"Promoting Energy Efficiency and Renewable Energy in MSMEs in India"

With an aim to develop and promote a market environment for introducing energy efficiency and enhanced use of renewable energy technologies in process applications in the energy-intensive MSMEs, 'KV Energy Revenue LLP' in collaborations with various industries is implementing industry-funded projects "Promoting Energy Efficiency and Renewable Energy in MSMEs in India". The project supports MSME units in implementing various energy conservation measures and thus the result is reduced energy consumption and Green House Gas (GHG).

A Project by 'KV ENERGY REVENUE LLP', INDIA

Power Quality Improvement by Incorporating Harmonic Filter

Company Profile

'KV Energy Revenue LLP' is a registered company in INDIA as per company's act and Electrical Contracting and Energy Auditing firm. The company has also the scope in the area of Solar PV Plant Inspection, Electrical Design, Earthing Adequacy, Thermal Scanning and Energy Monitoring Services with state of art instruments.

Objective

To improve power quality, maintain the harmonics in the system within the prescribed limit and avoid the penalties in the utility bills and save the electrical energy.

Intervention

Installation of Active Harmonic Filter (AHF) and reactive passive LC detuned filter have been installed at main electrical distribution panel on LT supply side.

Outcomes

- ✓ Power Quality is improved and Total Harmonic Distortion (THD) level reduced.
- ✓ Total RMS current consumption is reduced.
- ✓ True Power Factor is improved.
- ✓ Distribution losses reduced.
- ✓ Voltage profile improved.
- ✓ Cable and motor heating reduced.
- ✓ Capacitor failures reduced.

Principle

When sinusoidal voltage is applied to a certain load, the current drawn by the load is proportional to the voltage and impedance follows the envelop of the voltage waveform.

Some loads cause the current to vary disproportionately with the voltage. The resulting waveforms contain distortions, creating multiple frequencies within the normal 50 Hz sine wave.

A harmonic is a component of a periodic wave having a frequency that is an integer multiple of the fundamental power line frequency. Harmonic loads increase power losses and have a negative impact on electric utility distribution systems and components.

Power quality can be enhanced by introducing harmonic filters and detuned reactors to mitigate the harmonic level of the current.

Implementation

After analysis of the power quality study the customised designed dedicated Active Harmonic Filter without any tuned or detuned reactor was installed at LT PCC and MCC panels.

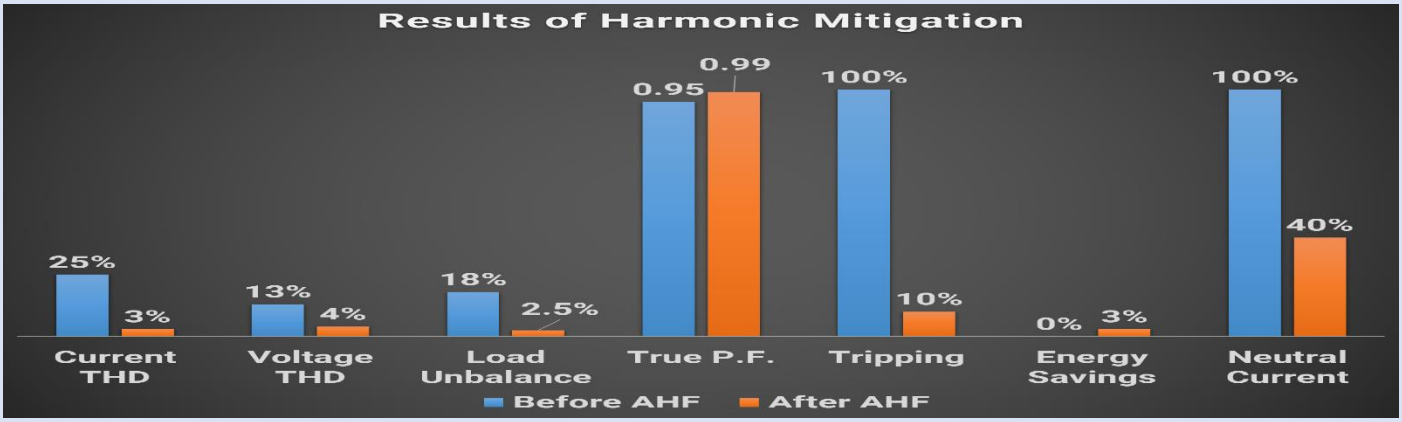
The objective was to improve the power quality of the electrical network within the plant by mitigating the harmonic level in the current and voltage with True P.F. improvement.

Before installation, the Harmonic Distortion current was found to be 20% to 40%. After installation of these filters, the level was brought down to 5%, well within the permissible limit prescribed by the IEEE-519-2014 standard.

Cost Economics

Expected Current Harmonics Reduction	Less than 5%
Expected Voltage Harmonics Reduction	Less than 5%
Expected Improvement in True Power Factor	0.99
Expected Current Reduction	90 A
Expected Demand Reduction	64 kVA
Expected Energy Savings per month	63323 kWh
Approximate Monetary Savings per month	Rs. 506585
Approximate Monetary Savings per year	**Rs. 60.79 Lakh**
Approximate Investment	Rs. 45 Lakh
Simple Payback Period	**09 Months**
Expected Life Cycle of Product	10 Years
Approximate Monetary Savings during Life Cycle	**Rs. 6 Crore**

Proposed Equipment



RESULTS

Power Quality was improved and the Total Harmonic Distortion level in the current was **reduced from 35% to 3.5%.**

Total RMS current consumption was **reduced to 5%** leading to Energy savings of **5277 kWh** per day.

True Power factor was improved **from 0.95 to 0.99**, reducing distribution losses in the network.

Reduction in **883 tonnes of CO2** emissions per annum.

Possible reduction in actual maximum demand is **64 kVA.**

Reduction in distribution losses lead to energy savings of approximately **759876 kWh/year.**

Reduction of overheating of electrical distribution equipments, cables, transformers and motors.

Replication Potential

This type of filter can be implemented in all industries wherein the major non-linear loads are present. It results in around 5% reduction in grid energy consumption and ensures better power quality within the plant. A very simple measure with no risk involved in implementation.

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