the equipment and types of loads. A staged mitigation plan for filter installation matching ramp up of production allowed specific solutions exactly matching the specific issues at each location. This way a greater reduction in Voltage THD was achieved, preventing future failures of critical devices, such as PLCs and controls, reducing the energy losses due to excessive currents and extending lifespan of mission critical power equipment.