

Students: Halivni Omer
Siman-Tov Effi

Supervisor: Prof. Ben-Yaakov Shmuel
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Abstract

In recent years the applications of modern electronic equipment, both for industrial and consumer needs, have been increasing rapidly, exposing the *AC Main* in various times to nonlinear loads.

These nonlinear loads draw reactive and harmonic current, which leads to a low power factor, low efficiency and rapid warming of the electrical equipment. This phenomenon can cause significant damage to the *AC Main* and can also be harmful to the electrical equipment.

One of the proposed solutions is the A.P.F (Active Power Factor). This device minimizes and even eliminates the reactive and harmonic current, thereby improving the power factor.

The A.P.F can be connected in parallel or serial to the nonlinear load. It consumes and produces current harmonics, so the *AC Main* senses a linear load and its current is a sinusoidal waveform.

The A.P.F is controlled by a closed loop controller, which gets data from the *AC Main* (V_{line} ; I_{line}), and from the power stage (V_{out}). The controller produces the required duty cycle of the A.P.F switches, so that the filter stage will meet its requirements.

Various control systems were built to operate the A.P.F., and they differ from each other in their electrical parts, their cost, speed and efficiency.

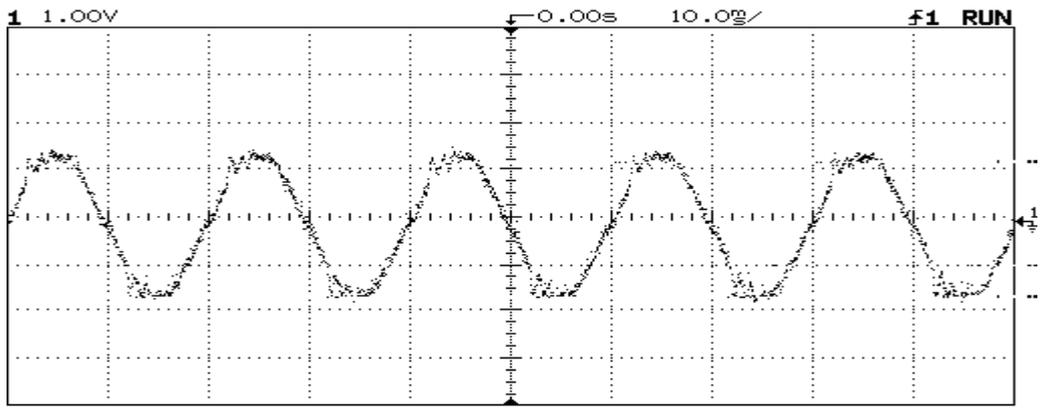
In this project we will design and implement an A.P.F. with a parallel connection to the nonlinear load. This A.P.F will eliminate the reactive and harmonic current, which are consumed from the *AC Main*, the current will thereby meet the relevant requirements, which are:

