

00/UC3M/68 – ACTIVE FILTER TO IMPROVE THE ENERGETIC EFFICIENCY IN ELECTRIC INSTALLATIONS.

The Department of Electrical Engineering of the University Carlos III of Madrid has developed a prototype of active filter to compensate the disturbances that a nonlinear load produces. The active filters appears like the dynamic solution that best fits to the needs of compensation of electrical disturbances in industrial facilities. This active filter allows correcting the power factor of the installation. With this improvement, electrical consumes are reduced, which results in significant cost savings.

Description and special features

The efficient use of energy allows us to optimize the operation of the facility achieving a reduction of electricity consumption and a reduction in the environmental impacts. This can be achieved by incorporating technological innovations and efficient collaboration of users, enterprises and government agencies.

During the last decade, power systems have undergone an important change since they have been gradually happening to be formed by linear elements to contain a large amount of non-linear elements: electronic rectifiers, converters, uninterrupter power supplies, etc. These elements can alter the “theoretically ideal” parameters of the electrical signals, causing disturbances that spread through electric networks and that may increase the losses of other electronic devices that are connected to the network.

It is increasingly important not only to know what are the disturbances that exist in the electrical signals, but can predict and estimate the damage that can originate in industrial plants and distribution networks. To solve these problems, many techniques have been used ranging from the use of tuned passive filters to the use of active filters. While the former have the advantage of being cheaper, his selectivity does not allow them to compensate for all unwanted, in addition its passive nature bring themselves the modification of the resonance frequencies and their possible excitation can bring serious consequences. The active filters appear, then, like the dynamic solution that adjust more to the needs of compensation.

The Department of Electrical Engineering of the UC3M has developed a prototype of active filter to compensate the disturbances that a nonlinear load produces. Fig 1 shows the experimental results obtained before connecting the active filter. It is observed as the intensity of the nonlinear load is distorted with a high rate of harmonic distortion. The phase angle that exists between the signal voltage and current indicates that the factor of power of the load is low, which translates in economic surcharges in the invoicing of the electrical consumption of the companies because of a high consumption of reactive power.

When the active filter is connected to the installation, shown in Figure 2 that the current wave tends to be pure sinuosidal, and the resulting distortion, therefore, much lower than the initial . Fig. 2 shows that the active filter has corrected the factor of power from the installation when being the signal of tension and current in phase. With this improvement the electrical billing has been reduced, obtaining an important economic saving.

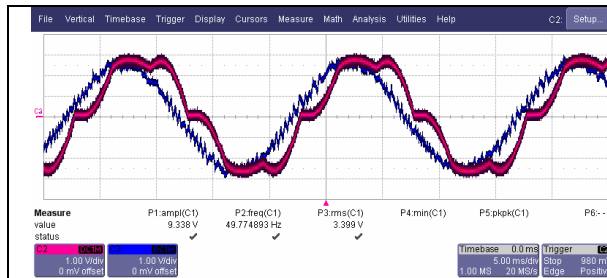


Fig 1. Installation of a flow (red) and voltage (blue) before connecting the active filter.

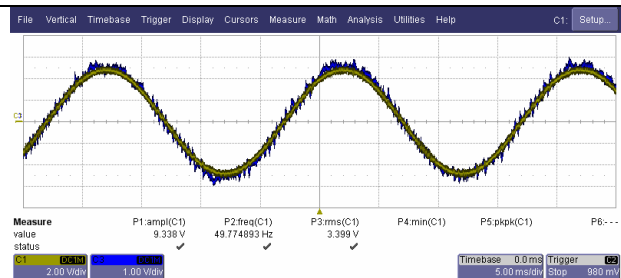


Fig 2. Forms of current (yellow) and voltage (blue) after compensation.

Innovative aspects

- Application of active filters as a technological solution for energy savings.
- Innovative procedure for the compensation of disturbances and PFC.
- Compact design, configurable according to customer requirements ad low cost.
- Remote system monitoring and measuring electrical variables of voltage, intensity and consumption.

Competitive advantages

- Increasing the life expectancy of the equipment by means of reducing electrical disturbances.
- Reduction of the monthly electric bill by means of diminishing losses and power factor compensation.
- Real time information on electricity consumption.

Technology Keywords

Storage of energy, batteries; Transmission of electricity; Generators, motors and power converters

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