



GRANT MEDICAL FOUNDATION
RUBY HALL CLINIC



NATIONAL ENERGY CONSERVATION AWARD – 2008

HOTEL AND HOSPITAL BUILDINGS

**Award for Excellence in Energy Conservation and
Management**



To,
Secretary
Bureau of Energy Efficiency,
4th Floor, Sewa Bhawan,
R.K.Puram, New Delhi- 110 066

Subject – National Energy Conservation Award-2008 Hotel & Hospital Buildings

Dear Sir,

With reference to your notice inviting applications from Hotel & Hospitals Category for National Energy Conservation Award -2008, please find enclosed our application in the prescribed format.

Kindly note that, all the data provided herein is confidential and we are providing the same for the purpose of this award. We request you to maintain confidentiality with respect to sharing information provided in this document with any third party.

We hope the data provided herein is sufficient for the evaluation of our application. However, incase you need any further information please do not hesitate to contact us.

We look forward to receiving your prestigious award this year.

Thanking you,

Yours faithfully,
For **Ruby Hall Clinic**

Bomi Bhote
Chief Executive Officer

Enclosed as above



TABLE OF CONTENTS

| No. | Particulars | Page No. |
|------------|--|-----------------|
| 1. | Application format for Energy Conservation Award in Hospital Building Sector | 3 |
| 2. | Brief description of the project | 24 |
| 3. | Project Information CD | - |



NATIONAL LEVEL ENERGY CONSERVATION AWARD - 2008
HOTEL & HOSPITAL BUILDINGS
"Award Questionnaire"

| | | |
|--------------|---|---|
| 1 | Name of the organization owning and maintaining the nominated Hotel/Hospital building | Grant Medical Foundation – Ruby Hall Clinic |
| 2 | Specific name of the nominated Hotel/ Hospital building | Ruby Hall Clinic |
| 3 | Year of commencement of the commercial activities in the building | 1960 |
| 4 | Complete address of Hotel/ Hospital building's location (including Chief Executive's name & designation) with telephone, fax nos., E-Mail and Mobile nos. | Mr. Bomi Bhote Chief Executive Officer Grant Medical Foundation Ruby Hall Clinic 40 Sassoon Road, Pune-411007. Tel: (020) 26123391 (Extn:4091) Fax: 020 26124529 |
| 5 (a) | Name, designation, address, telephone, fax nos. & e-mail of responsible person who could be contacted in connection with the application for Award | Mr. A. K. Paliwal Manager – Engineering & Projects Grant Medical Foundation Ruby Hall Clinic 40 Sassoon Road, Pune-411007. Tel: (020) 26123391 (Extn:5354) Fax: (020) 26123973 Mobile No. :+91-98903 00505 |
| 5 (b) | Delhi liaison office address with contact person name, telephone no., if any, may also be given | N.A |
| 6 | Description of the Hotel/Hospital Building and Connected Load (kW) | |
| 6 (a) | Building Status (Please tick appropriate box) | <input checked="" type="checkbox"/> Stand alone building <input type="checkbox"/> Part of a building complex |
| 6 (b) | No. of floors : 7 | |



GRANT MEDICAL FOUNDATION
RUBY HALL CLINIC

| 6 (c) | Hotel/ Hospital Building Area and Connected Load | 2005-06 | 2006-2007 | 2007-2008 |
|--------------|---|----------------|------------------|------------------|
| (i) | Total Built up Area (in Sq. Meters) | 27989 | 27989 | 31248 |
| (ii) | Air-conditioned area (in Sq. Meters) | 15203 | 15203 | 18462 |
| (iii) | Non-Air conditioned area (in Sq. Meters) | 12786 | 12786 | 12786 |
| (iv) | Total carpet Area (in Sq. Meters) | 22391 | 22391 | 24998 |
| (v) | Total Connected Load (in kW) - Sanctioned | 3087 | 3087 | 3087 |
| | (a) Lighting (kW) | 143.71 | 150.91 | 179.73 |
| | (b) Space cooling (air conditioning) (kW) | 332 | 332 | 410.5 |
| | (i) Window air conditioners (kW) | 30.1 | 30.1 | 30.1 |
| | (ii) Central air conditioners (kW) | 301.9 | 301.9 | 380.4 |
| | (c) Space heating- Room heaters and Strip heaters (kW) | N.A | N.A | N.A |
| | (d) Water pumping (kW) | 79.7 | 79.7 | 79.7 |
| | (e) Ceiling fans, (kW) | 102 | 102 | 103.7 |
| | (f) Computers and other office equipment (kW) | 57 | 61 | 71 |
| | (g) Other loads ----- Air Compressors (kW) | 42.5 | 42.5 | 42.5 |
| | (h) Other loads / Medical Equipments (kW) | 463.05 | 524.79 | 555.66 |
| | (i) Actual Connected Load (KW) | 1219.96 | 1292.9 | 1442.79 |
| | (j) Spare Connected Load (KW) | 1867.04 | 1794.1 | 1644.21 |
| 6 (d) | Building contract demand with electric utility company (kVA) | 1000 | 1000 | 1500 |
| 6 (e) | (i) Average demand rate charged by the utility (Rs./ kVA) | 350 | 350 | 300 |
| | (ii) Average energy rate charged by the utility (Rs./ kWh or Rs./ kVAh) | 3.96 | 5.21 | 5.21 |
| | (iii) Average power factor for the period | 1 | 1 | 1 |
| 6 (f) | Building operating hours/ Year | 8760 | 8760 | 8760 |



7 Energy (Electricity & Fuels) Consumption in the Hotel/Hospital Building and its Energy Cost

| | Energy used | Units | 2005-06 | 2006-07 | 2007-08 |
|--------------|---|---------------------|---------------|---------------|---------------|
| 7 (A) | Electrical Consumption | | | | |
| (a) | Electricity Purchased | Lakh KWh | 39.93 | 50.51 | 67.93 |
| (b) | Self generated | Lakh KWh | 2.51 | 2.56 | 1.68 |
| (c) | Sub-Total | Lakh KWh | 42.44 | 53.07 | 69.61 |
| 7 (B) | Electricity Cost | | | | |
| (a) | Total cost of purchased electricity | Lakh Rs. | 158.20 | 263.27 | 353.63 |
| (b) | Self generated | Lakh Rs. | 25.31 | 32.69 | 13.86 |
| (c) | Sub-Total | Lakh Rs. | 183.51 | 295.96 | 367.49 |
| 7 (C) | Fuels | | | | |
| (a) | Furnace Oil (It should NOT include fuel used for self-generation of electricity) | Kilo litres (kL) | 720 | 698 | 508 |
| (b) | Cost of 7 (c) (a) | Lakh Rs. | 149.32 | 143.49 | 127.52 |
| (c) | LPG | Kg | 24949 | 26335 | 27721 |
| (d) | Cost of 7 (c) (c) | Lakh Rs. | 11.49 | 13.17 | 15.32 |
| (e) | Natural Gas /CNG | Lakh M ³ | N.A | N.A | N.A |
| (f) | Cost of 7 (c) (e) | Lakh Rs. | N.A | N.A | N.A |
| (g) | Any other fuel : HSD for incinerators | Kilo litres (kL) | 4.8 | 4.8 | 4.8 |
| (h) | Cost of 7 (c) (g) | Lakh Rs. | 1.69 | 1.88 | 1.73 |
| 7 (D) | Combined cost of fuels 7 (C) (b) + 7 (C) (d) + 7 (C) (f) + 7 (C) (h) | Lakh Rs. | 162.50 | 159.07 | 144.57 |
| 7 (E) | Total Energy Cost 7 (B) (c) + 7 (D) | Lakh Rs. | 346.01 | 455.03 | 512.06 |



