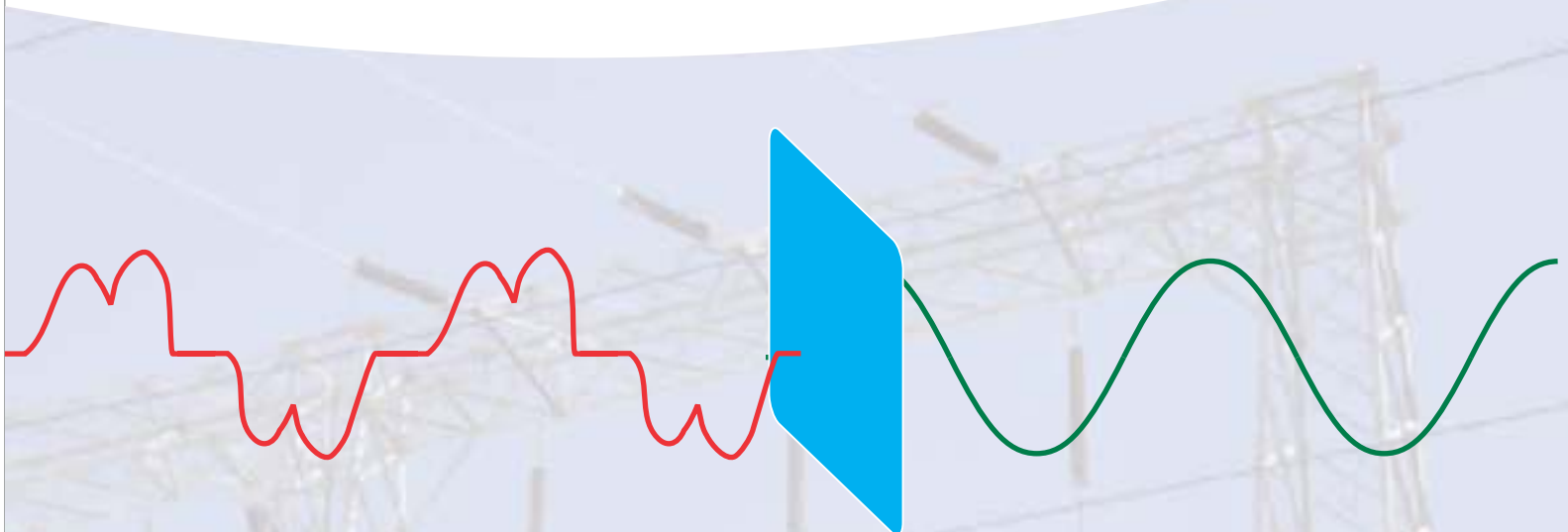


Re-shaping the power curves



with State of the art Active Harmonic Filter - **IORA 3000**



Introduction

About power quality

Our increased demand for quality and comfort of life have lead us to use more and more Industrial Automation, centralized and larger IT applications, Hi tech office and commercial buildings, Malls, Speciality hospitals and domestic usage of PCs, CFL, Ballast, Inverter etc. Such loads are increasing in numbers and their power rating percentage in overall electrical consumption is growing steadily.

This growth in recent past resulted in the introduction of potentially harmful current harmonics into the power system. Also termed as Power Pollution, these harmonics has increased power demand, and the supply authorities are getting stretched beyond their capacities, which have further deteriorated the quality of Power.



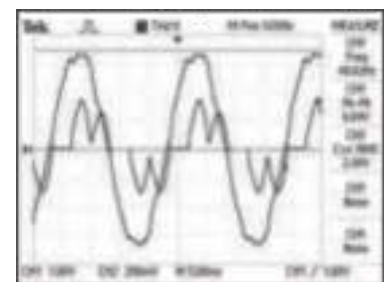
Harmonics

The main contributor to this is the nature of load current drawn by these equipments. These equipments, to remain more power efficient, uses regular power waveform in a “chopped” manner. In the process they become “non-linear” type of load, a load is said to be non-linear when the current it draws does not have the same wave form as the supply voltage.

The examples of non linear loads are:

- in industrial environment Welding machines, Arc furnaces, Induction furnaces, Rectifiers, Chargers, VFD for motors
- in Office environment PCs, Photocopy machines, UPSs etc.
- in Residential area TV, Microwave ovens, Fluorescent lights, CFL, Ballast, Inverters, Battery Charges etc.

These non-linear loads generates Harmonic currents. The presence of higher percentage of harmonics are disastrous and hence need to be controlled. They are potential hazards for both, electricity suppliers and the industrial, commercial as well as residential users.

