

# Tata Honeywell Ltd Kolkata



**TATA Honeywell**



**Performance Contracting**

## Unit Profile

Tata Centre is a multistoried building in Kolkata owned by Tata Steel. Being one of the tallest buildings it is a great and well-deserved honour for Kolkata. The foundation stone was laid by Jehangir Jivaji Ghandy in the year 1964. It houses more than 20 offices of the TATA group of companies.

The total area of Tata Centre is 2,12,482 sq.ft, the air-conditioned area being 1,97,741 sq.ft. The temperature maintained throughout the air-conditioned space is 24 deg.

The Office Working hours/Days at Tata Centre are

Mondays to Fridays 0900 hrs to 1900 hrs

Saturdays 0900 hrs to 1400 hrs

However the actual working hours stretch beyond 1900 hrs

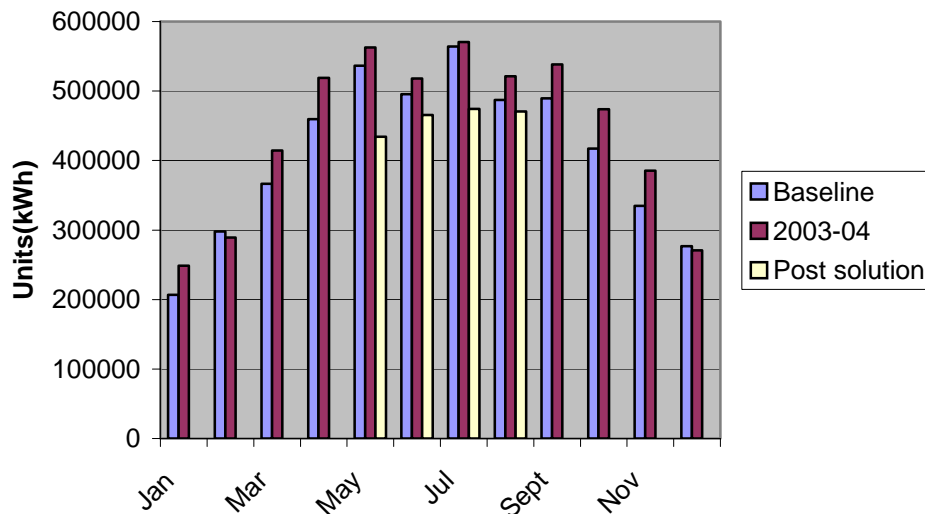
The connected load is approximately 2000 kW.

The Tata Iron and Steel Company & Tata Honeywell Ltd have gone into an Energy Management Agreement by way of which Tata Honeywell will carry out energy efficient upgrades at their own cost on various utilities in the facilities at Tata Centre. Tata Honeywell has guaranteed energy savings of more than 8.5 lakhs units of electricity per year.

## Energy Consumption

Figures of the Energy expenditure at Tata Centre have shown decline as seen in the fig. below

**Energy Consumption at Tata Centre**



The average reduction of energy consumption over the last 4 months has been about 18%. We hope to get more savings by providing Advanced Energy Management & Automation Systems to achieve Energy & Systems efficiencies.

### **Energy Conservation Commitment, Policy & Setup**

Substantially reducing the Operation & Maintenance, Consumables, Spares & Consumables cost at Tata Centre and to achieve guaranteed Energy Savings. Our goal is to have the lowest Specific Energy Consumption throughout the year for a commercial/office building in India. Maintaining these at the same level will be one of the greatest challenges that we will face.

The setup required to achieve the energy savings is in place. Tata Steel & Tata Honeywell teams closely monitor the energy consumption patterns each month. Targets are decided every month & ensured that they are met. Deviations from the target are reasoned and documented. This team is balance in terms of both technical & function experience. The team has experts from Instrumentation, BMS, HVAC, Training, Electrical, Finance and Operations & Maintenance. The focus of the team is always on delivering the committed results.