8 Electricity Consumption per square Meter of area (Specific Energy Consumption with respect to area). In case no separate sub-metering for lighting and air-conditioner is being done, the total electricity consumption should be indicated at 8 (d) only, and accordingly specific electrical energy consumption is indicated only at 8 (g) (i)

| 8 | Parameter | 2005-06 | 2006-07 | 2007-08 |
|----------|--|----------------|----------------|----------------|
| (a) | Electricity consumption for lighting (Lakh kWh) | 6.10 | 7.29 | 7.89 |
| (b) | Electricity consumption for air- conditioning (cooling) (Lakh kWh) | 25.69 | 26.39 | 32.78 |
| (c) | Others (Pumping + Misc. Load) (Lakh kWh) | 19.39 | 19.39 | 26.8 |
| (d) | Total Electricity Consumption in building (Lakh kWh) S.No.8 (a) + 8 (b)+ 8 (c) | 51.8 | 53.07 | 67.47 |
| (e) | Total built-up area in Square Meter S.No. 6 (c) (i) | 27989 | 27989 | 31248 |
| (f) | Total air conditioned area in Square Meter S. No. 6 (c) (ii) | 15203 | 15203 | 18462 |
| (g) (i) | Total electricity consumption/ built-up area (in kWh/sq. meter) $= [8(d) / 8(e)] \times 10^5$ | 185.07 | 189.61 | 215.92 |
| (ii) | Electricity consumption for lighting/ built-up area (in kWh/sq. Meter) $= [8(a) / 8(e)] \times 10^5$ | 21.79 | 26.05 | 25.25 |
| (iii) | Electricity consumption for air conditioning / air conditioned area (in kWh/ sq. Meter) $= [8(a) / 8(e)] \times 10^5$ | 168.98 | 173.58 | 177.55 |

9 Thermal Energy Consumption per Square Meter of built up area (if applicable)

| 9 | Parameter | 2005-06 | 06-07 | 07-08 | |
|----------|--|----------------|--------------|---------------|---------------|
| (a) | Total thermal energy consumption* in building (Million kCal) Refer S.No. 7 C - - - - (FO + HSD) | F.O | 6912 | 6700.8 | 4876.8 |
| | | HSD | 56.83 | 56.83 | 56.83 |
| (b) | Total built up area of building in Square Meter S. No. 6 (c) (i) | 27989 | 27989 | 31248 | |
| (c) | Thermal energy consumption/ built-up area (in Million kCal per Sq.Meter)[9(a) / 9(b)] | 0.249 | 0.241 | 0.158 | |

*Thermal Energy consumption in the Building is to be obtained and presented in Million kCal by multiplying the quantity of Fuel (Coal, F.Oil, Gas, etc.) consumed with corresponding gross calorific value of the fuel. The enclosed chart at Annexure- 'C'- may be used for working out the Million k Cal.



10 (a) Energy Efficiency/Conservation Projects commissioned & Energy Savings Achieved

Please provide details in the following format on major energy efficiency and energy conservation projects and measures (including energy substitution, renewable energy systems, technology innovation, in-house R&D efforts, etc.) commissioned during last three years giving energy savings achieved and the investment incurred. In case building has employed the latest technology/trend setter technology/renewable energy technology, please list the projects as bonus weightage will be awarded. (Please also fill-up the Annexure-A for the Energy Conservation Measures implemented during the year 2007-2008).

| Year of Commissioning of the projects | Project description | Achievement of energy savings per year basis | | | Investment incurred on the project (Rs. Lakhs) |
|---------------------------------------|---|--|---------------|---------------|--|
| | | Power | Fuels * | Total savings | |
| | | (Lakh kWh) | F.O(KL) | (Rs. Lakhs) | |
| 2005-06 | N.A | ---- | ---- | ---- | ---- |
| 2006-07 | Conversion of VAM to Screw Chiller with templifier | -1.13 | 68.00 | 7.69 | 181.3 |
| | Right sizing of Chilled Water pumps with Variable Flow Pumping System | 0.15 | -- | 0.82 | |
| | Right sizing of Condenser Water pumps with Variable Flow Pumping System | 0.14 | -- | 0.72 | |
| | Sub total | -0.83 | 68.00 | 9.24 | |
| 2007-08 | Conversion of VAM to Screw Chiller with templifier | -7.59 | 448.29 | 73.10 | 161.0 |
| | Right sizing of Chilled Water pumps with Variable Flow Pumping System | 1.49 | -- | 7.79 | |
| | Right sizing of Condenser Water pumps with Variable Flow Pumping System | 1.74 | -- | 9.06 | |
| | Sub total | -4.35 | 448.29 | 89.91 | |

Note: In 1st phase one VAM that was used for Air conditioning of Main Building was replaced by Screw Chiller in Jan 07, hence the savings considered in 2006-07 is only for 2 months i.e. Feb & March 07. In 2nd phase VAM used for Cancer Block was replaced with 2nd Screw Chiller so for year 2007-08 Total savings is considered for 10 months for chiller 1 (April 07 – Jan 08) and 2 months for chiller 2 (Feb 08 – March 08)

*Delete or add fuels as the case may be

Note: With the commissioning of a particular project/ measure, annual energy savings indicated in one year should not be shown again in the second or third year, as recurring energy saving


10 (b) VERY IMPORTANT:

For the year 2007-08 please fill up Annexure "A" for Energy Conservation Measure implemented. Please send the above write up on a CD also.




