



Unidyne Energy Environment Systems Pvt. Ltd

Centralized hot water generation in residential buildings through Heat Pump system

CASE STUDY

Summary

The implementation of centralized hot water generation through Heat Pump systems will save thousands of MW in connected load if implemented in the urban areas of the country. The peak power thus saved could be diverted to other needier areas. The saved connected power will consequently save around four times the thermal energy saved in fuel savings at the power plant. This will reduce carbon emissions and lower the overall carbon footprint. In fact, all residential buildings over 10 floors should be encouraged to switch over from individual electric storage geysers in bathrooms to the centralized hot water generation system through Heat Pumps as this is a permanent saving in utilized power. In fact, the facilities can also consider hybrid systems of Heat Pumps cum solar for the purpose. This is because in tall multistorey buildings, the terrace level does not have adequate space for solar heating panels for the entire facility. Furthermore, the Heat Pump option is an all-weather choice as solar becomes rather ineffective during cloud cover, monsoons and the winter seasons when the solar insolation is low.

Objective of Intervention

To reduce the connected load for hot water generation by around 90 per cent. The benefit is also to the user apartment whose cost of hot water would come down by around 65 per cent. The power distribution company would also be saved of providing the additional peaker power to the facility. This will enable the saved power to be available to other areas of the city/needier areas which have shortage of power.

Type of Intervention and Location

Centralized hot water generation through Heat Pump systems has been successfully implemented at three facilities. The first is a 12-storey residential building at Santacruz West, Mumbai. The connected load has come down from 800 kW to around 65 kW. The system has been in operation for the last three years. The



second location is at Jacob Circle in Central Mumbai where three towers of 45 storeys each have been fitted with the centralized Heat Pump system. The saving in connected load per tower is around 1 MW each.

Description of Intervention

Unidyne had been for many years supplying systems for Thermal heating which were fueled by hydrocarbon fuels such as HSD, FO, Natural Gas and Coal. Due to the constantly rising costs of such fuels and also with a view to reduce GHG emissions, Unidyne decided to explore alternative routes at substituting these fuels with more effective and less polluting systems. With this in mind, they employed the utilization of the Heat Pump route (near 100 year old technology which forms the basis of refrigeration and aircon) to be used in the Commercial and Industrial sector for low grade heating involving hot water generation. This has been successfully implemented in the Hospitality Industry and also initiated in the Residential sector.

The Heat Pump is a machine that can upgrade very low grade heat from the ambient air or any fluid (such as water) to higher grade heat as hot water at 60 to 85°C, with the output heat energy being generated at only 1/3rd to 1/5th the energy input (based on the 2nd law of thermodynamics) . The economic OPEX savings are around 60 to 75% of the original costs with fuels. Furthermore this is a demand side measure of energy savings which is important because in Residential buildings where the individual electric outflow / storage geysers can be replaced with centralized hot water generation at 1/3rd to 1/4th the power input through the Heat Pump route. Both these measures will result in much lower emissions to the environment and enable lower carbon footprints. Existing installations can be retrofitted to save energy and OPEX costs which is a win-win situation for all stakeholders.

Intangible or Tangible Benefit

The tangible benefits are as follows:

- The connected power on account of hot water generation in a residential building would come down by 90 per cent;
- The user apartment hot water bill will come down by 65 per cent;
- The electrical connected with providing the higher peak power will be saved;
- The backup DG capacity of the facility will come down including the transformer, substation, etc.;
- The maximum demand power charge to the facility will come down;
- If implemented on a national level in urban areas the benefits would be enormous.

The intangible benefits are as follows:

- One kW of power saved at the user point saves four times of that at the power generation facility;



- Carbon emissions come down;
- Carbon footprint comes down;
- Greenhouse gases emissions come down.

The cost for the Heat Pump system would be almost same or marginally higher as compared to the individual electrical geyser system. Hence, the payback if applicable can be immediate.

About Unidyne Energy

Unidyne is a registered SME involved in the domain of Energy Optimization and Efficiency with particular focus on Thermal Systems in Industry and the Commercial sector. The Company was earlier involved in Industrial heating systems such as Steam Boilers, Thermic Fluid Heaters and Waste Heat Recovery systems with an installation base of 3000 units of which around 450 are in the Hospitality Sector. Due to the constantly rising costs of hydrocarbon fuels we shifted focus to the demand side use of energy and energy efficiency.

The Company pioneered the use of Heat Pumps in the country for energy efficient hot water generation with the OPEX costs in the hospitality industry coming down by 70%. The Company also introduced centralized hot water generation through Heat Pumps in the Residential sector as against decentralized individual storage geysers in bathrooms. The result was that the connected power load came down to less than 10% on account of power required for hot water.