

**PROJECT: REPLACE THYRISTOR BASED WELDING MACHINE BY
INVERTER BASED WELDING MACHINE**

DATE: 10/06/2008

AIM: To save the Electrical Energy by using inverter base welding in the place thyristor base welding machine in PL15.

In Godrej Campus; there are various manufacturing plants which are using welding machines for assembly purpose. Welding machines play the major role in power consumption. Hence; we are focusing on energy conservation in welding machines.

Existing we had used thyristor based welding machines at PL15 PED. These machines consume more power.

Hence, we have replaced some machines by inverter based welding machines & measure power consumption.

The power measurement taken at PL 15 as below:

Measurement taken on 7th July, 2007

4mm Electrode had used on both machine for Welding

| | | |
|---|---|----------------|
| Average Power Consumption of ' <u>Memco</u> ' Machine | : | 10 kW |
| Average Power Consumption of 'Kempi' Machine | : | 06 kW |
| Energy Saving by Kempy Machine / Hour | : | 1160 kW |

The Energy saving calculations is as follows:

| | | |
|---|---|------------------|
| Average working hours per day in (assumed) | : | 14 Hours |
| Energy Saving per day by Kempy machine | : | 56 kW |
| Energy Saving per Month | : | 1,400 kW |
| Energy saving per Annum | : | 16,800 kW |
| Energy saving per Annum in Rupees (Rate: Rs. 6.5/kWh) | : | 107,520 Rs. |
| Total Cost of installation of two sheets | : | 125,000 Rs. |
| Payback period in months | : | 14 Months |

The simple pay back period for Kempy machine is 14 months.

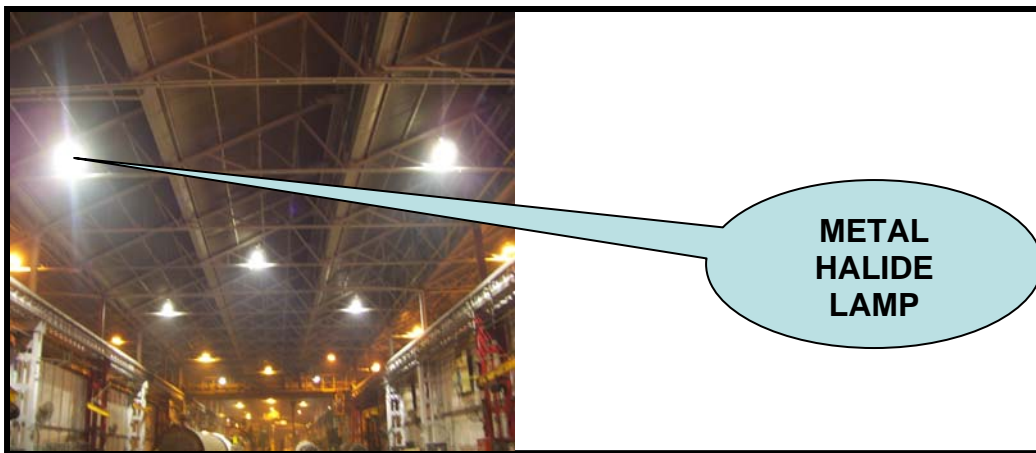
**PROJECT: ENERGY SAVING BY REPLACES 400W MERCURY/SODIUM
VAPOUR LAMPS BY 250W METAL HALIDE LAMPS.**

DATE: 17/06/2008

AIM: Replace 400w Sodium Vapour lamp by 250w Metal Halide & save energy by 30%.

Existing we had installed Mercury Vapour lamps on shopfloor in various plants, that has good Colour light Rendering Index but poor light illumination level with compare Metal Halide Lamps. Metal Halide lamps have good illumination level, good visibility & less glare. We can replace 400w Mercury Vapour lamps by 250w Metal Halide lamp with same lux level.

Hence, we have installed a Metal Halide lamps various plants.