Energy Conservation Measure implemented in 2007-2008

(To be filled up separately for each Energy Conservation Measure)


| | | | | | |
|--|---|----------------|---|---|-------|
| ID to be filled by BEE | Title of the measure Conversion of VAM to Screw Chillers with Desuperheater | | | Sector | |
| Year to be filled by BEE | | | | Technology | |
| Description of the energy conservation measure: | | | | | |
| <p>The Screw chillers with Desuperheaters are installed replacing previous VAM and are compatible with Honeywell Automation Control System which makes the entire system very flexible and focuses on reducing the operating expenditure.</p> <p>The combination of chiller and automation includes optimizing the operating pattern of the equipment to exactly match the plant loads throughout the year using various control strategies. The micro-processor based control of the chiller will deliver the exact tonnage as desired by the system.</p> | | | | | |
| Picture/ sketch/ drawing before modification (if available) | | | Picture/ sketch/ drawing after modification | | |
| N.A | | |  | | |
| Agency that executed the project (with complete address and email): Honeywell Automation India Ltd, S.P Infocity, Ozone-2, 3 rd floor, Pune-Saswad Road, Hadapsar, Pune. | | | | | |
| Total investment, Rs.: 104.16 Lakhs | | | Year of implementation: 2007 | | |
| First year energy cost savings, Rs: 73.10 lakhs | | | | | |
| First year other savings, Rs: -- | | | | | |
| On annual basis | kWh 000' | Coal (Tons) | Gas Nm ³ | Oil (kL) | Other |
| Energy consumption before | 0 | -- | -- | 625.50 | -- |
| Energy consumption after | 758.89 | -- | -- | 177.21 | -- |
| Energy tariff, Rs/ kWh/ Ton/ Nm ³ / kL ... | 5.21 | -- | -- | 25.12 | -- |
| Company complete address: Honeywell Automation India Ltd, S.P Infocity, Ozone-2, 3 rd floor, Pune-Saswad Road, Hadapsar, Pune - 412308. | | | | We authorise Bureau to use this information for dissemination | |
| Contact person who could be contacted for more information: Mr. Shantanu Nadpurohit , Head- Energy Services Department | | | | Signature | |
| | | | | Date | |

Note: Please submit this sheet separately for each Energy Conservation Measure implemented in 2007-2008 and a CD containing the above information may be please be enclosed.



| | | | | | |
|--|--|----------------|---|---|-------|
| ID to be filled by BEE | Title of the measure Right sizing of Chilled Water pumps with Variable Flow Pumping system | | | Sector | |
| Year to be filled by BEE | | | | Technology | |
| Description of the energy conservation measure: | | | | | |
| <p>A variable flow pumping was designed in place of a fixed flow pumping, which reduces the load on the chiller, thus consuming lower overall energy. The VFD modulates the pump speed according to the feedback from the differential pressure between supply and return headers of chiller. If AHU valves are closed due to reduction in load there would be backpressure in the system. This would result in increased differential pressure. With this signal VFD would adjust the frequency and hence the speed of secondary pump to ensure that the chilled water is pumped to the load only if there is a demand from the load side. Hence, a substantial amount of energy is saved on the pumping.</p> | | | | | |
| Picture/ sketch/ drawing before modification (if available) | | | Picture/ sketch/ drawing after modification | | |
| N.A | | |  | | |
| Agency that executed the project (with complete address and email): Honeywell Automation India Ltd, S.P Infocity, Ozone-2, 3 rd floor, Pune-Saswad Road, Hadapsar, Pune. | | | | | |
| Total investment, Rs.: 29.51 Lakhs | | | Year of implementation: 2007 | | |
| First year energy cost savings, Rs: 7.79 Lakhs | | | | | |
| First year other savings, Rs: -- | | | | | |
| On annual basis | kWh 000' | Coal (Tons) | Gas Nm ³ | Oil (kL) | Other |
| Energy consumption before | 241.68 | -- | -- | -- | -- |
| Energy consumption after | 92.09 | -- | -- | -- | -- |
| Energy tariff, Rs/ kWh/ Ton/ Nm ³ / kL ... | 5.21 | -- | -- | -- | -- |
| Company complete address: Honeywell Automation India Ltd, S.P Infocity, Ozone-2, 3 rd floor, Pune-Saswad Road, Hadapsar, Pune - 412308. | | | | We authorise Bureau to use this information for dissemination | |
| Contact person who could be contacted for more information: Mr. Shantanu Nadpurohit , Head- Energy Services Department | | | | | |
| | | | | Signature | |
| | | | | Date | |



| | | | | | |
|---|--|------------------|---|---|-------|
| ID to be filled by BEE | Title of the measure Right sizing of Condenser Water pumping system | Sector | | | |
| Year to be filled by BEE | | Technology | | | |
| Description of the energy conservation measure: | | | | | |
| Energy efficient pumps were selected according to the head and flow requirement, thus reducing the power consumption. | | | | | |
| Picture/ sketch/ drawing before modification (if available) | | | Picture/ sketch/ drawing after modification | | |
| N.A | | |  | | |
| Agency that executed the project (with complete address and email): Honeywell Automation India Ltd, S.P Infocity, Ozone-2, 3 rd floor, Pune-Saswad Road, Hadapsar, Pune. | | | | | |
| Total investment, Rs: 27.32 Lakhs | | | Year of implementation: 2007 | | |
| First year energy cost savings, Rs: 9.06 Lakhs | | | | | |
| First year other savings, Rs: -- | | | | | |
| On annual basis | kWh 000' | Coal (Tons) | Gas Nm ³ | Oil (kL) | Other |
| Energy consumption before | 290.29 | -- | -- | -- | -- |
| Energy consumption after | 116.42 | -- | -- | -- | -- |
| Energy tariff, Rs/ kWh/ Ton/ Nm ³ / kL ... | 5.21 | -- | -- | -- | -- |
| Company complete address: Honeywell Automation India Ltd, S.P Infocity, Ozone-2, 3 rd floor, Pune-Saswad Road, Hadapsar, Pune - 412308. | | | | We authorise Bureau to use this information for dissemination | |
| Contact person who could be contacted for more information: Mr. Shantanu Nadpurohit , Head- Energy Services Department | | | | Signature | |
| | | | | Date | |



11 Organizational set up for Energy Conservation

a) Does your organization have Energy Conservation Cell?

Yes

b) If yes, who heads the EC Cell? Whether energy conservation is his exclusive or additional responsibility? To whom he is reporting?

Mr. A K Paliwal heads this cell along with his responsibility of maintenance and new projects. Additionally we have appointed Honeywell Automation (I) Ltd. as our energy partners to take care of implementation of energy conservation measures. They assist us in energy audits, retrofitting and efficient operation & maintenance of utilities.

c) Does your unit have energy accounting and monitoring procedures and system in place? Which department is responsible for maintaining such records - EC cell or any other?

Yes, we have a comprehensive energy & water monitoring system in place. All the meters are hooked up to a centralized energy management system and regularly monitored by all the stakeholders – Mr. Paliwal, Mr. Savane and Honeywell site engineer. Engineering & Projects department is responsible for maintaining such records.

d) Has your unit/organisation declared its `Energy Management Policy'? If yes, please attach a copy of the same.

N.A

e) Has your unit appointed or designated an `Energy Manager'? If yes, please give his name, complete plant address, Telephone No., Fax No. and E-mail Address.

N.A

12 (a) Whether any energy audit has been undertaken in your unit in last three years? If yes, please give details on the following:

Yes

i) When was last energy audit carried out in the building? What is the frequency of carrying out energy audits?

