- Load Flow & Harmonic Analysis
- Harmonic Duty Power Capacitors
- IOT Enabled IPFC Relay
- Anti Harmonic Detuned Reactor
- APFC Panel (Thyristorized / Contactor)
- Thyristor Switches
- Active Harmonic Filter
- AC MFD Capacitor
Havells India Limited is a leading Fast Moving Electrical Goods (FMEG) Company and a major power distribution equipment manufacturer with a strong global presence. Havells enjoys enviable market dominance across a wide spectrum of products, including Industrial & Domestic Circuit Protection Devices, Cables & Wires, Motors, Fans, Modular Switches, Home Appliances, Air Conditioners, Electric Water Heaters, Power Capacitors, CFL Lamps, Luminaires for Domestic, Commercial and Industrial Applications.

Today, Havells owns some of the most prestigious brands like Havells, Lloyd, Crabtree, Standard and Promptec. Its network constitutes of 6500 professionals, over 7650 dealers and 40 branches in the country. Our products are available in over 50 countries. The company has twelve state-of-the-art manufacturing plants in India located at Haridwar, Baddi, Sahibabad, Faridabad, Assam, Alwar and Neemrana, manufacturing globally acclaimed products, synonymous with excellence and precision in the electrical industry.
Swiss Technology
What is Harmonics?
Harmonics are multiple frequency of current apart from fundamental, which are the request of non-linear load.

Benefits of Harmonics Analysis & its Solutions:
- Root cause analysis of Power Quality related issues
- Improve True Power Factor
- Reduce kVA Demand
- Reduce kWArh
- Reduce Energy Losses
- Reduce Harmonics
- Eliminate Spurious operation of protection system
- Eliminate Erratic operation of Control Systems
- Stable Operation of Plant in Island as well as Grid connected mode
- Ensure accurate operation of metering systems
- Reduce equipment failures
- Reduce Downtime
- Increase productivity

Harmonics Analysis – Havells Expert Approach

Few critical parameters which should be captured as per their relevant standards for proper solutions:

<table>
<thead>
<tr>
<th>REFERENCE STANDARD</th>
<th>PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEEE 519</td>
<td>Current Harmonics</td>
</tr>
<tr>
<td>IEEE 519</td>
<td>Voltage Harmonics</td>
</tr>
<tr>
<td>EN 50160</td>
<td>Load Unbalance</td>
</tr>
<tr>
<td>EN 610002-12</td>
<td>Supply Voltage Unbalance</td>
</tr>
<tr>
<td>EN 610006-1 &amp; 6-2</td>
<td>Transient Over Voltage</td>
</tr>
<tr>
<td>EN 50160. EN 50160</td>
<td>Long Interruption of Supply Voltage</td>
</tr>
<tr>
<td>EN 610006-1 &amp; 6-2</td>
<td>Short Interruption of Supply Voltage</td>
</tr>
<tr>
<td>EN 50160 EN 610006-1-2</td>
<td>Voltage Swells/Voltage Dips</td>
</tr>
<tr>
<td>EN 50160</td>
<td>Voltage Magnitude Variations</td>
</tr>
<tr>
<td>EN 50160</td>
<td>Frequency</td>
</tr>
</tbody>
</table>
Right solution is the KEY

IEEE 519-2014 Guidelines for Harmonics Limits

Recommended Voltage Harmonics Limits:

<table>
<thead>
<tr>
<th>Bus Voltage V at PCC</th>
<th>Individual harmonic (%)</th>
<th>Total harmonic distortion THD (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>V &lt; 1.0 kW</td>
<td>5.0</td>
<td>8.0</td>
</tr>
<tr>
<td>1 kW &lt; V ≤ 69 kW</td>
<td>3.0</td>
<td>5.0</td>
</tr>
<tr>
<td>69kV &lt; V ≤ 161 kV</td>
<td>1.5</td>
<td>2.5</td>
</tr>
<tr>
<td>161 kV &lt; V</td>
<td>1.0</td>
<td>1.5</td>
</tr>
</tbody>
</table>

* High-voltage systems can have up to 2.0% THD where the cause is an HVDC terminal whose effects will have attenuated at points in the network where future users may be connected.

