

## Wipro

### Some of the Projects carried out in 2004 -05 for EC - 1

#### Project 1. Installing large capacity pump for night hours.

##### Background of the Project

The space in the Wipro – EC 1 building is provided with the help of a centrally Air conditioning plant. The refrigeration system consisting of 3 Nos Screw chillers of 2 x 300 TR and 1 x 240 TR .

During the night Hours (10 PM to 8 AM) workstation AHU's are switched off. Only server AHU's are operated around the clock. Normally during the night hours (9PM to 9AM) one chiller of 240 TR is in operation to meet the AC load. During the same period 3 chilled water pumps (after implementing proposal #1) will be in operation. By closing the 300 TR (2 Nos) inlet valves, chilled water is allowed to flow through one chiller (240 TR) with 2 Nos pumps operation. the measured chilled water flow rate is 3392 LPM as against designed flow rate of 2331 LPM, the delivery pressure is 4.5 Kg/Sq cm which is very high. The chilled water velocity through chiller is 3.7 m/s as against the acceptable levels of 1.5 – 1.8 m/s. it is always advised to operate the chillers close to the designed flow rate (with  $\pm 5\%$  variations to meet any emergent exigencies) for its best performance

##### Observations / Recommendation

By installing single large capacity pump as against the present pumps for the night hours operation realize the energy savings. The capacity of the new pump and new head is as follows.

Parameters	Unit	Present Pumps (designed)	Proposed large pump
Flow rate	LPM	1380 (23 lps)	2331 (39 lps)
Head	M	39	30
Power consumption	Kw	15.17	20.86
Evaluated efficiency	%	58	55

Replace any one old pump with new large capacity pump and the same can be operated after switching off the workstation AHU,s during night period. While new pump operation other two non operating chillers inlet valves should be closed.

##### Technical and financial Analysis

Power consumption of chilled water pumps	: 48 KW(3 nos)
Power consumption of new pumps	: 21 KW
No of hours new pump operated	: 10 per day
Annual operating hours	: 3650
Annual energy savings	: 0.99 Lakh KWh
Annual cost savings (@Rs 4.62 per KWh)	: 4.5 Lakh
Investment required (for two pumps)	: Rs 1.2 lakh
Simple pay back period	: 4 Months

#### Project 2. Optimising of AHU fan speed.

##### Background of the Project

During the measurement of AHU parameters, it is found that AHU fan speeds are varied from designed speed. AHU's are operating at supply frequency less than 50 Hz and the measurements were taken at the operating frequency as per design motor and fan speeds are s follows

AHU capacity (TR)	Motor speed (RPM)	Fan Speed (RPM)
26	1460	642
29.57	1460	565

The supply frequency is 48 Hz for which motor speed will be around 1400 RPM. At lower motor speed fan speed should less, but measured fan speeds are higher compared to designed fan speeds. At higher fan speeds power consumption will be cube times high. It is also noticed during the Dg set operating where frequency is 50 Hz, AHU fan power consumption is around 7 KW. In the case of tower 4 and server AHU's uniformity in fan speeds is observed.

The measured air flow rates and speeds are given in the table. The air flow rates depends on the filters cleanliness.

AHU	Rated flow (m <sup>3</sup> /s)	Rated capacity (TR)	Measured flow (m <sup>3</sup> /s)	Motor speed (RPM)	Fan Speed (RPM)	Power consumption (KW)
<b>Tower A</b>						
GF-B	6.85	29.57	5.59	1405	639	5.4
FF-B	6.85	29.57	5.84	1403	615	5.2
SF- A	6.02	26	6.31	1415	719	5.1
TF-B	6.85	29.57	5.78	1408	617	5.1
<b>Tower – 2</b>						
GF-A	6.02	26	7.82	1395	699	6.2
GF-B	6.02	26	6.21	1403	697	5.1
FF-A	6.02	26	7.87	1413	668	5.5
SF-A	6.02	26	7.27	1394	708	6.0
SF-B	6.85	29.57	6.22	1404	707	5.0
TF-A	6.02	26	7.0	1394	700	6.2
<b>Tower – 3</b>						
GF-B	6.85	29.57	5.82	1400	678	6.3
FF-B	6.85	29.57	5.2	1408	626	4.5
SF- A	6.02	26	8.9	1388	703	6.8
TF-B	6.82	29.57	9.18	1404	638	6.7

### **Observations / Recommendation**

By changing the fan pulleys uniformly for given TR, reduction in the power consumption is possible. The power consumption of AHU's should be around 5 KW for normal operating frequency. After optimizing the fan speed reduction in AHU fans power consumption will be 10 KW.

### **Technical and financial Analysis**

Energy savings

Reduction in AHU fan power consumption	: 10 KW
AHU operating hour per day	: 14
No of days in a year	: 300
Annual energy saving	: 0.42 lakh KWH
Annual cost savings (@Rs 4.62 per KWH)	: Rs 1.94 lakh
Investment required(for new AHU pulley)	: Rs 0.50 lakh
Simple payback period	: 4 months.