The last audit was carried in the month of May 2008. The frequency of carrying energy audits is twice in a year.

ii) Who did the energy audit? Whether this was done by in-house team or an external agency/consultant was engaged? Please give salient features.

Honeywell, our energy partners, started conducting energy audits from year 2006 after they were appointed by us. Since then, they conduct regular audits and apprise us of the potential energy conservation measures.



(b) Did you engage any Energy Service Company (ESCO) to implement energy efficiency/ conservation measures? If yes, please give the name of the Agency and other details (i.e. experience, benefits, etc.)

Yes, our energy partners, Honeywell acts as an ESCO for implementing all the energy conservation measures identified jointly by us.

Honeywell has been in the ESCO business for the last 8 years in India and 25 years globally. They have to their credit over 50 energy performance contracts in India and over 4200 globally. They have been working closely with Bureau of Energy Efficiency (BEE) for Central government projects and selected as an ESCO for implementation of performance contracts at the prestigious Rashtrapati Bhawan, Delhi. They are recipient of the coveted MEDA award for ESCO's for 3 years

13 Submit a write up (not more than 3-4 pages) about the Building as per the format given below along with a few photographs depicting specific equipment/locations where energy efficiency activities have been undertaken.

Please also submit the above matter in a Floppy Diskette in Word and mark the name of your organisation with address). Any Organisation not adhering to this may loose certain weightage in the evaluation.

i) General description of the Building

ii) Energy Consumption

Include information on total energy consumption (i.e. electricity, fuels, and their money value) for the period 2005-06, 2006-07 & 2007-08

A good computer graphic and coloured presentation may also be incorporated, wherever considered important.

(iii) Energy Conservation Achievements

Include one paragraph write-up on each major energy conservation project implemented during the year 2007 - 08 only.

(A Sample Write up is attached at Annexure 'D' for ready reference.)



(i) Building Profile:



Established in 1959 by Dr. K.B Grant, Ruby Hall Clinic started modestly but has now grown to a mammoth facility. Ruby Hall Clinic occupies a prominent place among the medical institutions in India as a multi specialty hospital dedicated to the diagnosis, treatment and research related to various diseases. The hospital is located in the heart of Pune city with area of 31248 sq.m. It is a 560-bed hospital facility with a staff of 150 consultants, 500 panel doctors and 1400 paramedical staff. Ruby Hall Clinic has state of the art facilities in Cardiology, Cardiac Surgery, Neurology, Nuclear Science Center, Diagnostic Center, Intensive Care Units, Blood Bank and Cancer Unit (which was operational from April 2007).

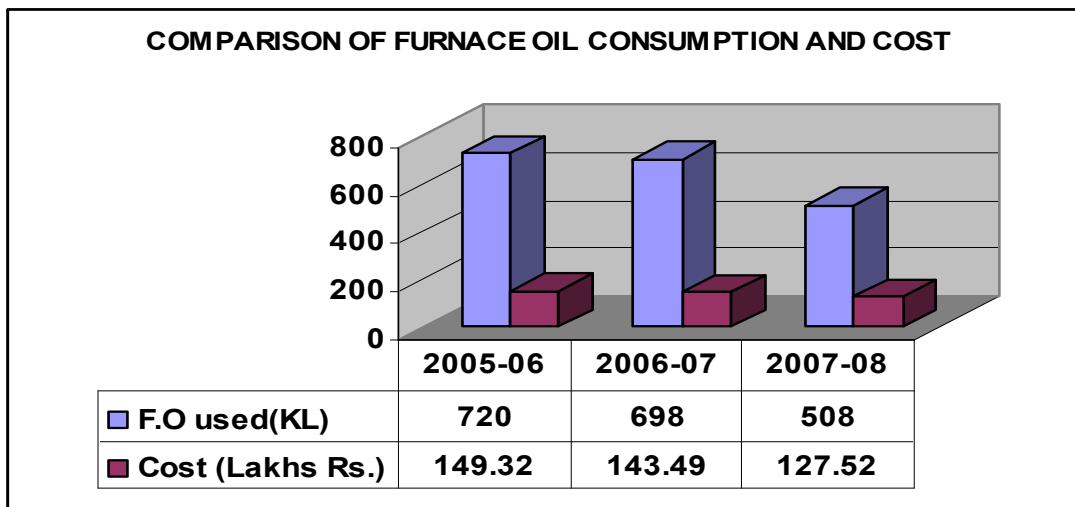
In 1966 Ruby Hall Clinic was converted from a private institution owned by Dr. Grant to a Public Charitable Trust - Poona Medical Foundation. It was later converted to the Grant Medical Foundation in 2000, of which Dr. Grant is the Chairman and Managing Trustee.

Ruby Hall Clinic extends free and concessional treatment to the economically weaker sections of society. At present, a large number of deserving patients from the economically backward strata of society are treated free of charge and at concessional rates.

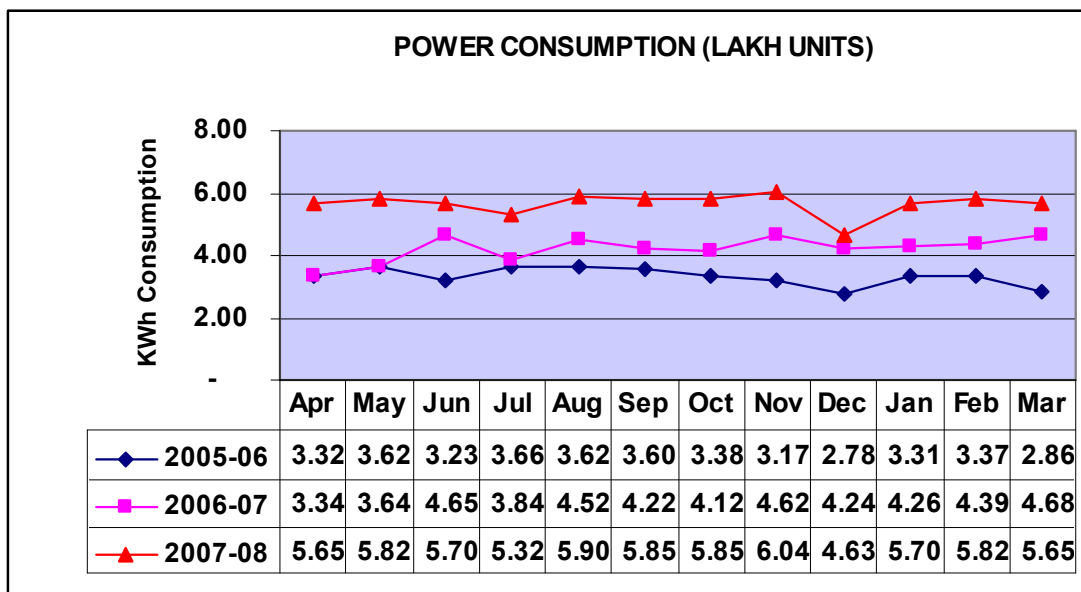


(ii) Energy Consumption:

