

# Chapter 6

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## Conclusion

### 6.1 Conclusions

One of the objectives of this project was to investigate the quality of electric power supply of Uva Provincial Council. The logged data revealed that the Total Demand Distortion, as well as the individual Current Harmonic Distortion are beyond the limits prescribed by IEEE standard 519-1992. The main distortion consists of odd multiples of the fundamental component (50 Hz) and occurs in a frequency range up to 1 kHz. Moreover, it was observed that the Voltage Total Harmonic Distortion was within prescribed limits.

Presence of excessive harmonics could result equipment failure, mal-functioning and pre-aging. Additional losses due to the harmonics in the power system are less than one tenth of a percent of the total active power flow. But in long term the effect is significant.

Analysis of various harmonic mitigation techniques revealed that the shunt APF with voltage-fed PWM linear control unit is suitable for mitigating the harmonics at UPC building. The strategy suitable for harmonic determination is notch filtering and the power circuit appropriate is a voltage-fed PWM inverter.

Selected configuration was modeled, and an example simulation was done using MATLAB / Simulink environment. The results reveal that active power filters can be used successfully to mitigate the harmonics produced by non-linear loads. However, the location of harmonic reduction equipment within the building wiring is crucial for effectiveness. The greatest potential for loss reduction and harmonic mitigation can be achieved through filtering the harmonics near the harmonic generating loads, while installations near the service entrance may be of little value.

In this research, data were collected using limited resources within a limited period. There are several possible sources of error when analyzing the monitored data, not only the technical measurement, due to harmonic interaction in the system. However, proper monitoring the distortion is important to get real data of the harmonics amplitude and phase angle and of the variation over the time, i.e. the day, week or year.

## 6.2 Remarks and Discussion

The survey was conducted in a typical office building with many computers connected. The data obtained from case study indicates that it could be a problem commonly found in much similar office building in Sri Lanka. Problems of harmonics from non linear loads continue to grow with modern office buildings. This work may alert the electrical engineers interested in Power Quality issues, as well as those unaware of it by embracing a large number of aspects related with this subject. This analysis may provide useful information in the future dimensioning and project of the electrical installation in the facility buildings.