

## **Performance of unified power quality conditioner (UPQC) based on fuzzy controller for attenuating of voltage and current harmonics**

*Mohamad Milood Almelian<sup>ab</sup>; Izzeldin I Mohd<sup>a</sup>; Mohamed Asghaiyer Omran<sup>ac</sup> and Usman Ullah Sheikh<sup>d</sup>*

<sup>a</sup> Faculty of Electrical and Electronics Engineering, University Malaysia Pahang (UMP), 26600 Pekan, Pahang, Malaysia.

<sup>b</sup> Department of Electrical and Electronics Engineering, Higher Institute of Sciences and Technology, Mezdah, Libya.

<sup>c</sup> Faculty of Electrical and Electronics Engineering, Bani Walid, Libya.

<sup>d</sup> Faculty of Electrical Engineering, Universiti Teknologi Malaysia, 83100 UTM Skudai, Johor Bahru, Johor, Malaysia

### **ABSTRACT**

Power quality-related issues such as current and voltage distortions can adversely affect home and industrial appliances. Although several conventional techniques such as the use of passive and active filters have been developed to increase power quality standards, these methods have challenges and are inadequate due to the increasing number of applications. The Unified Power Quality Conditioner (UPQC) is a modern strategy towards correcting the imperfections of voltage and load current supply. A UPQC is a combination of both series and shunt active power filters in a back-to-back manner with a common DC link capacitor. The control of the voltage of the DC link capacitor is important in achieving a desired UPQC performance. In this paper, the UPQC with a Fuzzy logic controller (FLC) was used to precisely eliminate the imperfections of voltage and current harmonics. The results of the simulation studies using MATLAB/Simulink and Simpower system programming for R-L load associated through an uncontrolled bridge rectifier was used to assess the execution process. The UPQC with FLC was simulated for a system with distorted load current and a system with distorted source voltage and load current. The outcome of the comparison of %THD in the load current and source voltage before and after using UPQC for the two cases was presented.

### **KEYWORDS:**

Fuzzy logic; MATLAB; Passive filters