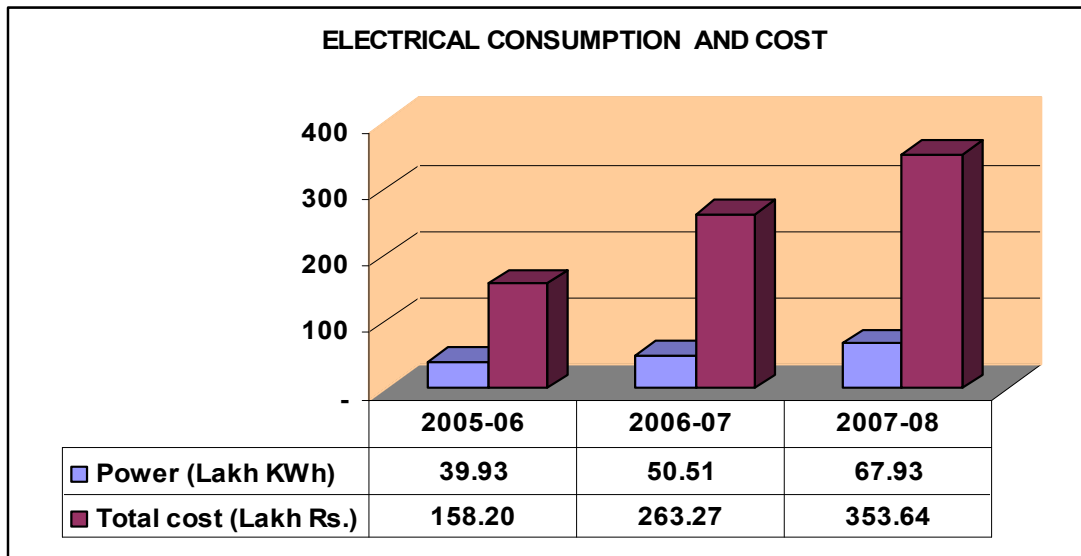
The energy consumption is shown below:



The F.O consumption has considerably reduced due to replacing V.A.M to Screw Chillers. Due to change over from Vapor Absorption technology to Screw Chiller the power consumption increased but at the same time it resulted in large quantity of Furnace Oil saving.(Refer section 10 a)



The power consumption increased due to expansion of hospital. The Cancer Block was operational from April 2007. There was also addition of new loads like Hospital's new Medical equipments, along with increased air conditioning requirement in new building.



(iii) Energy Conservation Achievements:

1. Energy efficient Screw Chillers with Automation system:



The chillers were selected for the **right-size of load and energy efficient, compatible with Honeywell Automation and Control System (ACS)**, which makes the entire system very flexible and focuses on reducing the operating expenditure (OPEX).

The combination of chiller and automation includes optimizing the operating pattern of the equipment to exactly match the plant loads throughout the year using various



control strategies. The micro-processor based control of the chiller will deliver the exact tonnage as desired by the system.

2. Waste Heat Recovery by Desuperheaters:

We evaluated the potential of **waste heat recovery** from the refrigerant gases that could be utilized to produce hot water for domestic use. This circuit would be continuously in synchronization with the facility requirement. This circuit reduces the fuel consumption, hence the operational costs substantially.



HOT WATER PUMPING FROM DESUPERHEATER TO CALORIFIER

3. Variable Frequency Drives:

A) Chilled water Secondary pumps:

A variable flow pumping was designed in place of a fixed flow pumping, which reduces the load on the chiller, thus consuming lower overall energy.

The secondary pumps were operated through VFDs so that the flow control is achieved without the loss of energy. The VFD modulates the pump speed according to the feedback from the differential pressure between supply and return headers of chiller. If AHU valves are closed due to reduction in load there would be backpressure in the system. This would result in increased differential pressure. With this signal VFD would adjust the frequency and hence the speed of secondary pump



to ensure that the chilled water is pumped to the load only if there is a demand from the load side. Hence, a substantial amount of energy is saved on the pumping.

VARIABLE FLOW SECONDARY CHILLED WATER PUMPING



B) VFD for Air Distribution System:

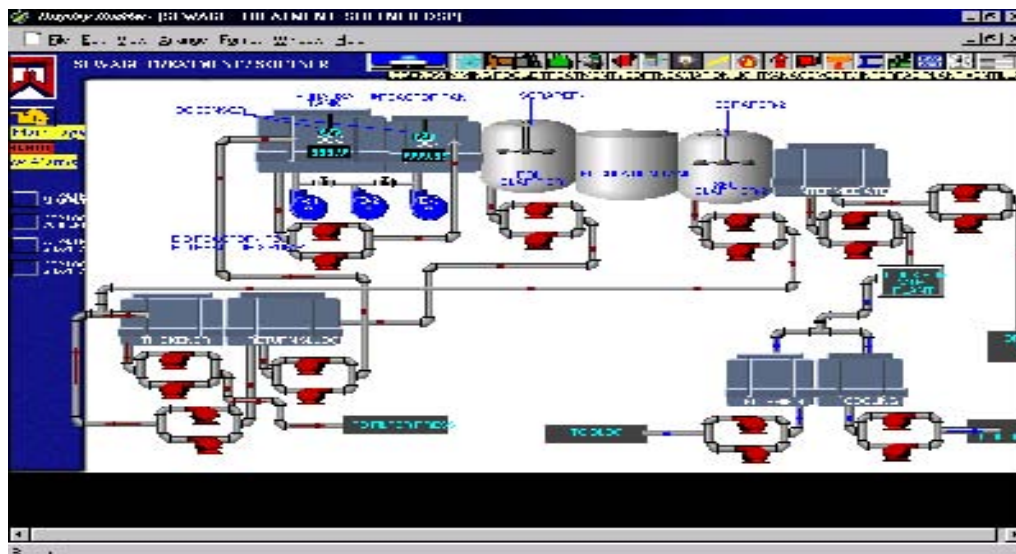
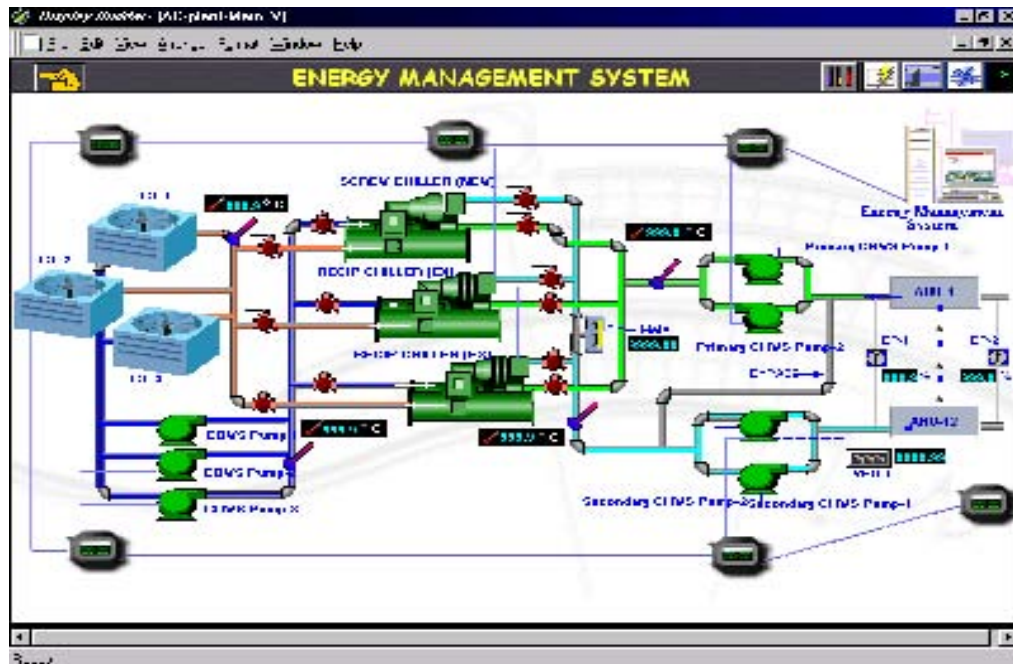
The efficiency of a system also depends on its air distribution system, viz the Air Handling Units. The same is designed to cater to the varying load requirements and cooling applications. Variable frequency drives for the AHU were installed depending on the area and operating pattern. A control valve on the return lines ensure that the chilled water flow is varied depending upon the load, thus savings in the chilled water pumping power.