Not only does the top management emphasize on achievement of the highest level of energy efficiency but it also provides secure funding to implement energy efficiency measures. Their timely approvals of the energy conservation plans help speedy implementation of measures to conserve energy.

Training & regular briefings are done to help the plant personnel understand the terms related to energy consumption.

### **Energy Conservation Achievements**

**Implemented Measures:** - We have implemented energy efficient upgrades in the following areas

#### **1. PC based Energy Management System: -**

The building control Automation System is a state of art system that is microprocessor-based system. One scaleable system that pulls together all core building systems and integrates information from many different enterprise subsystems. With the Honeywell Enterprise Buildings Integrator, we have the information needed to make critical decisions quickly - decisions that ultimately help us to conserve energy



### **Energy management strategy for Chillers**

#### **Load reset**

Chilled water flow control responds quickly to load changes, to maintain the chilled water temperature. The chilled water temperature may be reset from chilled water return temperature.

### **Chiller sequencing**

In Chiller sequencing the chilled water flow temperature is controlled by switching chillers on & off. If the flow and temperature are below the specifications for the chillers, then the system first circulates the cooling load, checks the load, and decides number of chillers to be on line.

### **Cooling Tower**

A cooling tower's capacity to cool the water is limited by the ambient conditions. If the condenser water design temperature minus the approach temperature of the tower is lower than the outside air temperature, then Cooling tower fans can be sequenced, Set point of the condenser water can be raised, quantity of water can be by-passed to reduce the load on C/T, Fans can be switched off to provide free cooling etc.

### **Energy management strategy for Air handling units**

#### **Duty Cycling**

The duty cycling, software program reduces energy consumption (electrical and mechanical) in HVAC systems by switching fans OFF & ON periodically, on a fixed time schedule. However, if space temperature exceeds the limits, duty cycling program is disabled.

#### **Optimum Start/Stop**

Air handling units are switched ON depending upon the outside air/inside air temperature and the capability of the AHU to recover the space temperature to the middle of the comfort band before occupancy.

Optimum stop function is the opposite of optimum start function. It calculates the earliest possible point in time when the HVAC system can be stopped, ensuring that the minimum comfort condition has just been reached at the end of the occupancy period.

## **2. HVAC upgrades/modifications & Lighting upgrades/modifications**



Light & VFD upgrades



Sl. No.	Solution	Description	Quantity
			Nos.
1	Chillers	300TR water cooled Screw chiller	2
2	Cooling Tower	Modification / Up gradation of existing Cooling Towers	Lot
3	Pumps	Chiller primary pumps - 3 nos Condenser pumps - 3 nos Secondary pumps - 3 nos	9
4	Tubelights	Energy Efficient Fluorescent Tube lights	4800
5	Electronic Ballasts	Electronic Ballasts	3150
6	CFLs	Energy Efficient Compact Fluorescent Lamps	100
7	VFD	Variable Frequency Drives with Panel suitable to Drive Secondary Pumps of suitable capacity	2
8	CCTV system	CCTV	Lot
9	Energy Management System	EBI license for monitoring and control of Central AC plant, AHU's, Pumps, Cooling tower + Direct Digital Controllers + Panels + PC + Sensors etc.	Lot
10	Energy Meters	For monitoring Chiller/AHU power consumption	5
11	Electrical cabling	For EMS & CCTV system	1
12	HVAC related Mechanical Upgrades	Modifications / Upgrades of the existing HVAC system to accommodate new Chillers, Primary and Secondary pumping systems, upgraded cooling towers and modifications in the AHU	1
12	Water Treatment Plant	Water treatment	1

### Energy Conservation plans & Targets

The road ahead is promising & challenging. Our future endeavors to reduce the Specific Energy Consumptions are:-

1. Modernization of Elevators.
2. Overhauling of the Diesel Generators..
3. Improved Air Distribution System for all floors.
4. Improving power Factor.
5. Installation of Smart Energy meters.
6. Solar panels on the east wall of Tata Centre.

