Project Title: Active Power Filter

Students: Alon Shamay
Dudu Yaakobi

Director: Prof. Shmuel Ben Yaacov

Abstract:

The rapid increasing of usage of electronic equipment in recent years impose nonlinear loads to the ac main that draw a reactive and harmonic current in addition to the active current. The reactive and harmonic current lead to, low efficiency, harmful electromagnetic interference to neighborhood appliance (fig 1), as well as heating the transformers. Vast numbers of power factor correction techniques have been proposed. Most techniques use a current shaper to shape the input current to sinusoidal waveform. There are several problem concerning with that technique. Firstly, since the current shaper is in the cascade path of the power, it processes all the power and thus requires high current and high voltage semiconductor devices and involves significant power losses. Secondly, it is not convenient to insert a current shaper to existing electronic equipment, since significant redesign would be required.

An alternative Parallel harmonic correction technique, shunt active power filter (APF), has been exported by many researchers. An active power filter is a device that is conected in parallel, (Fig 4) to and cancels the reactive and harmonic currents from a group of nonlinear loads so that the resulting total current drawn from the ac main is sinusoidal (Fig 3). Ideally, the APF needs to generate just enough reactive and harmonic current to compensate the nonlinear loads in the line (Fig 2), thus it handles only a fraction of the total power to the load. The performance of the active power largely depends on the inverter topologies and PWM control method. Our application (implementation of the project) is base on switched converter of the Full-Bridge type. The control module is done based on a micro controller of Microchip. The stage is capable handling transition power of 500W.

