

## **Simulation and Hardware Circuit of Hybrid Power Filters to Improve Power Quality**

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**Abstract:** This project describes the mitigation of power quality problems introduced by nonlinear loads. Through the expansion of modern industrial technology large number of nonlinear loads are used in power system. Because of this, harmonic distortion occurs which results with power quality problems. To overcome this problem, a hybrid power filter constituting a series active and a passive filter coupled in parallel with the load to improve the power quality. Thus the control strategy is verified by means of experimental prototype using a multisim software. <TELL ABOUT HARDWARE IMPLEMENTATION, SIMULATION RESULTS AND HARDWARE RESULTS>.

**Key words:** Passive filters, Active filters, Hybrid filters, Power quality.

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### **I. INTRODUCTION**

**PROBLEM STATEMENT:** The main of this project is to eliminate the harmonics to overcome the power quality problems. The existence of harmonics in electrical power systems is the key source for many problems. The main target of this system is the eradication of harmonics and lessening of reactive power. Depending on the application, passive or active or combinations of both are used. To overcome the drawbacks of passive and active filter, we propose a hybrid filter in which the harmonics are almost negligible where high power rating MOSFETS are used. Thus the power quality can be improved by using hybrid filters.

**FIELD OF THE PROJECT:** As this project is mainly concentrated on the design of power filters to improve the power quality, therefore this project comes under the field of power systems in which the filter eliminates the harmonics. This problem occurs due to presence of nonlinear loads. Due to the evolution of industrial technology, it results with the enormous number of nonlinear loads. Thus the lower order harmonics are eliminated by passive filter and higher order harmonics are eliminated by active filter.

### **II. METHODOLOGY**

Methods to eliminate harmonics :

- Passive filter
- Active filter
- Hybrid filter

(1) Passive Filter: Passive filter are the combinations of inductor and capacitor in which it does not depend on external supply and also it does not contain any active components. In this the inductor blocks high frequency signals and conducts the low frequency signals whereas the capacitor performs vice versa

(2) Active Filter: Active filter are electronic filters which are used in the analog circuits which consists of active components like amplifier, MOSFET, etc. The active filters also comprises of inductor , capacitor and resistor along with MOSFET and it reduces the higher order harmonics like fifth and seventh order harmonics.

(3) Hybrid Filter: Hybrid filters are the combinations of both active and passive filter in which it eliminates the lower order harmonics as well as higher order harmonics. This filter consists of high power rating MOSFETS where it eliminates the harmonics almost negligible.

### **III. IMPLEMENTATION OF POWER FILTERS**

**DESIGN:** These harmonics can be measured by the measurement of total harmonic distortion. The hybrid filter is designed based on the frequency range and it eliminates the harmonics by passing through it. The filter is mainly designed for the purpose of improving the power quality.

**IMPLEMENTATION:** In this project we have designed the hybrid filter by using the passive filter and the active filter to eliminate harmonics to improve the power quality.

The hybrid filter which we have designed is connected in parallel across the nonlinear loads. Due to these large number of nonlinear loads, the harmonics distortion are higher.

To eliminate the low order harmonics passive filter has been used and to eliminate the higher order harmonics active filter has been used.

Even though it eliminates higher order harmonics, the hybrid filter which is a combination of both the filters eliminates harmonics up to 90 percent, therefore it becomes almost negligible.

These harmonics can be measured by the measurement of total harmonic distortion. Thus by implementing this hybrid filter the power quality can be improved.

#### IV. RESULTS

##### System Specifications

Hybrid filter specifications	Values
Frequency Range	2KHz to 30MHz
Attenuation Constant	-30dB
Harmonic Range	2 to 5%
Power Factor Range	.95 to .97

#### V. CONCLUSION

Thus the hybrid filter is designed for the purpose of eliminating harmonics in order to improve the power quality and these are verified using power analyzer.

Thus the harmonics are eliminated by this power filter and it is verified by connecting the nonlinear load.

#### REFERENCES

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