Our target is to have the lowest S.E.C in India for a commercial/office building.

## Environment & Safety

Safety is a key priority area at Tata Centre & will continue to be a priority in the future as well. This is done by maintaining a safe plant & equipment, ensuring safe handling & use of substances, providing information, instruction & supervision to our employees & maintaining safe & healthy working conditions.

By reducing the energy consumptions a significant amount of reductions in CO<sub>2</sub> have been attained. By saving an average 99,344 units of electricity per month Tata Centre prevents 2,12,596.16 pounds of CO<sub>2</sub> equivalent emissions every month into the atmosphere. This endeavor helps in reducing of global warming; & contributes to both environment & economy.

source

[www.hydropower.inel.gov/enviornmental/pdfs/ornlcon.pdf](http://www.hydropower.inel.gov/enviornmental/pdfs/ornlcon.pdf)

1kWh = 2.14 pounds emissions of Co<sub>2</sub>

We recognize the need to minimize waste at Tata Centre. To prevent wastage the following practices are encouraged: -

- Use of Network printers instead of Individual Printers
- Using Electronic Mail.
- Promoting inter office communication via email prior to using paper copies.
- Designing mailers to avoid use of envelopes
- Proofreading documents before printing.
- Circulating memos/documents/reports instead of distributing multiple copies.
- Posting announcements on bulletin boards.
- Encouraging air dryers in Restrooms instead of paper towels.
- Reusing paper printed on one side in fax machines, copiers, printers while printing draft documents.

To make the vicinity of Tata Centre greener, Tata Steel has undertaken beautification & gardening work.

Safety and Security are among the major concerns at Tata Centre. Ensuring security of people and equipment in plants is critical in ensuring minimum downtime of equipment. Tata Honeywell's state-of-the-art Integrated Safety and Security System provides Facility plant managers with a comprehensive range of solutions tailored to individual facility needs. The system also has the capability to integrate air-conditioning systems, lighting control system to provide the plant security / maintenance staff, with a single user-friendly yet powerful man-machine interface to monitor and control various subsystems of the plant.

Tata Honeywell's Access control system provides variety of card readers, controllers and central operating workstation. The Access Control System database is used by security personnel to identify who is where, in case of emergencies like fire



conditions etc. The Access Control System database is used by Human Resources Department for payroll and other purposes. The Access Control System database is interfaced to building management systems for zone wise control of lighting and air conditioning equipment depending on the occupancy, to reduce energy wastage.

Incase of fire conditions, it is very important to ensure that the occupants of the affected area are appropriately warned and evacuation of occupants. The emergency evacuation system involves Speakers, Microphones, Amplifiers, and Automatic Dialers etc. The system will be integrated with the fire alarm system. Incase of fire, the microprocessor based fire alarm system generates the fire alarm warnings. Depending on the intensity of the fire conditions detected by the fire alarm system, Emergency Voice Evacuation System broadcasts pre recorded alarm tone / voice messages in the area selected by the Fire Alarm System.

**TATA CENTRE**, the building & premises of TATA Steel where Tata Honeywell Ltd. has invested in energy efficient upgrades on various utilities/facilities at TATA CENTRE and assured guaranteed energy savings. This constitutes the ENERGY MANAGEMENT SYSTEM AGREEMENT.

**Plant Connected Load (kW) :-** 2000 kW (approx)

TATA CENTRE is a 17 storied centrally air conditioned building. The building has a total built up area of 2,12,482 sq.ft. of which more than 93% is air-conditioned (197,741 sq.ft.). The building is occupied from 0900 hrs to 1900 hrs (Mondays to Fridays) & 0900 hrs to 1400 hrs (Saturdays). However the actual working hours stretch beyond these time schedules.

