

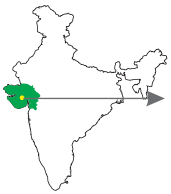
“Promoting Energy Efficiency and Renewable Energy in selected MSME clusters in India”

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

Variable Frequency Drive (VFD) for Refrigeration Compressor Motor

Company Profile



Panchmahal Dairy or The Panchmahal District Co-operative Milk Producer's Union Ltd. is located at **Godhra, Gujarat**. This dairy is one among the 17 district unions which acts as manufacturing units of dairy products for Gujarat Co-operative Milk Marketing Federation Limited, the marketers of 'Amul' brand of products.

Objective



Improving the compressor's trim efficiency by retrofitting compressor with a variable frequency drive to take advantage of the improved part load performance.

Intervention



Replacement of existing soft starter with VFD along with control system on 300 HP compressor motor that preferentially unloads the VFD compressor to achieve maximum system efficiency.

Outcomes



- Annual electricity savings : 306600 kWh
- Annual monetary savings : ₹ 24 lakhs
- System peak demand reduction

Principle

- ❖ Refrigeration compressors are subjected to changes in load due to changes in the thermal load variation on the system. Based on the thermal load, either one or two or three cylinders are functional. As a result, the percentage load on the compressor motor varies from 80% to 25%.
- ❖ During the part load, energy consumption of the motor is more when compared to output with less efficiency. This situation can be altered by introducing Variable Frequency Drive (VFD). The VFD provides smooth, step-less acceleration of motor and load while controlling inrush current and starting torque. This facilitate to achieve the maximum system efficiency with reduced power consumption.
- ❖ Along with energy saving, maximum demand of the chilling center can be controlled and overall life of components of the compressor can be enhanced.

Implementation

- ❖ After analysis of the refrigeration load pattern and motor power consumption, it was suggested to install a VFD at the 300 HP compressor motor.
- ❖ Replacement of existing soft starter with VFD along with control system on 300 HP Compressor motor helps to unload the VFD compressor to achieve maximum system efficiency.



Activity conceived and implemented with technical help from project



Cost-Economics

Rated capacity of existing refrigeration system	635 TR
Actual TR generated by refrigeration system (on part load)	315 TR
Operating hours	24 hrs/day
No. of days working per annum *	360 days
Actual electricity saving after installation of VFD system	840 kWh/day
Unit cost of electricity	₹ 7.86/kWh
Expected annual electricity savings	306600 kWh
Expected monetary savings per annum	₹ 2409876
Investment required to install VFD system	₹ 1,75,000
Payback period	~ 1 Month

* Assumption

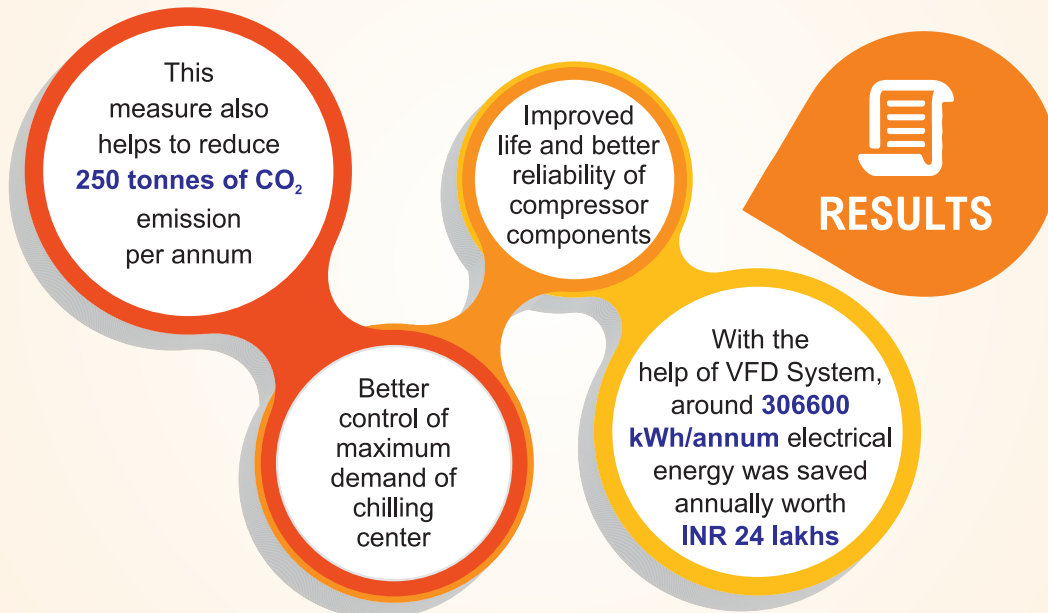
Variable Frequency Drive Installation



VFD installation at refrigeration compressor motor



Air compressor at refrigeration plant



Replication Potential

“ This type of measure can be implemented on most of the refrigeration systems operating with variable thermal load ”

“ VFD technology is very well proven and there is no risk involved in implementation of this measure but it is advised to assess the suitability of VFD to the existing field conditions ”

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