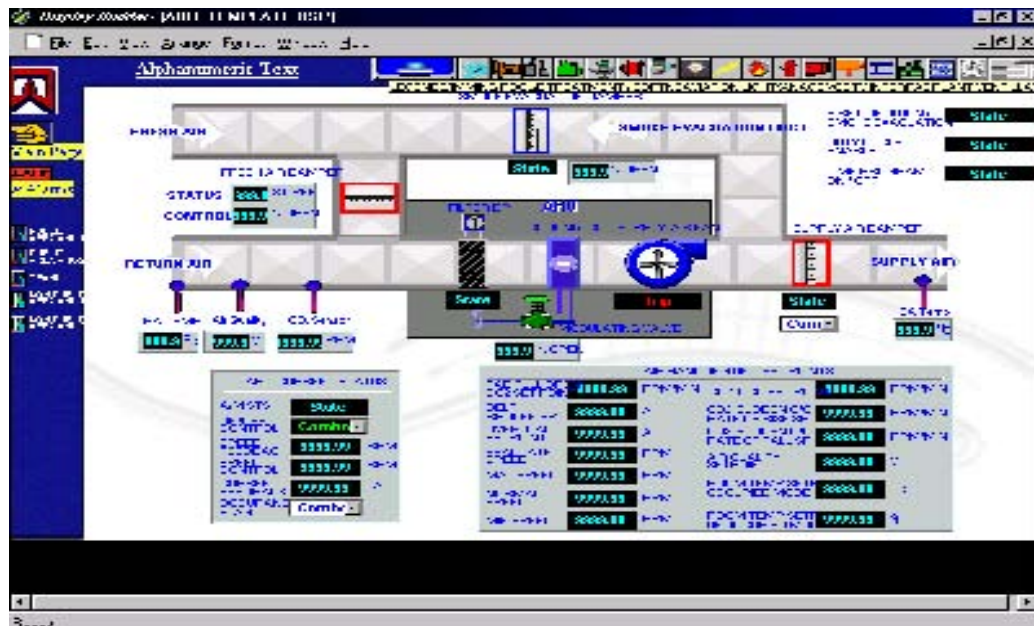
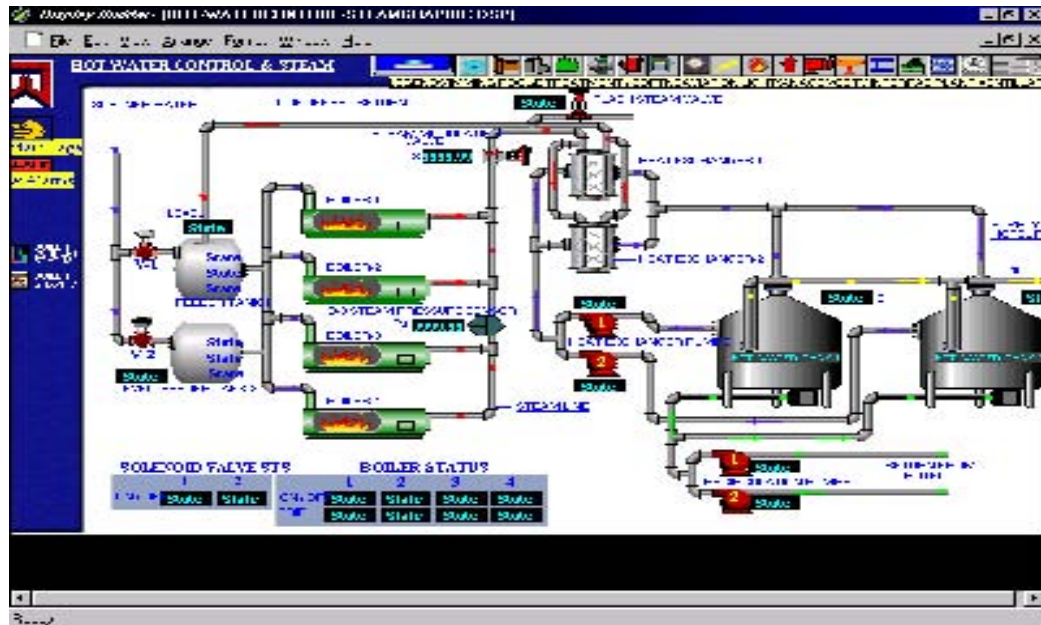




4. Building Management System for HVAC systems:

With the Honeywell Enterprise Buildings Integrator software (EBI) we got advantage of multiple applications like - Data monitoring, Control and energy optimization programs. We designed the system which helps in effective controlling of various parameters, measurement and monitoring of important parameters. Automated Chiller sequencing, switching on/off, duty cycling, temperature controls, etc. were incorporated through this computerized, state-of-the-art "**Enterprise Buildings Integrator**". Implementation of the same also provided us added benefits such as ease in operation and maintenance.







