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# Harmonic Assessment and Mitigation in Medical Diagonesis Equipment

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**Abstract :** Poor power quality in electrical power systems can lead to medical equipment at healthcare centres to malfunction and present wrong medical diagnosis. Equipment such as X-rays, computerized axial tomography, etc. can pollute the system due to their high level of harmonics production, which may cause a number of undesirable effects like heating, equipment damages and electromagnetic interferences. The conventional approach of mitigation uses passive inductor/capacitor (LC) filters, which has some drawbacks such as, large sizes, resonance problems and fixed compensation behaviours. The current trends of solutions generally employ active power filters using suitable control algorithms. This work focuses on assessing the level of Total Harmonic Distortion (THD) on medical facilities and various ways of mitigation, using radiology unit of an existing hospital as a case study. The measurement of the harmonics is conducted with a power quality analyzer at the point of common coupling (PCC). The levels of measured THD are found to be higher than the IEEE 519-1992 standard limits. The system is then modelled as a harmonic current source using MATLAB/SIMULINK. To mitigate the unwanted harmonic currents a shunt active filter is developed using synchronous detection algorithm to extract the fundamental component of the source currents. Fuzzy logic controller is then developed to control the filter. The THD without the active power filter are validated using the measured values. The THD with the developed filter show that the harmonics are now within the recommended limits.

**Keywords :** power quality, total harmonics distortion, shunt active filters, fuzzy logic
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