#### **Electrical Energy Consumption and Cost:-**

The base line financial year 1<sup>st</sup> April 02 to 31<sup>st</sup> March 03 (FY 2002-03) has been agreed upon by both the parties as a baseline, and performance of all energy efficient upgrades will be with reference to the above year. As any building is continuously upgraded by additional offices, personal computers, window a/c's lights etc any addition/reduction of load will be accounted for in the calculation of the energy savings by adding/deducting appropriate loads with reference to the baseline year. Following is the baseline year energy consumed at TATA CENTRE being used by both parties as benchmark.

#### **Electricity Consumption and cost:-**

(as energy consumption of a building changes due to seasons [more in summer than in winter] monthly details are forwarded )

**A] Purchased Electricity :-**

	Post solution units consumed (2004)	Additional loads / less loads , if any Units consumed / saved	Baseline months (units) consumed KWh	Savings units kWh	Tariff Rs / unit	Total savings (Rs)
Legend	A	B	C	D=B+C-A	E	F = D * E
Month						
April			459546		5.84	
May	434340	18480	536250	120390	5.84	703077.6
June	465474	36217	495282	66025	5.84	385586
July	474474	36217	564174	124817	5.84	728931.3
August	470508	69520.5	487134	86146.4	5.84	503095
September			489564		5.84	
October			417222		5.84	
November			334788		5.84	
December			276930		5.84	
January			206922		5.84	
February			297876		5.84	
March			366684		5.84	
					5.84	
Total			4932372			

Target is to achieve 60 lakh rupees as energy saving per year.  
 As the energy savings for 4 months has already crossed 20 lakhs in 4 months,  
 target will be met in 12 months

**DG Set generation:** - In case of power disruption from CESC, 3 nos DG sets are available to provide back up power. The DG sets are of CUMMINS make (model no. VTA 1710G) with Jyoti Alternators. Each set is rated at 525 kVA. Details of the run hours of the DG are tabulated below.

Month	Post solution run hours (2004-2005) (load shedding + trial run)	Baseline year run hours (2002-2003) (load shedding + trial run)
April	16.5	6.5
May	13.5	7.5
June	3	4
July	2	5
August	2	6
September		6
October		1
November		6.5
December		4.5
January		2.5
February		Nil
March		Nil
Total	Yr. Not complete	49.5

Units consumed by DG generator sets could not be obtained as no kWh meter is installed in DG room. However run hours of the DG are given as above.

**Total Electricity Consumption & Cost :-** As the contribution of DG sets is not available & negligible considering the run hours of the DG, the total Electricity Consumption & cost is predominated by purchased from CESC.

Kindly refer 8.1 A. for details of the purchased electricity in terms of Consumption & Cost.

**Specific Electricity Consumption (kWh/ sq.ft)**

Total area of TATA CENTRE :- 212482 sq.ft

	Post solution units consumed	Additional loads / less loads , if any Units consumed / saved	Baseline months unit consumed	S.E.C baseline yr. (B+C/area) kWh/sq.ft	S.E.C 2004 (A/area) kWh/sq.ft
Legend	A	B	C		
Month					
April			459546	2.16	
May	434340	18480	536250	2.69	2.04
June	465474	36217	495282	2.51	2.19
July	474474	36217	564174	2.82	2.23
August	470508	69520.5	487134	2.62	2.21
September			489564	2.3	
October			417222	1.96	
November			334788	1.57	
December			276930	1.32	
January			206922	0.99	
February			297876	1.41	
March			366684	1.72	
Total			4932372		

**Specific Electrical Energy Cost (Rs/ sq.ft):- Unit rate @ Rs 5.84 per unit**

$$\text{Specific Electrical Energy Cost} = \text{S.E.C} \times \text{unit rate (Rs/sq.ft)}$$

	Post solution units consumed	Additional loads / less loads, if any Units consumed / saved	Baseline months unit consumed	S.E.E.C baseline yr. S.E.C x 5.84	S.E.E.C 2004 S.E.C x 5.84
Legend	A	B	C		
Month					
April			459546	12.61	
May	434340	18480	536250	15.70	11.91
June	465474	36217	495282	14.65	12.78
July	474474	36217	564174	16.46	13.02
August	470508	69520.5	487134	15.3	12.90
September			489564	13.43	
October			417222	11.44	
November			334788	9.16	
December			276930	7.7	
January			206922	5.78	
February			297876	8.23	
March			366684	10.04	
Total			4932372		