Energy Conservation Plans and Targets:

| Energy Conservation Measures (Planned) | Anticipated savings in | | Approx. investment (Rs. lakhs) | Project Commencement & Completion year |
|---|------------------------|------------------|--------------------------------------|---|
| | Energy Value (KWh) | <u>Rs. Lakhs</u> | | |
| Water Pumping | 80000 | 6.4 | 12 | 2009 |
| Human sensors | 45600 | 3.65 | 10 | 2009 |
| Solar street lighting | 41600 | 3.33 | 8 | 2009 |
| Compressed Air optimization | 17100 | 1.36 | 7 | 2009 |
| HVAC condition monitoring | 50000 | 4.0 | 3 | 2009 |
| Energy saver on autoclave | 6000 | 0.50 | 2 | 2009 |

14) Whether any dispute pertaining to statutory requirements of safety and pollution control is pending with any Government Agency. If yes, give details:

N.A



15 Summary:

Please summarize the information and data provided in this questionnaire as per the format given below:

NATIONAL ENERGY CONSERVATION AWARD - 2008
HOTELS AND HOSPITALS
SUMMARY SHEET

Name of Organization: Grant Medical Foundation – Ruby Hall Clinic

Building Name and its Location: Grant Medical Foundation
Ruby Hall Clinic
40 Sassoon Road,
Pune – 411007

| 15 (a) | Implementation of energy conservation measures & investment [Ref. 10(a) & 7(E)] No. of measures implemented, investment made & savings achieved. | | | | |
|--|--|-------------------------------------|--|--|---|
| Year | No. of measures implemented (i) | Investment made (Rs. Lakhs) (ii) | Savings achieved (Rs. Lakhs/year) (iii) | Energy Cost (Rs. lakhs/year) S. No. 7(E) (iv) | % Savings of Energy Cost over previous year (iii / iv x 100) |
| 2005-06 | N.A | ---- | ---- | ---- | ---- |
| 2006-07 | 3 | 181.3 | 9.24 | 443.21 | 2.08% |
| 2007-08 | 3 | 160 | 89.91 | 498.47 | 18.04% |
| Remarks (if any): The first phase was commissioned in Jan 2007 so the saving was realized only for the month Feb and March in 2006-07. | | | | | |

| 15 (b) | Energy Savings (Ref. 10 (a) & 9 (a)) | | | | | |
|---|---|--|--|--|---|--|
| Year | Electrical Energy | | | Thermal Energy (if applicable) | | |
| | Elect. Saving (Lakh kWh) S.No. 10 (a) (i) | Elect. Consumption (Lakh kWh) S. No. 7 (A) (c) (ii) | % Elect. Saving over previous year (i) / (ii) (iii) | Thermal (Fuel) Saving (Mkcal) S.No. 10 (a) (iv) | Thermal (Fuel) Consumption (Million kCal) S. No. 9 (a) (v) | % Thermal (Fuel) Saving over previous year (iv)/(v)x100 |
| 2005-06 | ---- | 42.44 | ---- | ---- | 6968.83 | ---- |
| 2006-07 | - 0.83 | 53.07 | -1.56 | 652.8 | 6757.63 | 9.66 |
| 2007-08 | - 4.35 | 69.61 | - 6.25 | 4303.58 | 4933.63 | 87.22 |
| Remarks (if any): i) The Screw chiller was installed in Jan07, hence we got electricity & fuel savings for year 2006-07 and 2007-08 and the year considered was (April06 - March 07) i.e. only 2 months after Jan07. ii) Additional building load has been considered while computing savings. | | | | | | |



| 15 (c) | Overall Specific Energy Consumption (2005 - 2007) | | | |
|-----------|--|-------------------------------|---------------------------------------|----------------------------|
| | Electrical Energy | | Thermal Energy (if applicable) | |
| Year | kWh/m ² S. No. 8 (g) (i) | % reduction over 2005-2006 | Mkcal/ m ² S. No. 9 (c) | % reduction over 2005-2006 |
| 2005-2006 | 185.07 | ---- | 0.249 | ---- |
| 2006-2007 | 189.61 | -2.45 | 0.241 | 3.21 |

Remarks (if any): Cancer block became partly operational from Jan 07 also due to screw chillers the electricity consumption increased but we've achieved fuel savings for Feb07, March07.

| 15 (d) | Overall Specific Energy Consumption (2006 - 2008) | | | |
|-----------|--|-------------------------------|---------------------------------------|----------------------------|
| | Electrical Energy | | Thermal Energy (if applicable) | |
| Year | kWh/m ² S. No. 8 (g) (i) | % reduction over 2006-2007 | Mkcal/ m ² S. No. 9 (c) | % reduction over 2006-2007 |
| 2006-2007 | 189.61 | ---- | 0.241 | ---- |
| 2007-2008 | 215.92 | -13.88 | 0.158 | 34.44 |

Remarks (if any): The overall electricity consumption has increased due to addition of Cancer block with new medical equipments added to existing load of Main Building.

| 15 (e) | Specific Energy Consumption (SEC) Reduction (annual kWh consumption/ kW of connected load) (2005-2007) | | | |
|-------------|---|---------------------------------------|---------------------------------------|------------------------------|
| | Electrical Energy | | | |
| Year | kWh Consumption S. No 7 (A) (c) | Connected load (kW) S.No 6 (C) (v) | kWh consumption/ kW connected load | % reduction over 2005 - 2006 |
| 2005 - 2006 | 42.44 | 1220 | 0.035 | ----- |
| 2006 - 2007 | 53.07 | 1293 | 0.041 | -17.14 |

Remarks (if any): Some part of Cancer Block became operational from Nov 06 and 1 VAM was replaced with a Screw chiller hence the consumption increased for 2006-07.

| 15 (f) | Specific Energy Consumption (SEC) Reduction (annual kWh consumption/ kW of connected load) (2006-2008) | | | |
|-------------|---|---------------------------------------|---------------------------------------|------------------------------|
| | Electrical Energy | | | |
| Year | kWh Consumption S. No 7 (A) (c) | Connected load (kW) S.No 6 (C) (v) | kWh consumption/ kW connected load | % reduction over 2006 - 2007 |
| 2006 - 2007 | 53.07 | 1293 | 0.041 | ----- |
| 2007 - 2008 | 69.61 | 1443 | 0.048 | -17.07 |

Remarks (if any): ---



16 DOCUMENTS ATTACHED:

List of Documents attached with this Questionnaire

- (i) Copies of Certificates pertaining to statutory requirements such as safety and pollution control are enclosed. (As applicable)
- (ii) A brief write up of the building as mentioned at S.No. 13 along with photographs depicting equipment / locations where energy efficiency activities have been undertaken and a Floppy Diskette / CD containing the entire write-up is enclosed (Please ensure that name of the building is written on the Floppy Diskette / CD and it is virus free).

Signature of the Chief Authority.....

BOMI BHOTE
CHIEF EXECUTIVE OFFICER
RUBY HALL CLINIC

Date: Chief Executive.....