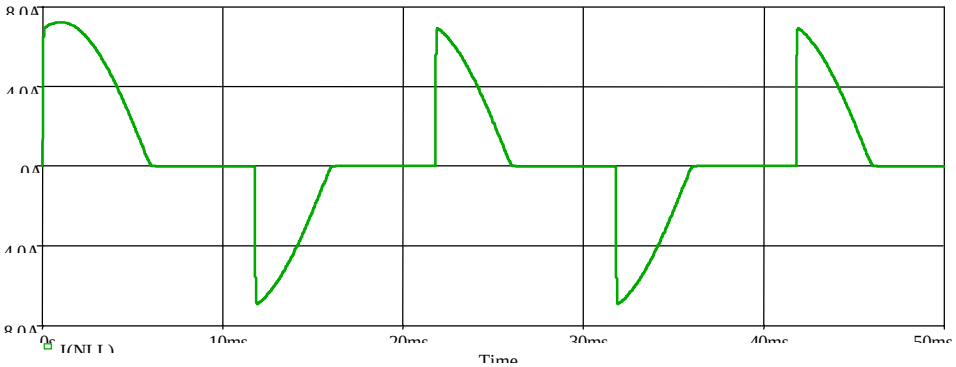

Fig 1 non-linear load Current

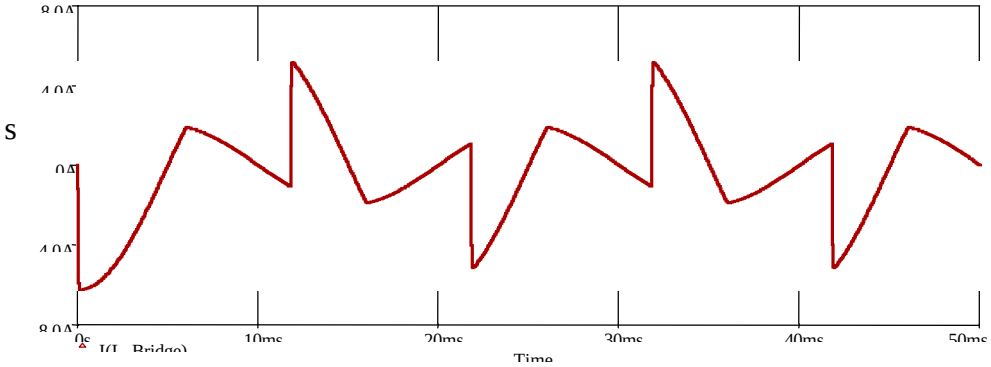

Fig 2 controller Current

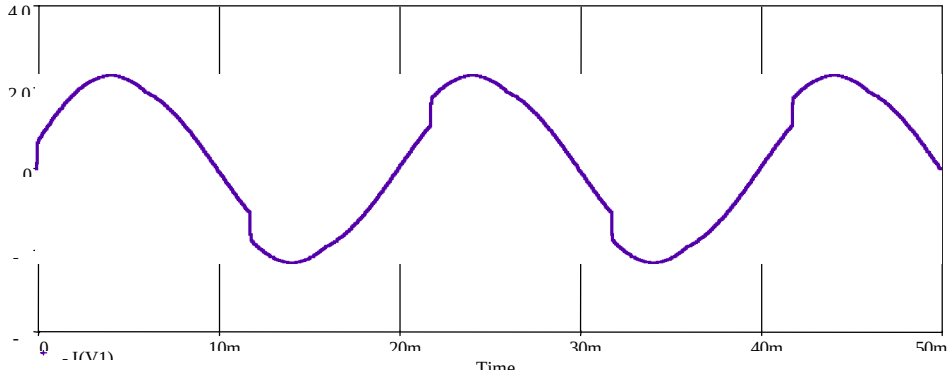

Fig 3 total Current

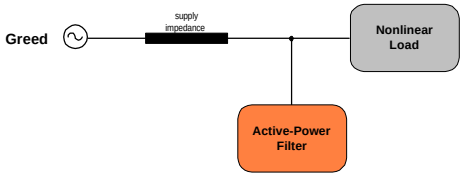

Fig Parallel active power filter

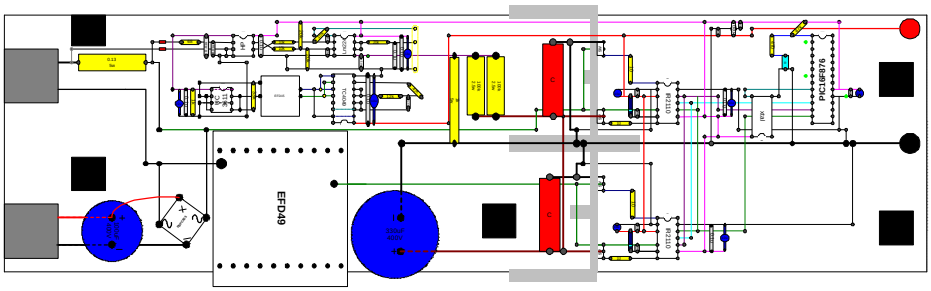

Fig 5 Layout

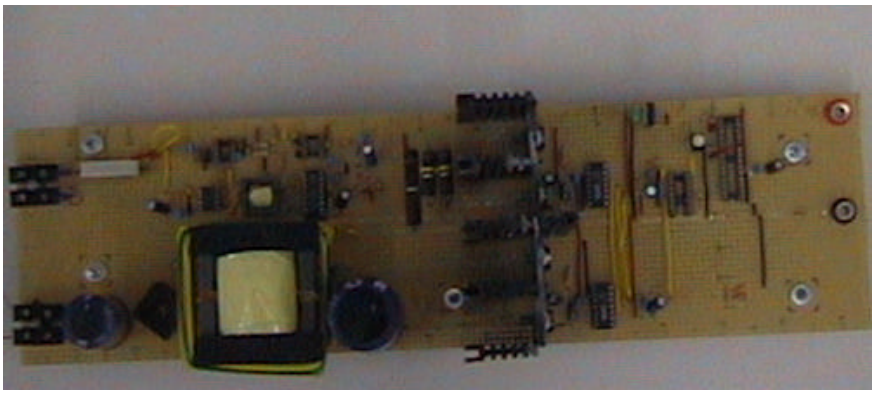

Fig 6 The Circuit