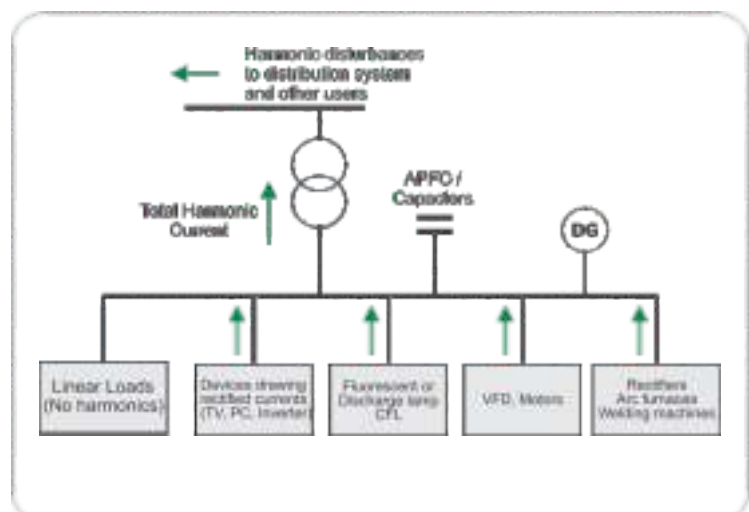


Wave shape of Supply voltage & Non linear load current

Disturbances caused by harmonics

In a power distribution systems, the presence of harmonics reduces power quality and consequently causes a number of problems like;

- Overloading of distribution systems due to increased RMS current
- Overloading of neutral conductor due to the summing of third-order harmonics
- Overloading and ageing of PFC capacitors
- Overloading and premature ageing of DG Setes, Transformers, motors etc.
- Distortion of the supply voltage, which can disturb the operation of sensitive loads
- Noise problem over the communication networks and telephone lines



Impact of Harmonics

Effects of Harmonics

The harmonics have a detrimental effect on the power quality. They reduce efficiency of the overall electrical system. Presence of harmonics reduces power quality. Which means reduced reliability and efficiency. These factors are assessed as important indicators of business operation, which are reliable operation of machines, manufacturing systems and office infrastructure.

Power quality problems in the internal power network also means ;

- Distribution lines and networks cannot be fully utilized
- High percentage of energy losses in the power lines
- Increased wear and limited system availability
- Downtime for equipment and systems



Economic impact

- Current harmonics creates nuisance tripping of breakers and shutdown of production line (increased OPEX)
- Life of equipment reduces, this means increase in replacement cost (increased CAPEX)
- During planning stage over sizing of DG, Transformer, UPS's, Cables, Switchgear etc. (increased CAPEX)
- During operation overloaded condition of DG, UPS, Transformers, Capacitors, Neutral conductors this means more demand of power, more energy cost (increased OPEX)
- Increased losses in cable, transformers, capacitors that means increase in the energy cost, and possible penalties due to increased demand (increased OPEX)
- Disturbances to sensitive loads, regulating, control and monitoring systems
- Disturbances on computer and networking equipments
- Disturbances on telephone and Data communication

These extra costs direct as well as indirect in terms of equipment, energy and productivity, they all contribute to the reduction of competitiveness of companies.

More over electrical networks with poor power quality result in financial loss, environmental impacts and / or safety concerns. These losses are cascaded back to the utility power plants and result in increased CO2 emissions.

Latest study conducted shows that
ONE unit of electricity saved is
equivalent to THREE units generated.



Improvement technics

Power Quality Improvement

By reducing harmonics, one can improve the power quality, and increase the efficiency of electrical distribution system. The power savings of 10 to 30% is possible to achieve, depending on the applications.

Knowing the damaging effects of Harmonic pollution on power utility sources, different distribution companies and SEBs are hard pressing to put power demand under strict control, by bringing restriction on the percentage Harmonic distortion getting injected in supply lines.

Consul Neowatt offers a complete solution to this problem. Consul Neowatt Active Harmonic Filter - IORA 3000, is the State of the Art designed filter, which improves the overall power quality by limiting and eliminating the harmonic currents.



IORA 3000 - Active Harmonic Filter

Consul Neowatt design team has over decade long experience and expertise to design Harmonic Mitigation solutions. IORA 3000, is a solid state, State-of-the-Art designed filter, which measures level of current harmonic in the supply line and eliminates it by generating the counter harmonics, in real time. This action is dynamic, closed loop and hence the power cleaning is achieved instantaneously.