**Main Constraints in the unit in implementing the energy efficiency program in the plant?**

- High initial cost :- High Initial Cost is one of the major constraints of any Energy Management project. However with the strong support & backup of the Top Management, we have been able to do more investments in Energy Efficient upgrades. All upgrades at Tata Centre are analyzed from the energy consumption point of view.
- Lack of Awareness :- To overcome this difficulty training programmes have been organized by Tata Honeywell Ltd. for their Engineers with special emphasis on Energy Management on HVAC systems & Electrical Energy management systems. Plant personnel are regularly briefed regarding terms related to Energy Consumption. The response of the plant personnel & workmen has been very encouraging.

## Details on the Energy Efficiency Improvement projects/Measures

### Description of the upgrades & approximate investment at Tata Centre

Sl. No.	Solution	Make	Description	Quantity	Value
				Nos.	Rs. Lakhs
1	Chillers	York / Carrier / McQuay / Ciat / Trane	300TR water cooled Screw chiller	2	85.00
2	Cooling Tower	Wet bulb / equivalent	Modification / Up gradation of existing Cooling Towers	Lot	8.00
3	Pumps	Kirloskar / equivalent	Chiller primary pumps - 3 nos Condenser pumps - 3 nos Secondary pumps - 3 nos	9	5.70
4	Tubelights	Osram / GE / Asian / equivalent	Energy Efficient Fluorescent Tube lights	4800	3.36
5	Electronic Ballasts	Asian / Opel / equivalent	Electronic Ballasts	3150	15.75
6	CFLs	Osram / GE / Asian / equivalent	Energy Efficient Compact Fluorescent Lamps	100	0.25
7	VFD	Danfoss / ABB / equivalent	Variable Frequency Drives with Panel suitable to Drive Secondary Pumps of suitable capacity	2	3.50
8	CCTV system	Tata Honeywell	CCTV	Lot	4.00
9	Energy Management System	TataHoneywell	EBI license for monitoring and control of Central AC plant, AHU's, Pumps, Cooling tower + Direct Digital Controllers + Panels + PC + Sensors etc.	Lot	32.70
10	Energy Meters	Nippen / Enercon / equivalent	For monitoring Chiller/AHU power consumption	5	0.25
11	Electrical cabling	TataHoneywell approved vendors	For EMS & CCTV system	1	6.50
12	HVAC related Mechanical Upgrades	Tata Honeywell approved vendors	Modifications / Upgrades of the existing HVAC system to accommodate new Chillers, Primary and Secondary pumping systems, upgraded cooling towers and modifications in the AHU	1	12.50

12	Water Treatment Plant	Tata Honeywell approved vendors	Water treatment	1	2.51
	<b>TOTAL</b>				<b>180.02</b>

Tata Honeywell Ltd has installed the EBI (Enterprise Buildings Integrator) at Tata Centre which provides a single source for enterprise productivity.

The total expenses incurred in the above upgrades are Rs 180.02 lakhs. All the upgrades have been done in energy efficient equipment that will reduce the energy consumption of Tata Centre. With the above upgrades in place we will be able to obtain guaranteed energy savings of Rs 50 lakhs per year.

#### 4. Comparison of plant current Specific Energy Consumption with the best Energy Consumption figures as reported at the National level:-

Yes, the S.E.C has been compared with certain other buildings in India. However the S.E.C of a building will vary depending on a number of factors. India has 6 different climatic zones, and the energy consumption in a building that is centrally air-conditioned will depend significantly on the following factors:-

- Occupancy period & density of the building.
- No. of persons, computers, heat loads, area that is air conditioned.
- A/C load due to seasonal variations in the year, load being different at different locations..
- Lighting loads in the building.
- Age of the building. Buildings build today are more energy efficient than the buildings built 30 years ago. Tata Centre was built in the 1960's.