### **Projects Proposed for 2005 -06**

**1. Eco Smart:** Eco Smart energy saver is an intelligent innovation to save energy for mixed loads which helps to reduce the total energy consumption based on the principle of reducing losses in the electrical circuits.

Proposed for Indoor Lighting, the expected savings are 30%

**2. Eco Litecon:** It is the state of art of Micro Controller based unit, which can save more than 30% energy on a cluster of lights, streetlights, Façade lights, etc. with programmable microcontroller for various modes of operations like energy saving and dimming in non peak hours. The device also increases life of lamps and ballasts by providing conditioned power to loads.

Proposed for Outdoor Lighting, the expected savings are 48%

**3. ETRACS :**Energy tracking and control system it is proposed to control & track the energy consumption & also monitor the critical parameters such as energy consumption, temperature of AC's, ETP parameters & health of machines remotely of all Wipro Buildings across India at very low cost using state of the art GSM/CDMA wireless technologies. This system will help the facilities department to centralize the monitoring and take collective and corrective decisions based on analysis of vital data collected on a day to day basis.

Proposed for Central Monitoring and Control , the expected savings are 5%

Description of Energy Saver	Buildings Considered	Savings per year (Rs.)	Investment(Rs.)	Payback (Months)
Eco-Smart	M3,M4,K2,K1,M2	14.5 lakhs	20.67 lakhs	11.1 months
Eco-Litecon	M3,M4,K2,M2	2.4 lakhs	1.82 lakhs	5.72 months
ETRACS	M3,M4,K2,K1,M2,ITPL	37.8 lakhs	53.52 lakhs	11 months

2. Some of the projects carried out in 2004 -05 for Madivala 3 & 4

### **Project 1. Line loss reduction by installing the capacitors in MCC panels**

#### **Background of the project**

Introduced Electro flow system to improve the following Electrical parameters

- **Voltage Improvement & Stability**
- **Three Phase Load Balancing**
- **Surge & Transient Protection**
- **Broadband Harmonic Reduction**
- **Power Factor Improvement**
- **Release In KVA Capacity**

#### **Observations/ Recommendations**

The benefits are as follows

- **Improved Voltage Stability**
- **Reduced Harmonic Distortion**
- **Improved Power factor**
- **Surge and Transient Protection**

#### **Technical and Financial Analysis:**

Oct.1st 2004 Feeder 1 - 513252 Feeder 2 - 293218  
 Oct.19th 2004 Feeder 1 - 569928 Feeder 2 - 319901  
 Difference in Units - 56676 + 26683 = 83,359

Nov.1st 2004 Feeder 1 - 603641 Feeder 2 - 333658  
 Nov.19. 2004 Feeder 1 - 659742 Feeder 2 - 354405  
 Difference in Units - 56101 + 20747 = 76,848

The actual Savings shown will be :  $83,359 - 76,848 = 6511$  Units  
 $6511/83359 = 7.81\%$

MSB Panel with EF OFF - 206.5 KW [Avg.]  
 MSB Panel with EF ON - 197.74 KW [Avg.]  
 Savings in MSB - 4.33%

Chillers with EF OFF - 157.31 KW  
 Chillers with EF ON - 150.28  
 Savings in Chiller Panel - 4.57%

Main Panel with EF OFF - 551.47 KW  
 Main Panel with EF ON - 537.01 KW  
 Savings in Main panel - 57.84 KWH /552

The project has been taken as a sample projects for HVAC, overall energy savings is 3.4 to 4 %. And the pay back period of 4 years.

## **Project 2. Introducing VFD in the chilled water system**

### **Back ground of the Project**

During day time 2 pumps are continuously on which is sufficient to handle the AC load.

We found even during night times( 7.00PM to 7.00 AM) weekends and holidays also these pumps run continuously without any throttling even in the partial loads.

### **Observations/ Recommendations**

Normally in the partial loading where only critical loads will be added on to AC if we throttle the flow as per the pr difference across the chilled water header we can have a potential savings in the pumping system

## **Technical and Financial Analysis**

### **SUMMARY**

#### **With VFD**

14 & 15 sep 2004 for 24 hrs = 158 units

16 & 17 sep 2004 for 24 hrs = 173 units

02 & 03 oct 2004 for 24 hrs = 218 units

04 & 05 Oct 2004 for 24 hrs = 237 units

**Total units for 4 days = 786 units**

**Average units per day = 196.5 units**

= 265.5 - 196.5

= **69 units**

**Energy saving per month = 69 x 30 = 2070 units**

**Energy saving per year = 2070 x 12 = 24840 units**

**Cost per unit = Rs 4.60**

Cost for 69 units ie, **cost saving per day = 4.60 x 69**

**= Rs 317.40**

**Cost saving per month = 317.40 x 30**

**= Rs 9522**

**Cost saving per year = 9522 x 12**

**= Rs 1,14,264**

Payback period  $114264/72384 = 1.5$  Years

#### **Without VFD**

19 & 20 sep 2004 = 253 units

20 & 21 sep 2004 = 271 units

21 & 22 sep 2004 = 260 units

22 & 23 sep 2004 = 278 units

**Total units for 4 days = 1062 units**

**Average units per day = 265.5 units**