POWER QUALITY INTERNATIONAL

CASE STUDY

LYNX Services
North Fort Myers, Florida

Facility Description

LYNX Services is a wholly owned subsidiary of Solera Holdings, Inc. Solera is a leading global provider of software and services to the automobile insurance claims processing and decision support industries. Solera is active in over 65 countries across six continents. The Solera companies include Audatex in the United States, Canada, and in more than 45 additional countries.

Challenge

In early 1997, PQI was contacted by an engineering firm that had been retained by Lynx Services to convert a small strip mall into a call center. The single story, on-slab structure's three-phase, four- and six-wire branch circuits were distributed throughout the building in the concrete slab. The electrical engineer had determined that the circuits 'home run' junction boxes were well placed, but the ampacity of the circuits was inadequate for the nonlinear load density. The engineer had considered upsizing the conductors; however, the conduits were too small to meet code. Even with upsizing, the engineer was concerned that voltage distortion and neutral-to-ground voltage at the loads would be beyond IEEE Std. 519 and ITIC recommendations. He was looking for a low-cost solution.

Solution

To solve these problems, PQI determined that if the zero-sequence harmonic currents could be shunted from the branch circuits at or near the office partition loads, the ampacity and power quality problems would be resolved.

Since our standard zero-sequence harmonic filter (I_0Filter™) was designed for application at the branch circuit panel, we needed a small alternative that:

- Could be connected directly to the client's prewired four- and six-wire Steelcase office partitions
- Would include coordinated circuit breaker protection
- Would not exceed an enclosure operating temperature of 35°C

PQI developed prototype zero-sequence filters that were approved by the engineer and his client and installed at all office partition lineups.

On June 11, 1997, Lynx retained an independent NETA testing company to complete a series of electrical measurements at their Call Center in North Fort Myers, Florida. Their purpose in taking these measurements was to confirm the benefits, which had been guaranteed by PQI, in applying small 'prototype' zero sequence harmonic filters at the load-end of the three-phase, four-wire 'shared neutral' branch circuits that supply their office partition workstations.

Two clusters of fifteen workstations were selected as the measurement sites. One cluster was approximately 100 feet from its distribution panel while the other cluster was approximately 300 ft. from its panel. The electrical distribution panel, which supplies these two clusters, was selected as the third measurement site.

The benefits in applying the filters were assessed by comparing measurements with the filters out-of-service and in-service.

Measurements were taken at the load-end of the selected 208/120-volt, three-phase, four-wire, 'shared neutral' branch circuits, which supplied each cluster of workstations. These measurements included phase-to-neutral voltages, a harmonic analysis of phase-to-neutral voltages, total harmonic distortion of voltages and neutral to ground voltage.

Measurements were also taken at the line-end of the same branch circuits (at the electrical distribution panel). These measurements included phase currents, a harmonic analysis of phase currents, total harmonic distortion of phase currents, neutral currents, a harmonic analysis of neutral currents, phase-to-neutral voltages, phase current balance, kW, kVA, True and Displacement Power Factor, and load K-Factor.

These measurements were taken under the direct supervision of the facility owner's consulting engineers.

In January 1998, PQI replaced the 'prototype' filters, which were included in the June 11, 1997 measurements, with its new, patent-pending Mini-Z™ zero sequence harmonic filters. The original measurements were then repeated to compare the performance of the 'prototype' filters with the new Mini-Z™ filters. Both sets of measurements are included in the summary provided in Table 1.

Compared to similar call center facilities, which include the use of office partitions, the application of Mini-Z™ filters will typically provide the following benefits:

- Increased Circuit Capacity by 250%
- Increased Transformer Capacity by 100%
- Reduced Transformer Losses by 70%
- Reduced Zero Sequence Current by 95%
- Reduced Common Mode Noise by 95%
- Reduction in Voltage Distortion by 73%
- Reduced Phase Current Imbalance by 45%
- Reduced RMS Phase Current by 12%

Based on the outcome of these and subsequent studies, Power Quality International has developed a number of distribution system design alternatives. One such alternative has now been incorporated into our customer's subsequent North Fort Myers expansions and their new Paducah, Kentucky facility.

Impact

I_0Filter™ Type	*I_0Filter™ Status*	*THD_V PU*	*N – Gr. Volts PU*	*I_0 Amps PU*	*RMS I_ϕ Reduction*	*I_ϕ Imbalance Reduction*
BASED ON THE NETA TESTING COMPANY REPORT, June 11, 1997.						
'Prototype'	OFF	1.0	1.0	1.0		
'Prototype'	ON	0.59	0.31	0.27	11.4%	34.4%
BASED ON THE POWER QUALITY INTERNATIONAL REPORT, January 30, 1998.						
Mini-Z™	OFF	1.0	1.0	1.0		
Mini-Z™	ON	0.23	0.05	0.05	11.7%	45.0%

Table 1

Notes

PU - Per Unit
THDV - Total Harmonic Distortion of Voltage
N-G V - Common Mode Noise (Neutral – Gr. Voltage)
I_0 Amps - Zero Sequence Phase and Neutral Currents
RMS I_0 Reduction - RMS Phase Current Reduction
I_0 Imbalance Reduction - Phase Current Imbalance Reduction