

“Promoting Energy Efficiency and Renewable Energy in selected MSME clusters 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 selected energy-intensive MSME clusters, United Nations Industrial Development Organization (UNIDO), in collaboration with Bureau of Energy Efficiency (BEE), is implementing a project titled “Promoting Energy Efficiency and Renewable Energy in selected MSME clusters in India” funded by Global Environment Facility (GEF) and co-financed by Ministry of Micro, Small and Medium Enterprises (MoMSME) and Ministry of New and Renewable Energy (MNRE). The project supports MSME units in implementing various energy conservation measures and thus result in reduced energy consumption and Green House Gas (GHG).

A GEF-UNIDO-BEE Project

Power Quality Improvement by Incorporating Harmonic Filter

Company Profile



Perumal Foundry is a medium scale foundry located at COSMAFAN Foundry Park, Arasur, **Coimbatore, Tamil Nadu**. The company manufactures high quality grey and ductile iron castings with an annual total production capacity of around 2800 tons.

Objective



To improve the power quality, maintain the harmonics in the system within the prescribed limit and avoid the penalty from state electricity board and save electrical energy.

Intervention



150 amps Active Harmonic Filter (AHF) and 100 kvar detuned filter have been installed.

Outcomes



- Power quality is improved and Total Harmonic Distortion (THD) level reduced
- Total RMS current consumption is reduced and energy savings achieved
- Power factor improved
- Distribution losses reduced in the plant network
- Better voltage at motor terminals and improved performance of motors

Principle

- ❖ When a sinusoidal voltage is applied to a certain load, the current drawn by the load is proportional to the voltage and impedance and follows the envelope 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 filters to mitigate the harmonic level of the current.

Implementation

- ❖ After analysis of the power quality study an Active Harmonic Filter (150 Amps) and a Detuned filter (100 kvar) was installed at MCC panel.
- ❖ The objective was to improve the power quality of the electrical network within the foundry unit by mitigating the Harmonic level in the current.
- ❖ Before installation, the Harmonic Distortion in current was found to be 26%. After installation of these filters, the level was brought down to 6.3%, well within the permissible limit prescribed by the state electricity board (TNSEB).



Activity conceived and implemented with technical help from project

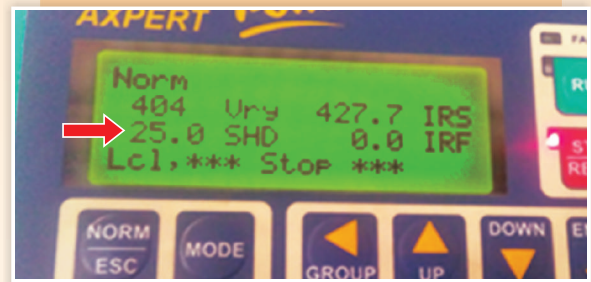


Cost-Economics

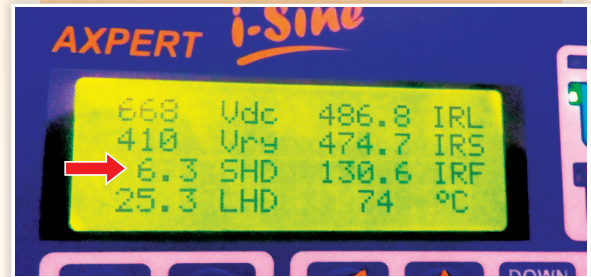
Energy savings per month	4500 kWh
Expected current reduction	18 A
Expected improvement in Power factor	0.97
Expected demand reduction in kVA	10 kVA
Approximate cost savings per month*	₹ 42000
Approximate cost savings per year	₹ 504000
Annual penalty for above 8% THD in Current by TNSEB	₹ 1200000
Investment costs	₹ 800000
Payback period (included TNSEB penalty savings)	06 months
Payback period (excluded TNSEB penalty savings)	19 months

* 25 operating days per month.

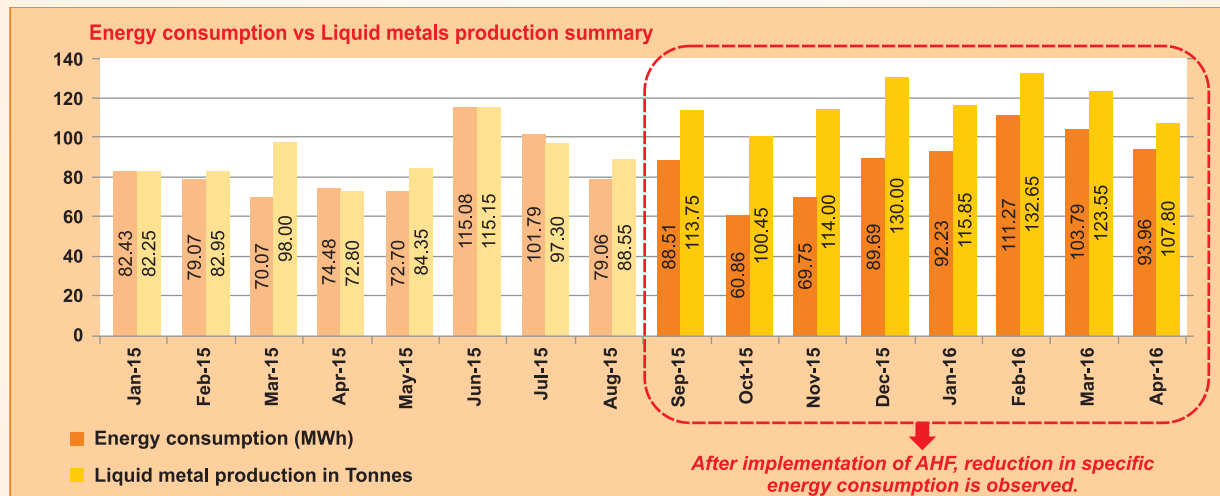
Total Harmonic Disturbance (THD) Value



Before installing the Active Harmonic Filter



After installing the Active Harmonic Filter



After implementation of AHF, reduction in specific energy consumption is observed.



RESULTS

Power quality was improved and the Total Harmonic Distortion level in the current was **reduced from 26% to 6.3%.**

Total RMS current consumption was **reduced to 3%**, leading to Energy savings of **130 kWh** per day.

Power factor was improved **from 0.93 to 0.96**, reducing distribution losses in the plant network.

Possible reduction in Max Demand is **up to 10 kVA.**

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

Reduction in distribution losses lead to energy savings of approximately **35200 kWh/year.**

Reduction of **30 tonnes of CO₂** emission per annum



Replication Potential

- This type of filter can be implemented in all induction based foundry units. It results in around 3% reduction in grid energy consumption and ensures better power quality with in the foundry unit.
- A very simple measure with no risk involved in implementation.

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