Place: Organization Seal



BRIEF DESCRIPTION OF THE PROJECT



BACKGROUND OF THE PROJECT

After continuous in-house energy conservation measures, like lighting retrofit program, fuel optimization program, solar water heating program, we decided to involve expertise of an external agency for taking forward our energy conservation programs. Honeywell Automation (I) Ltd., a leading energy services company (ESCO), was appointed as our energy partner and we implemented HVAC related energy conservation measures on a guaranteed performance basis in the following manner.

With the help of our energy partner, we conducted an energy audit of our facility in year 2006. On analysis of the data, we found good potential for savings in air-conditioning and heating related energy consumption – both electricity and fuel, a detailed technical write-up for which is enclosed in the following pages.

Our findings –

The following were the approved strategies after the investment grade audit was conducted by Honeywell.

- The chiller plant technology (Vapor Absorption) which we had adopted earlier was replaced by more energy efficient screw chiller one.
- An in-built heat recovery system provided with the screw chiller to not only result in energy savings in the hot water generation system but also enhance efficiency of the chiller
- pumping system needed a redesign
- variable frequency drives can be used to take advantage of variable HVAC loads
- an energy management system to control all the equipment to generate substantial energy savings



Technical & Financial Analysis:-

Year 2006-07 - Phase 1 of implementation

| | |
|-------------------------------|--|
| Finalized date | - 30 th March 2006 |
| Implementation start date | - April 2006 |
| Implementation end date | - Jan 2007 |
| Savings start month | - Feb 2007 |
| Savings realized for the year | - Rs.9.24 Lakhs (period of approx. 2 months) |
| Investment made | - Rs.181.3 Lakhs |
| Annual guaranteed savings | - Rs.60.73 Lakhs |
| Contract period | - 6 years |
| Project IRR | - 25% |

In this phase, we focused on the main building HVAC loads and the respective vapor absorption chiller was replaced with the screw chiller along with the pumping and automation solutions. Since the system was commissioned in Jan 2007, the energy savings was realized only for a period of 2 month during the financial year 2006-07.

Moreover, during the execution of contract, there were many internal project that were under execution, e.g. Cancer block load, new medical equipments, improvement in inside service levels, etc. These changes had an upward impact on the overall energy consumption of the hospital, thus helping us control the overall energy consumption.

The detail of the saving and the investment made in the year 2006 a-2007 is as follows.

| Year of Commissioning of the projects | Project description | Achievement of energy savings per year basis | | | Investment incurred on the project (Rs. Lakhs) |
|---------------------------------------|---|--|-------------|------------------------------|--|
| | | Electricity | Fuels* | Total savings in (Rs. Lakhs) | |
| | | (Lakhs (kWh)) | F. Oil (KL) | (Rs. Lakhs) | |
| 2006-2007 | Conversion of 1 no. VAM to Screw Chiller with Desuperheater | -1.133 | 68 | 7.695 | 181.3 |
| | Chilled Water pumping | 0.158 | | 0.82 | |
| | Condenser Water Pumping | 0.14 | | 0.72 | |
| | Sub total | -0.83 | 68 | 9.24 | |



Year 2007-08 - Phase 2 of implementation

| | |
|-------------------------------|------------------------------------|
| Finalized date | - 14 th Sep 2007 |
| Implementation start date | - Oct 2007 |
| Implementation end date | - Jan 2008 |
| Savings start month | - Feb 2008 |
| Savings realized for the year | - Rs. 89.91Lakhs (Phase 1+Phase 2) |
| Investment made | - Rs.161 Lakhs |
| Annual guaranteed savings | - Rs.34.51 Lakhs |
| Contract period | - 6 years |
| Project IRR | - 8% |

In this phase, we focused on the Cancer building HVAC loads and the respective vapor absorption chiller was replaced with the screw chiller along with the pumping and automation solutions. The system was commissioned in Jan 2008.

We also upgraded our system to replace standby chillers and pumps as well.

| Year of Commissioning of the projects | Project description | Achievement of energy savings per year basis | | | Investment incurred on the project (Rs. Lakhs) |
|---------------------------------------|--|--|---------------|------------------------------|--|
| | | Electricity | Fuels* | Total savings in (Rs. Lakhs) | |
| | | (Lakhs (kWh)) | F. Oil (KL) | | |
| 2007-2008 | Conversion of VAM to Screw Chiller with templifier | -7.59 | 448.29 | 73.1 | 161.0 |
| | Chilled Water pumping | 1.496 | | 7.79 | |
| | Condenser Water Pumping | 1.74 | | 9.06 | |
| | Sub total | -4.35 | 448.29 | 89.91 | |

Impact of implementation -

Implementation of these energy conservation measures not only reduced the air conditioning cost but also increased comfort levels, decreased maintenance cost, made hospital environment more serene and secure as it reduced burning of furnace oil. Certainly, we believe we have made a positive impact on environment of Pune.



REASONS FOR AWARD

Committed to healthcare since 1960, Ruby Hall Clinic offers a full spectrum of services in clinical and surgical care as well as wide range of specialty support, in patient & out services. We work in a very critical area of healthcare such as cardiology, neurosciences, cancer treatment, neurology etc. We at Ruby Hall have been very critical about usage of energy whilst we provide clinical services to our patients. In fact it is the same thread of social obligation that motivates us to provide healthcare to the needy as well as conserve energy in larger interest of the society.

We have been regularly implementing in-house energy conservation programs during the last decade such as fuel optimization programs, lighting retrofit programs, solar water heating programs etc. Since year 2006, we started taking expertise of external independent agencies like Honeywell to embark upon major energy conservation programs on a guaranteed performance basis. We appointed Honeywell as our energy partners to do regular energy audits, implement these programs and also undertake efficient O&M (operation and maintenance) practices.

All along we have been implementing such program taking into account the nature and criticality of our business scenario. Since our facility works on 24 x 7 basis and uptime of utilities is critical to business operations, it has always been challenging to make both the ends meet.

We have been energy conscious from the very start. We carry out energy audits on regular basis and check performance of various equipments and by working immediately on aberrations observed we make sure that our equipments work on their optimum efficiency. All our programs have had little or no impact on our business operations, thereby avoiding discomfort to our internal customers (Doctors and medical staff) and the end user (the patients). The implementation always happened during the lean periods of 1:00 to 4:00 am.

Our program in the last couple of years focused on the air-conditioning system, which is a high energy consuming utility in a hospital scenario. We worked on upgrading the old and inefficient vapor absorption machines to an efficient screw machine, whilst changing the chilled water pumping from a constant flow one to variable flow one. We also optimized the condenser pumps and the cooling tower operation. We also recovered waste heat from the screw chillers and used it for domestic hot water application, thus saving on fuel consumption. A head end energy management system installed on all the related equipment ensures efficient operation and maintenance practices.

We feel that in a complex business environment to design and implement energy conservation measures generating over 18% savings is an accomplishment and it is with this conviction that we stake our claim for this award. Moreover, this award will reassure us about our decision to invest in such programs and a moral booster for the whole organization.