The Energy saving calculations is as follows:

| | | |
|---|-----------|---------------|
| TOTAL POWER CONSUMES BY HPMV LAMP & BALLAST PER HOUR | 450 | Watt. |
| TOTAL POWER CONSUMES BY HPMV / ANNUM | 1350 | kWh |
| TOTAL POWER CONSUMES BY MHD LAMP & BALLAST PER HOUR | 300 | Watt. |
| TOTAL POWER CONSUMES BY MHD / ANNUM | 900 | kWh |
| TOTAL POWER SAVING BY REPLACING HPSV/HPMV TO MHD LAMPS / ANNUM | 450 | kWh |
| ENERGY COST SAVINGS / Annum | 2950 | Rs/Annum |
| TOTAL COST OF UNIT & ACCESSORIES | 3,800 | Rs |
| % SAVING PER ANNUM | 33% | |
| <u>SIMPLE PAYBACK PERIOD</u> | 15 | Months |

The simple pay back period for Metal Halide lamp is 15 months with & saving is 33%.

PROJECT: INSTALL VARIABLE FREQUENCY DRIVE ON DERUSTING BLOWER TO SAVE ELECTRICAL ENERGY.

DATE: 13/06/2008

AIM: To save the Electrical Energy by installing Variable Frequency Drive on Derusting tank blower in PL17.

In PL17; there is a pretreatment process plant & it has blowers to exhaust the toxic gases. When material immersed in the tank, chemical reactions takes place and toxic gases are formed in the tank. To exhaust them blowers are used & they run continuously. When the material is not dipped in the tank, the blower still runs at full speed & unnecessary consumes the power.

Hence, we have installed a variable Frequency Drive on a blower. When the material is immersed in the tank, the blower runs at 50 Hz (normal speed), when material is taken out from tank, the blower runs at 45 Hz for two minutes (timer controlled) & then it drops down to 35 Hz (decreased speed) and continuous to run at 35 Hz until the material is dipped in the tank again.

The power measurement taken at PL 17 Derusting Blower as below:

Measurement taken on 5th & 6th Jan, 2008

| | | |
|--|---|------------------|
| Average Power Consumption in an hour without VFD | : | 05.07 kWh |
| Average Power Consumption in an hour with VFD | : | 03.52 kWh |
| Energy Saving by VFD / Hour | : | 01.55 kWh |

The Energy saving calculations is as follows:

| | | |
|---|---|------------------|
| Average running hours per day (assumed) | : | 14 Hours |
| Energy Saving per day by VFD | : | 21.7 kW |
| Energy Saving per Month | : | 542.5 kW |
| Energy saving per Annum | : | 6,510 kW |
| Energy saving per Annum in Rupees (Rate: Rs. 6.5/kWh) | : | 42,315 Rs. |
| Total Cost of installation of VFD | : | 55,000 Rs. |
| Payback period in months | : | 16 Months |

There are two variable frequency drive on two derusting blowers. The simple pay back period for Variable Frequency Drive machine is 16 months.

**PROJECT: REPLACE RECIPROCATING CHILLER WITH SCREW CHILLER
IN HVAC SYSTEM**

DATE: 17/06/2008

AIM: To save Electrical Energy by Installing Screw Chiller instead of Reciprocating Chiller in PL10, PL11 and PL18.

In Godrej Campus; we were using reciprocating chiller in HVAC system. For achieving energy saving in chillers; we have decided to go for screw type chillers for all the new AC projects.

We already installed the 'TRANE' Screw Chillers in PL04, PL16 & PL01 E&E New Office. Now we are replacing Reciprocating Chiller by Screw Chillers in various plants.

