

UNIVERSITI TEKNOLOGI MARA

**IMPLEMENTATION OF HALF-BRIDGE ACTIVE
POWER FILTER USING FUZZY LOGIC
CONTROL**

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Thesis submitted in fulfillment of the requirements
for the degree of

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Candidate's Declaration

I declare that that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and it is the result of my own work, unless otherwise indicated or acknowledged as reference work. This thesis has not been submitted to any other academic institution or non-academic institution for any other degree or qualification.

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ABSTRACT

In this work, a single-phase half-bridge topology employing the commonly used hysteresis current control loop complemented with fuzzy logic based voltage control loop is proposed for use in single-phase parallel active power filter (APF). This is connected in parallel with a typical non-linear load performing appropriate compensations to resolve associated problems such as current displacement and harmonics. The unique use of fuzzy logic control (FLC) strategy has been chosen for voltage control; known for providing fast response and simple for microprocessor based implementations in control electronics independent of load changes. In this instance, it is being used to maintain the DC capacitor voltage of the APF for compensation purposes. This voltage is maintained at an appropriate higher value than the supply voltage to ensure that current can be injected into the system when required. To facilitate, a boost inductor is used to increase the charging voltage to the capacitor. The proposed scheme was implemented as a computer model using MATLAB/Simulink to evaluate the behaviour and performance. This is then implemented using an experimental test-rig for investigations on the proposed APF operation; with a single-phase bridge rectifier used to represent a non-linear load. The APF comprising a half-bridge inverter is constructed using 2 units of BUP314D. The proposed control scheme was then implemented using 2 units of PIC 16F877 microcontroller complemented with analogue circuits. Investigations have shown that the proposed APF is capable of achieving nearly sinusoidal input current and in-phase with respect to the supply voltage whilst providing a highly distorted supply current required by the load, even under certain transient condition. The performance when compared to BS-EN61000 and IEEE 519 is satisfactory.

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