Unparallel Features	Benefits
Modular construction, most unique design concept	Basic modules of 100 A / 200 A, which can be paralleled to get the desired rating. There will be horizontal and vertical modularity.
Based on Floating point 32 bit DSP	Excellent attenuation even at the lower load levels, hence overall better performance on entire load cycle.
Selective harmonic elimination methods. CT can be connected in load as well as in source	Flexible design, hence particular harmonics which are causing damages can be kept under control.
Works up to 690 VAC (optional)	Wider voltage window, thanks to its inbuilt auto transformer.
Ethernet based Remote monitoring and 7 inch SVGA touch screen display	Enhanced monitoring and control of filter and hence the entire distribution system.
Lower audible noise	Suitable for installing near servers inside datacenter. It helps to curtail down harmonics, where they are generated.
Compact in size	Saves space, reduces installation cost.
Compliant to protection up to IP 51 (optional)	Ideal for the harsh industrial environments.

IORA 3000 - Active Harmonic Filter

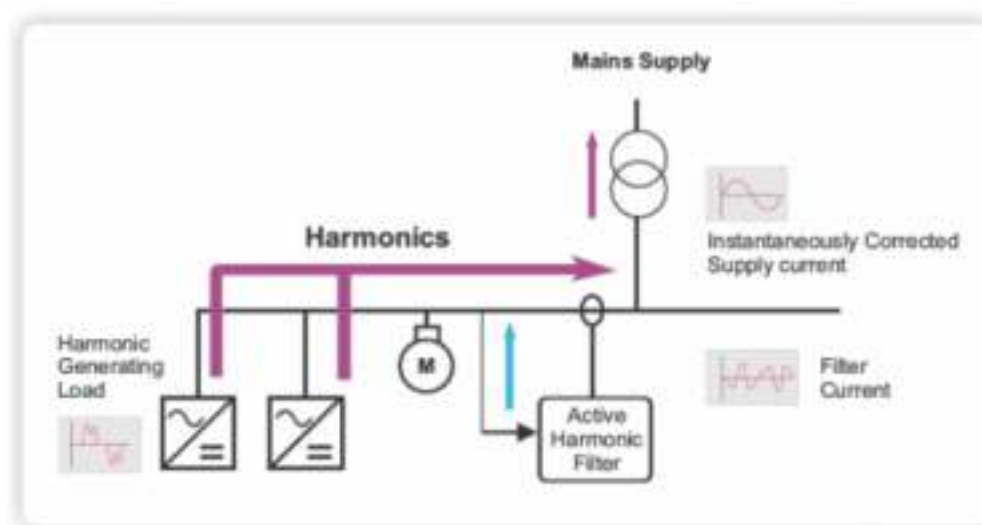
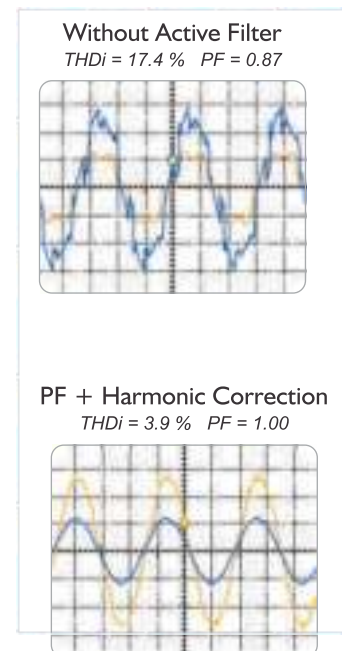
Additional Features

- Internal CAN Communication
- Employs high speed IGBTs in power circuit
- Closed loop active filter with source current sensing
- High attenuation
- Programmable selective harmonic elimination
- PF compensation, leading as well as lagging
- Helps in achieving the compliance with Power Quality regulations like IEEE 519
- IEC / EN 62040 - 2 category C3
- CT Sensing at Load side or Source side
- Neutral compensation model available upto 300 Amp

Principle of operation

IORA 3000 is a state-of-the-Art designed filter, which measures level of current harmonic in supply line and eliminates it by generating the counter harmonics. The harmonic mitigation is achieved, by sensing the load current and deriving the harmonic current spectrum. Thanks to its **Floating point 32 bit DSP** which determines the amplitude to be injected in the opposite phase angle for each harmonic order. This signal along with fast acting IGBTs injects current into the power circuit. This action happens almost instantaneously, restoring sine wave and attenuating harmonic levels at the point of installation.

Correction for displacement PF calculates the phase shift of the fundamental current from the voltage of the supply on a per cycle basis. DSP then calculates the amplitude and phase shift required for correcting the displacement power factor. The IGBTs are then directed to inject fundamental current at the proper phase shift to meet the preset objective.



