Case Study: Successful Filter Installation

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Introduction

Today, every city in the world faces similar demand for growing confidence in the commercial facilities building market as the community expects better:

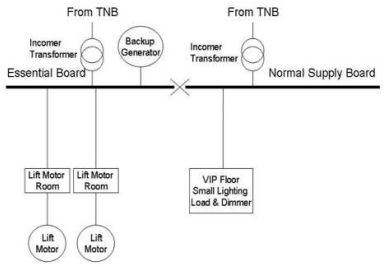
- facilities with advanced infrastructure
- ease of maintenance and low management costs, and
- energy savings.

These demands however, have resulted in multiple equipments that are sensitive towards power quality supplied by the systems. PQE has over 9 years of experience and conducted more than 2,000 points of measurements and solutions for power quality problems. This has resulted in a high percentage of savings for clients not only in terms of energy consumption but also, prolonging equipment life span and improving business process continuity.

Power Recording Findings

A VIP lift in a high-rise building is experiencing frequent lighting dimmer failure. From the on-site recorded power data, PQE established the following:

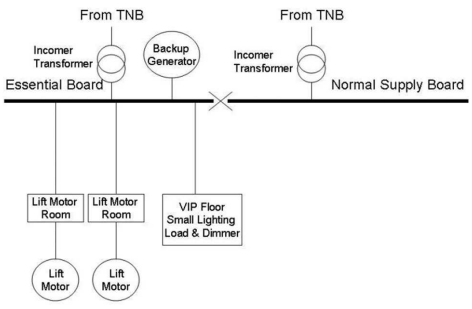
Initially, the VIP floor power supply was connected to a normal supply board which did not have backup supply during utility blackout. Upon request, the in-house engineers moved the VIP lift floor supply from a normal supply board to an Essential Board. (Figure 1)



Upon connection to an Essential Board, the VIP floor experienced the power quality problem which was the failure of the frequent light dimmer electronic card. PQE conducted an on-site PQ survey to identify the root cause of the frequent lighting dimmer failure.

From the PQ survey, PQE found that large loads, such as the building lift banks operated by DC drives, produces high harmonic distortion. The lift operation causes a rapid change in current within a short period which led to high voltage flicker. Thus, the Essential Boards power supply was not clean and this resulted in the power quality problems.

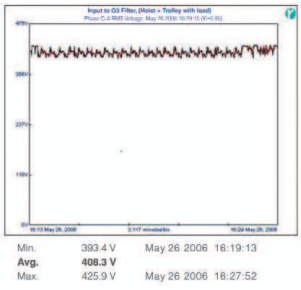
The recorded input RMS voltage trending suggests that the 415V incoming supply fluctuates rapidly. This high dv/dt, causes an additional voltage stress to the connected load. This leads to a premature failure of the loads, which consists of the air-conditioning system, inter-communication system, lighting dimmer system and suction fan.



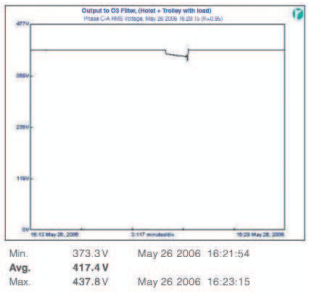
PQE subsequently installed a PQ7 Voltage Source Filter to the Essential Board. This resulted in a more reliable performance with zero failure to the connected load.

Comments

Acceleration and Deceleration with Load
Recorded RMS Voltage Trending
at Input of PQ7 Voltage Source Filter

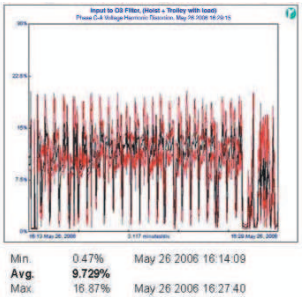


Acceleration and Deceleration with Load
Recorded RMS Voltage Trending
at Output of PQ7 Voltage Source Filter

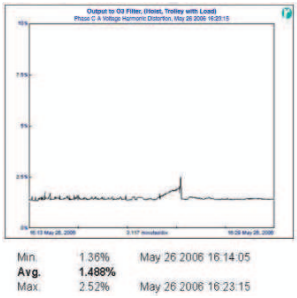


The above graphics show the recorded RMS voltage trending at input and output of the PQ7 Voltage Source Filter. The recorded input RMS voltage trending suggested that the 415V incoming supply fluctuated rapidly. This high dv/dt, caused an additional voltage stress to the connected loads; which caused the premature failure of the connected loads.

Acceleration and Deceleration with Load
Recorded Total Harmonic Voltage Distortion Trending
at Input of PQ7 Voltage Source Filter



Acceleration and Deceleration with Load
Recorded Total Harmonic Voltage Distortion Trending
at Output of PQ7 Voltage Source Filter



The above graphics show the recorded total harmonic voltage distortion (THVD) trending at input and output of the PQ7 Voltage Source Filter.

The recorded high input total harmonic voltage distortion suggested that the 415V incoming supply experienced a THVD higher than the maximum allowable limit of 5% as stipulated in the IEEE 519 Engineering Recommendation. On-site power measurement data shows that, with the installation of PQ7 Voltage Source Filter, there was improvement in RMS voltage dv/dt, harmonic voltage distortion and voltage flicker short-term severity index.

The recorded data also confirmed that the installed PQ7 Voltage Source Filter has helped the 415V feeder meet IEEE 519 (engineering recommendation for harmonic distortion) and ER P28 (engineering recommendation for voltage flicker severity index) requirements.