Figures that could be obtained from the sources listed below are attached for reference: -

Sr. No.	Building Name	Area(sq.ft)	S.E.C kBtu/sq.ft/year	S.E.C kWh/sq.ft/year	Location	Year built
1	24th AT CAMELBACK	315397	72	21.1	arizona	*
2	America West Airlines Corporate Headquarters	244020	73.2	21.45	arizona	*
3	100 Pine	402534	87.9	25.76	california	1972
4	10100 Santa Monica	652814	88.4	25.9	california	1972
5	AIIMS	1076391	124.26	36.41	INDIA	*
6	Rail Bhavan	31323	152.48	44.69	INDIA	*
7	Shram Shakti Bhavan (6 storied) + Transport Bhavan (5 storied)(both bldgs considered together)	49902	143.5	42.08	INDIA	*

8	Tata Centre	212482	88.7	26	INDIA	1964
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\* Data not Available

Source

www.energystar.gov, Energy Star website, Energy star labelled buildings  
[www.hwwa.de/Publikationen/Discussion\\_paper/2004/289.pdf](http://www.hwwa.de/Publikationen/Discussion_paper/2004/289.pdf)

From the above data we see that performance of Tata Centre is comparable to the best in the world if the age of the building is considered

**Energy Conservation Measures, investments Planned & expected Savings: -**

1. **Modernisation of Elevators:-** Tata Centre has a total of 7 lifts. Of these 7 lifts, 5 passenger lifts cater to the general public, officers, employees at Tata Centre.  
Present Operation Mode:- 3 nos. passenger lifts cater to all 17 floors.  
2 nos. passenger lifts cater to 7<sup>th</sup> & above floors.  
Modified Operation Mode :- 1 nos. passenger lifts cater to all 17 floors.  
1 nos. passenger lifts cater to all even floors.  
1 nos. passenger lifts cater to all odd floors.  
2 nos. passenger lifts cater to 7<sup>th</sup> & above floors.  
All existing DC drives to be converted to variable frequency drives.  
The status/position of the Lifts can be monitored from the EBI (Enterprise Building Integrator) installed by Tata Honeywell Ltd. The estimated cost is 20 lakhs.
2. **Overhauling of the Diesel Generators:-** The total overhauling of (3 x 650 KVA) DG's will ensure that they will be able to take the entire load of the building. As the DG's are old & had not been maintained they have become energy guzzlers. The estimated cost for this is Rs18 lakhs.
3. **Improved Air Distribution System for all floors :-** As & when the floors of Tata Centre are available for renovation the Central A/C air distribution system design is being studied & modified so as to optimize the air flow requirements of the floor. Estimated cost is Rs 1 lakh per floor.
4. **Improving power Factor:-** Installation of capacitors across all inductive loads to further improve power factor.
5. **Installation of Smart Energy meters :-** These devices will be installed on all floors so that energy consumption on each floor can be closely monitored. These Smart Energy Meters will be directly connected to the computerized system of Tata Honeywell Ltd.. The EBI will then monitor the energy consumption automatically.
6. **Solar panels on the east wall of Tata Centre: -** This implementation will ensure that partial electrical load of the building can be fulfilled by these solar panels. However a detailed Cost-Benefit analysis needs to be done before taking this up.

**5. Energy Efficiency targets**

**Current targets: -** The target set for the year 2004 is to achieve savings of minimum 8,56,164 units of electricity, ie 71,347 units per month. In the last 4 months we have been able to achieve savings of 99,344 units on an average. Thus we have achieved 140 % of our target for the previous 4 months.

In terms of money saved, we have to achieve Rs.50 lakhs savings in 2004, ie Rs 41,6,666./- per month. In the last 4 months we have been able to achieve an average savings of Rs 5,80,172 /- per month.

**Future targets:-** Our target for the year 2005-2006 is to achieve a S.E.C of 25 kWh/sq.ft/year.