IORA 3000 - Active Harmonic Filter

SPECIFICATIONS	Model	IORA 3000									
	Rating (A)	30	60	75	100	150	200	225	300	400	600
	Electrical Specifications										
	Utility connection method	3 Phase, 4 Wire									
	Utility Frequency	50 / 60 Hz, ± 5%									
	Utility Voltage V	400 V AC +10%, -15%									
	Filter Current I (A)	30	60	75	100	150	200	225	300	400	600
	Parallel Combination	Maximum 4 Units of same power rating									
	Filter Power Loss	Up to 3 % of equipment rating									
	Power Protection for Filter	MCCB and Fast Acting Semiconductor Fuses									
	Cooling	Forced Air Cooling									
	Cable Entry	Front - Bottom									
	Current Transformer Ratio	As Per Load current, Secondary 5A (class-1)									
	Harmonic Range	2 nd to 50 th order									
	Harmonics Selection	Selection of any 20 Harmonics									
	Harmonic Attenuation Ratio	Typically 10:1									
	Response Time	<20 ms (up to 80% filtering)									
	Reactive Current Compensation	Yes									
	Compensation Method	Closed loop									
	Current Limiting	Nominal Current									
	Overload (Peak Value)	2.5 times rated compensation current									
	User Interface										
	Monitoring	IORAMON on Ethernet									
	User Parameter Settings	From the system display									
	Standard	Meets IEEE 519 for compensated Harmonics									
	Environment										
	Protection Class	IP-20									
	Operating Temperature	0 to 40°C									
	Storage Temperature	0 to 70°C									
Relative Humidity	95% (Non condensing)										
Altitude	1000 m without derating										
Color	RAL 7016, Texture Finish										
Noise Level@1m(Ref:ISO 3746)	<65 db			<68 db				<70 db			
Dimensions in mm (WDXH)											
Width	620				800				1000		
Depth	450				850				900		
Height	1000				1750				1750		

Unparallel benefits

User Interface with Advance Graphics Display

Use of 7 inch SVGA color display enhances the user experience while interfacing with IORA Active Harmonic Filter. Colorful viewing of different waveforms, and setting various parameters can be done by use of this touch pad sensitive display. With this almost every details about the power can be monitored and logged for corrective action. The entire firmware is running on proprietary software, there is provision for the up gradation of software. For more details please talk to us.



User Benefits

- Reduction of the THDi in compliance with IEEE 519
- Load balancing
- Reduces capital expenditure cost of the electrical distribution network due to reduction in the over-sizing of cables, transformers and other equipments
- Safe and reliable AC power supply and distribution network
- Reduced overloading and overheating of the neutral conductor
- Nuisance tripping of protection circuit breakers avoided
- Reduction of the THD (V) due to cancellation of current harmonics
- Increased lifetime of distribution equipments
- Increased productivity by eliminating downtime
- Increased generator performance and life
- Lowers energy consumption bill
- Reduces operating expenses

With other harmonic mitigation solutions, expensive and time-consuming site data collection, power quality surveys and computer generated studies are usually needed. Consul Neowatt IORA 3000 corrects a full range of harmonic orders, and does not create a resonance condition with other existing equipments, so only minimal up-front analysis is required. Add to this its modular design feature, which makes it most suitable in case of expansions. In such case add new module of AHF, to achieve desired harmonic mitigation.

Investments in harmonic filters generally pay off within 6-24 months.



Applications

Active Harmonic Filters are ideal solution for harmonic mitigation in industrial and commercial environment. Typical applications includes;

- Oil and Gas industry (onshore and offshore)
- Steel industry
- Foundries
- Textile industry
- Water and waste water industry
- Cement industry
- Automotive industry
- Process plants
- Pulp and paper industry
- Chilling stations / HVAC
- Printing industry
- Offices and commercial buildings
- Hospitals, Malls, Stadiums etc.
- Data centers
- Residential buildings
- UPS systems, lifts and advanced lighting systems
- Light industrial loads such as remote pumping stations
- Light railway and metro applications



Consul Neowatt, is working towards Energy saving and Power Management Solutions for tomorrow's growing energy demands. It's business focuses on providing end to end solutions for the Power Quality Enhancement and Renewable Energy using latest technology.

With its strong domain expertise, dedication to serve the customer needs and desire to bring the world class solutions in Power quality and continuity market, Consul Neowatt shall be offering unmatched techno commercial solutions to the Global Power Electronics Market.

Optional:-

- 1) Different utility voltages available
- 2) Paralleling configuration available

* The information contained in this publication is subject to change without prior notice

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