Recommended Current Harmonics Limits:

<table>
<thead>
<tr>
<th>Individual harmonic order (odd harmonics)*</th>
<th>Maximum harmonic current distortion in percent of I1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3≤h&lt;11</td>
</tr>
<tr>
<td>&lt;20</td>
<td>4.0</td>
</tr>
<tr>
<td>20&lt;50</td>
<td>7.0</td>
</tr>
<tr>
<td>50&lt;100</td>
<td>10.0</td>
</tr>
<tr>
<td>100&lt;1000</td>
<td>12.0</td>
</tr>
<tr>
<td>&gt;1000</td>
<td>15.0</td>
</tr>
</tbody>
</table>
LT MPP
Harmonic Duty Cylindrical Power Capacitor

Range:
- 0.5 kVar to 50 kVar
- 220 Vac to 1000 Vac
- Soft Sticky Resin / Gas Filled
- IS: 13340 / IEC: 60831

Features:
- High inrush current withstand capability.
- Soft sticky resin to withstand high temperature.
- Special imported metallised hazy film profile to withstand high voltage and current stress.
- Tripple safety protection (Self healing, internal notch mechanism & over pressure disconnector).
- Explosion proof, low losses & high over current withstand capabilities.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Splendid Duty</th>
<th>HD Plus</th>
<th>SHD Plus</th>
<th>SHD - Gas Filled</th>
<th>Agri Boost (Normal Duty)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>MPP</td>
<td>MPP</td>
<td>MPP</td>
<td>MPP-Gas</td>
<td>MPP</td>
</tr>
<tr>
<td>Over Current withstand capacity</td>
<td>1.6 X Ir</td>
<td>2.2 Ir</td>
<td>3.0 X Ir</td>
<td>2.6 X Ir</td>
<td>1.3 X Ir</td>
</tr>
<tr>
<td>(kVar)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>250 times</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.2 W / kVar</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35000</td>
<td>60</td>
<td>65</td>
<td>60</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>No of switching per year</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max Ambient Temp (°C)</td>
<td>55</td>
<td>60</td>
<td>65</td>
<td>60</td>
<td>55</td>
</tr>
<tr>
<td>Operating life in hours</td>
<td>120000</td>
<td>180000</td>
<td>215000</td>
<td>180000</td>
<td>80000</td>
</tr>
</tbody>
</table>
LT MPP / APP / Mixed Dielectric
Harmonic Duty Square Power Capacitor

Features:
- High inrush current withstand capability.
- Inbuilt high grade copper air core inductor for high inrush current suppression.
- Soft sticky resin to withstand high temperature.
- Special imported metallised heavy film profile to withstand high voltage and current stress.
- High grade oil impregnation
- Tripple safety protection (Self healing, internal notch mechanism & over pressure disconnector)
- Explosion proof, low losses & high over current withstand capabilities.

Range:
- 0.5 kVAR to 100 kVAR
- 220 Vac to 1000 Vac
- MPP / APP / Mixed Dielectric

Vacuum Technology

(Splendid Duty)
Range
0.5 kVAR - 100 kVAR
220 Vac - 1000 Vac

(Splendid Duty)
MPP
1.6 X Ir
250 times
0.2 W / kVAR
35000
55
120000

(Heavy Duty)
Range
0.5 kVAR - 100 kVAR
220 Vac - 1000 Vac

(Super Heavy Duty)
Range
0.5 kVAR - 100 kVAR
220 Vac - 1000 Vac

UHDXL
(Ultra Heavy Duty) APP
1 kVAR - 100 kVAR
220 Vac - 1000 Vac

UXDXL
(Ultra Heavy Duty) Mixed Dielectric
1 kVAR - 100 kVAR
220 Vac - 1000 Vac

MPP
2.0 Ir
300 times
0.2 W / kVAR
50000
60
175000

MPP
2.8 X Ir
400 times
0.2 W / kVAR
65000
65
200000

APP
4.0 X Ir
525 times
0.2 W / kVAR
125000
70
325000

MPP
5.0 X Ir
550 times
0.2 W / kVAR
135000
75
400000
Advance kVar Sensing Technology