In the view of Energy Saving followings are main differences between Reciprocating & Screw Chiller:

| ROTARY SCREW COMPRESSOR | RECIPROCATING COMPRESSOR |
|---|--|
| RELIABILITY & MAINTENANCE | |
| A Rotary compressor has only 4 moving parts-the two rotor assemblies, a variable unloader valve & a step unloader valve.Capacitor control is achieved by modulation of the load /unloads valves. Fewer moving parts increases reliability & endurance. Considerable reduction in Maintenance. | Reciprocating compressors have pistons, connecting rods, suction & discharge valves or a mechanical oil pump. A reciprocating compressor has 15 times as many critical parts as the rotary compressors. High on Maintenance. |
| The robust design of rotary compressors can ingest amounts of liquid refrigerant. | Reciprocating compressors valves, piston rods & cylinders can get severally damaged by refrigerant. |
| ENERGY EFFICEINCY | |
| Indicative Power Consumption is 0.75 kw / TR. | Indicative Power Consumption is 1.20 kw / TR. |
| C.O. P. is 4.8 | COP is 3.8 |
| Part load efficiency is far superior. | Part load efficiency is Very Poor. |
| STEPLESS CONTROLS: Unloader valves are stepless plus modulating the compressor capacity to match building cooling loads. | Reciprocating chillers with minimum step capacity control operate at cooling capacity equal to or greater than the cooling load, results in increasing energy cost also it decreases the life of compressors components e.g. motors, valves etc. |
| Effective loading / unloading of chillers is from 10 % to 100 %. | Effective loading / unloading is from 33%, 66% & 100% only |

| | |
|---|---|
| Electronic expansion valve coupled with MICROPROCESSOR improves part load performance by minimizing superheat in the evaporator thus allowing the chiller to run at reduced condensing temperature. Provides better control stability of variable load & pressure changes. | RECIP. chillers run at higher head pressure and consume more power at part loads. Under these conditions control stability can never be achieved causing extended periods of hunting and liquid slugging. |
| MICROPROCESSOR BASED INBUILT PID TEMP. CONTROLLERS maintain accurate chilled water temperature control to +/- 1/2 deg.F | Reciprocating chillers can only maintain the water temperature tolerance to +/- 2deg.F |
| REDUCE COMP. CYCLING. Modulating capacity control offers better compressor reliability. | Comp. Cycling is inevitable, which impacts the life of Comp. & Motor. |
| INSTALLATION | |
| Installations cost is reduced drastically because of lightweight designed units. | These chillers contain heavy & bulky units. Hence installation cost is more. |
| Factory installed & tested options maintain minimum startup time & expenses. | |
| SMALL FOOTPRINT OF EQUIP. SAVES VALUABLE ROOM SPACE | LARGE FOOTPRINT OF EQUIP. CONSUMES MORE ROOMSPACE. |
| MICROPROCESSOR BASED ADAPTIVE CONTROLS WITH SAFETY & OPERATIONAL FEATURES | |
| Adaptive control protects the chiller during abnormal conditions that may damage the unit. | These dual circuit designs are not available in reciprocating chiller units. |
| Unit control module (UCM) takes corrective action to keep the unit from shutting down under abnormal conditions & avoids nuisance tripping. | Features not available in the controls provided in Recip. System. |
| Evaporator water flow protection is built in to the microprocessor, thus external flow switch is not required. | Absent in Recip. Type system. |
| Easy interface capacity | Separate provision has to be made. |
| Remote display option allows the operator to monitor the chiller operation from a remote place. | Separate provision has to be made. |
| ENVIRONMENT FRIENDLY. | |
| Environment friendly Non CFC based R-134a refrigerant is used. | Ozone depleting R-22 is used. |

ENERGY SAVING CALCULATION**CASE STUDY OF PL11 OFFICE:**

| | |
|--|--------------------|
| PL11 office AC Average Power Consumption (Reciprocating chiller) | 50,000 kWh / Month |
| E&E New office AC Average Power Consumption (TRANE Screw Chiller) | 40,000 kWh / Month |
| % Energy saving per Month | 20 % |

BY USING SCREW CHILLER & BMS SYSTEM WE SAVED 20% OF ELECTRICAL ENERGY.