- ✓ Power Factor 0.99
- ✓ Standard EN-61000-3-2

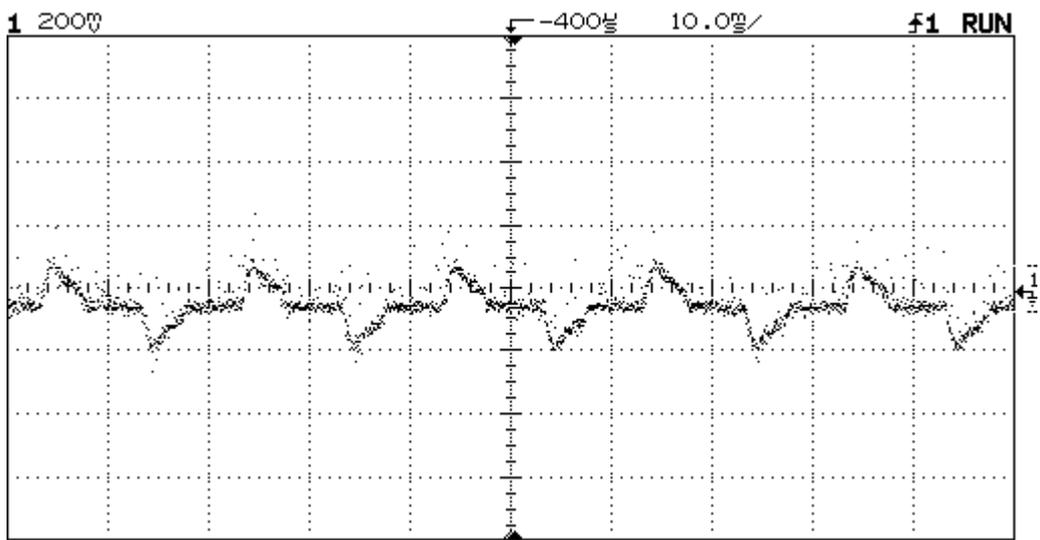
Our A.P.F will be based on existing models, which have been developed in the power laboratory at *Ben-Gurion University*. The control unit of these models senses the input current and the output voltage.

The first generation of these filters is based only on analog technology, which has some disadvantages like high cost and low speed. In this project our goal was to built the control system based on a digital microcontroller.

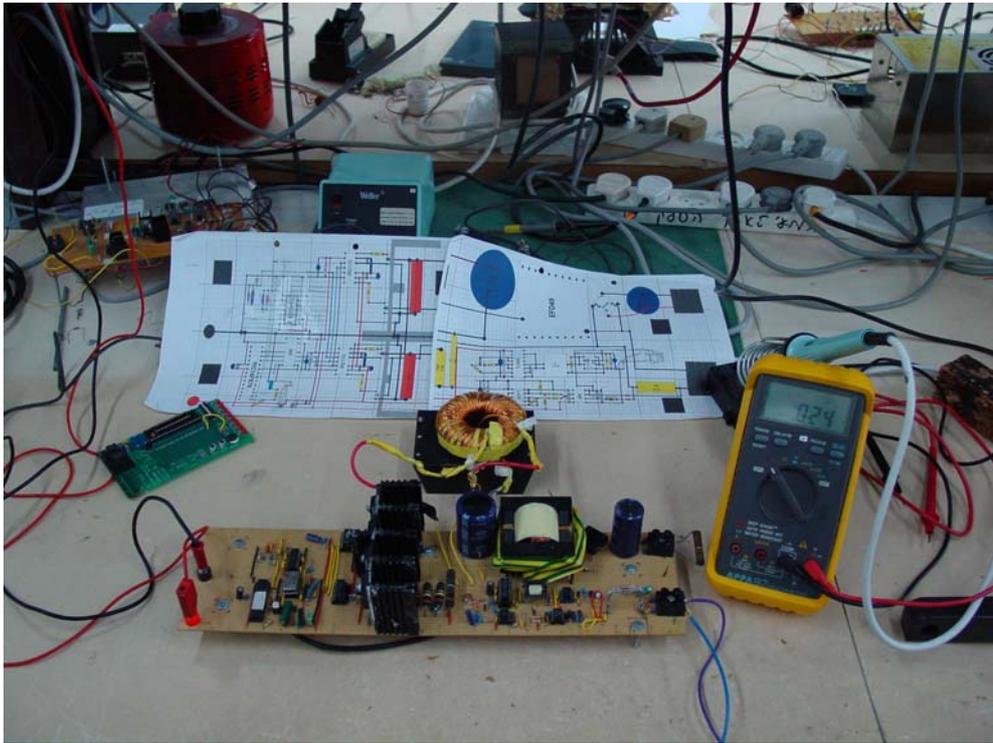
A prototype was built and tested in open and closed outer loop ,it was proved that the device produce a sinusoidal waveform current in the same phase with the *AC Main voltage*. In addition the device is adapting the input resistance according to the load.



Ac main current



Nonlinear load current



The A.P.F.C and its Layout