Range:
- 5, 6, 8, 12, 14 & 16 steps
- Single CT & Three CT sensing APFC Relay
- Contactor Switching & Thyristor switching
- LED & LCD Display.
- IEC: 61010-1

Features:
- Wide band of Auxiliary supply 90 Vac - 550 Vac
- Dual Password protection
- Dual Source PF Relay (E.B./DG)
- IOT enabled with Data logging facility
- 4 digit display (0.xxx) PF
- Automatic CT Polarity Detection
- Advanced 32-bit Micro-controller based logic
- NTC Temperature sensor
- Communication interface through Wi-fi, RS 485, GSM & Modbus RTU

3 CT : 8, 12 & 16 Steps with Thyristor / Contactor Switching with GSM

Industry 4.0 ready IOT IPFC Relay
**Range:**
- Copper / Aluminum
- 1 kVar to 100 kVar
- 5.67%, 7% & 14% filtering factor
- 185% to 225% Linearity
- IS: 5553 / IEC: 61558

**Features:**
- High linearity 185% to 225%
- Insulation Class H
- High harmonic loading capability
- Temperature protection-NC contact (UL approved)
- Long expected life time
- Low noise
- Very low losses
- Convenient mounting
- IEC-61558

**Applications:**
- Reduction of harmonic distortion (network clearing)
- Avoidance of resonance conditions
- Tuned and detuned harmonic filters
- Reduction of power losses
APFCS - Automatic Power Factor Correction System

Range:
- 10 kVAR - 1000 kVAR
- Switching: Contactor / Thyristorised (Ultra Fast)

Features:
- Ref. Standard: IEC 61921/IS 8623/IS 16676
- Manufactured with highly precise modern Amada CNC machine.
- 11 tank process for corrosion proof powder coating.
- Ergonomic, compact and robust design.
- Designed with fully copper conductor.
- Heavy duty power capacitor for long life.
- Advance C-MOS technology based micro processor relay for intelligent power factor control.
- Air core reactor for extra safety from inrush current (High currents).
- Provision of top and bottom cable entry.
- Automatic temp. control through fans and louvers in panel.
- Double side earthing connection.

How Havells use the Best Practices and Latest Standards in manufacturing of APFC Panel

“INTERGRATED PROCESS”

Fabrication
The sheet metal processing like cutting, sizing, punching & bending are done on state-of-the-art, high accuracy CNC Turret Punch machines of Amada (Japan) & Trumpf (Germany). The fabrication is totally modular design.

The busbar contains High conductivity electrical grade Copper conductors, sourced directly from the manufacturers like Hindalco and other reputed make. The copper bus bar are fully rated considering all design related parameters and completely shielded by sendwitch casicading design insulated by nylon robust shrouds with propter air vents.

Smart Surface Pre-Treatment
Prior to the painting process, all sheet metal enclosure and fabricated metallic parts of the Panel undergo a robust Eleven Tank process of surface pre-treatment.

The pre-treatment consists of:
1. Degreasing
2. Rinsing-I
3. Rinsing – II
4. De-rusting
5. Rinsing- III
6. Rinsing –IV
7. Activation
8. Phosphating
9. Rinsing
10. Passivation
11. Dry Off

Modular Design with 100% Copper Conductor
• **Fully Automatic Advance Painting Process**
After the Eleven Tank process of surface pre-treatment, the enclosures & fabricated metal sections are ready for painting. The painting process is carried out by powder coating done on fully automated conveyerised painting line & baking in advance automatic and computerised temperature control oven thereafter.

• **In-process & Final Inspection**
All products and systems during In-process & as finished products undergoes inspection and testing in accordance with stringent Quality Assurance Plan (QAP) and results are recorded.

IOT Enabled & On Site Service
Range:
- Rating: 5 kVar - 100 kVar
- Voltage: 200 Vac – 1000 Vac

Features:
- Ultra High Speed capacitor switching with response time as Half supply cycle
- Integral Protection to Thyristors facilitates non usage of costly Semiconductor Fuses
- High end Smart Microcontroller Technology
- Multifold Protection system in built
- Remote and Local override control
- Continuous display of Capacitor Current and any annunciation on 4-digit 7-seg LED display & LCD display
- Thyristor rating 2300 V for up to 500 Vac supply and 3600 V for up to 800 Vac supply
- THD monitoring and protection
- Capacitor kVar value deterioration monitoring and protection
- Thyristor health check and supply health check monitoring
- Standard Protection like Over/Under Voltage, Over temperature, spike current and supply voltage transient protection
- Extra Heavy duty fan for super fast cooling

Applications:
- Production Lines involving automation and CNC machines.
- Lifts / Elevators.
- Sheet Metal Press Shops.
- Wind Turbines involving induction generators.
- Central Air Conditioning Load.
- Metal Rolling Mills, Electrical furnaces and Coiling / De-coiling plants.
- Printing Presses.
- Welding Machines.
AHF Features:

- The Havells make AHF is a unique innovation solution for Power Quality that address all power quality issues effectively. Major features are:
  - Ultra-fast response
  - No deration up-to 50°C ambient temperature
  - Havells unique Quad Pro feature- These features enables user to program AHF as per its priority for following compensation:
    - Current harmonics
    - Reactive compensation
    - Load balancing
    - Neutral compensation
  - Priority selection feature for maximum capacity utilization as per the system requirement.

Range:

- Rating: 10 A - 1000 A

AHF Technology & Innovation

- Heavy Duty IGBT used for Switching Technology
- Latest technology & Ultra-Fast algorithm used for sensing and control which provides smooth & precise compensation.
- Advanced LCD display with intelligent 32 bit microprocessor.
- User friendly programs and customization as per customer requirement for data display.
- Modular design enclosure fabricated by latest Amada CNC Machines & painted through fully automatic powder coating plant after 11 tank process.

Applications:

- Compliance of IEEE-519
- Printing Press.
- Automobile.
- Textile.
- Harmonic rich environment.
- Hospitals.
- Airports etc.
Certifications

MANAGEMENT SYSTEM CERTIFICATE

This is to certify that the management system of Havelis India Limited has been found to conform to the Quality Management System standard: ISO 9001:2015.

Havelis India Limited
Plot No. 6, Gymnastics Industrial Area, Sahibabad - 201 030, Dist. Ghaziabad, Uttar Pradesh, India

MANAGEMENT SYSTEM CERTIFICATE

This is to certify that the management system of Havelis India Limited has been found to conform to the Environmental Management System standard: ISO 14001:2015.

Havelis India Limited
Plot No. 6, Gymnastics Industrial Area, Sahibabad - 201 030, Dist. Ghaziabad, Uttar Pradesh, India

MANAGEMENT SYSTEM CERTIFICATE

This is to certify that the management system of Havelis India Limited has been found to conform to the Occupational Health and Safety Management System standard: OHSAS 18001:2007.

Havelis India Limited
Plot No. 6, Gymnastics Industrial Area, Sahibabad - 201 030, Dist. Ghaziabad, Uttar Pradesh, India

MANAGEMENT SYSTEM CERTIFICATE

This is to certify that the management system of Havelis India Limited has been found to conform to the Energy Management System standard: ISO 50001:2011.

Havelis India Limited
Plot No. 6, Gymnastics Industrial Area, Sahibabad - 201 030, Dist. Ghaziabad, Uttar Pradesh, India

Major Manufacturing & Quality Certificates
Few Customer References

- SAIL
- NTPC
- Honda
- ISGEC
- BSES
- Jindal Steel & Power
- CPWD
- BHUSHAN
- MES
- ACC
- EXIDE
- Idea
- IRCL
- TATA
- UFlex
- Ashok Leyland
- Ambuja Cement
- PWD
- Reliance
**Range:**
Rating: 2.25 μF - 120 μF
Available in: P0, P2 type
Casing: Plastic & Aluminium
Terminal: Wire, SFO, DFO, QFO

**Features:**
- Low dissipation factor
- Extended life capacity
- Self-healing properties
- Self-extinguishing plastic material
The most trusted service network

Havells Service Team
300+

Havells Service Centres
Pan India
670+

E-mail: marketing@havells.com, www.havells.com

Consumer Care No.:
1800 11 0303, 1800 103 1313
(All Connections)
011-4166 0303 (Landline)

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