



***CASE STUDY OF ENERGY SAVING PERFORMANCE CONTRACT***

***PRESENTED AT THE ASIAN ESCO CONFERENCE, NEW DELHI***

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**PRESENTED BY**

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## ***ENERGY SAVING PERFORMANCE CONTRACT (ESPC)***

***HOTEL LEELAVENTURE LIMITED (HVL), MUMBAI AND  
ONLINE ENERGY MANAGER (OEM) AGREED ON AN  
ENERGY SAVING PERFORMANCE CONTRACT TO  
IMPROVE ENERGY EFFICIENCY (kW/Ton) OF THE  
CHILLED WATER PLANT OF THE HVAC SYSTEM AT  
THE MUMBAI PROPERTY OF HVL***

- ***HVL & OEM agreed on the project scope, price and the performance guarantee terms***
- ***OEM guaranteed a minimum energy & cost savings***



## ***ESPC PROJECT SUMMARY***

- ENERGY SAVING/YEAR : OVER RS. 1.50 CRORES \*\*  
( > \$ 300,000 )***
- PROJECT COMPLETION: LESS THAN THREE  
MONTHS***
- PROJECT IMPLEMENTATION: NON INTRUSIVE***

***\*\* based on the measured saving for the past four months  
after the project installation***

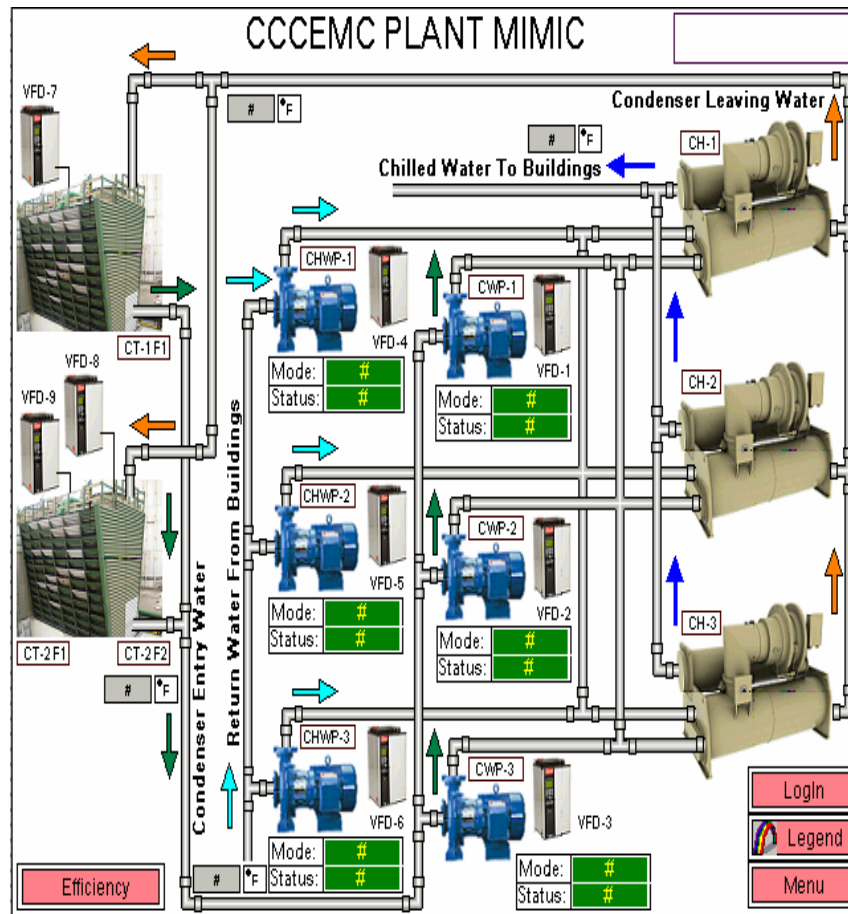
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## ***ENERGY SAVING PERFORMANCE CONTRACT (ESPC)***

- ***PAYMENT TERMS***
  - ***50 % On project completion by OEM.***
  - ***50% In twelve monthly installments commencing from the acceptance date.***
- ***GUARANTEE TERMS***
  - ***If the saving/month is less than the monthly equivalent of the guaranteed saving , HVL will deduct the amount by which the monthly saving is less than the guaranteed amount, from the balance payment owed to OEM.***
  - ***If the saving is more than the guaranteed saving per month, HVL will pay 50% of the excess saving as bonus for a period of twelve months subject to an agreed maximum amount.***

# System Description



- **Three 500 TR centrifugal chillers**
- **Each chiller has one dedicated chilled water pump and one condenser water pumps**
- **Chilled water pumps are connected to a common header**
- **Condenser water pumps are connected to a common header**
- **One cooling tower of 1,200 TR and one cooling tower of 1, 000 TR ( 2\* 500 TR) are connected on line**



## **PROJECT SCOPE**

- **DESIGN, CUSTOMIZATION, PROGRAMMING , BUILDING AND INSTALLATION & COMMISSIONING OF THE OEM'S CONTROLLER CCCEMC**
- **SUPPLY AND INSTALLATION OF VARIABLE FREQUENCY DRIVES FOR ALL THE PUMPS AND COOLING TOWER FANS**
- **SUPPLY AND INSTALLATION OF PRESSURE & TEMPERATURE TRANSMITTERS**
- **SUPPLY AND INSTALLATION OF BACnet AND MODBUS COMMUNICATION PROTOCOLS**



## *Unique Features of OEM's Technology*

- *Pro-Active*
- *Customizable Design*
- *Pre-Engineered*
- *Dynamic program logic*
  - *Sample Time*
  - *Response Time*
  - *Equipment Selected*
- *Non-Intrusive Installation*
- *Rugged Hardware*
- *Money Back Performance Guarantee*



## ***Unique Features (Continued)***

- ***OEM controllers concentrate on the supply side of the energy system; therefore they eliminate the vagaries of human factors for the sustainability of the savings***
- ***All OEM technologies are non-intrusive retrofits and therefore there will be no shutdown time in any facility.***
- ***OEM controllers can interface through communication protocols (such as Modbus RTU, RP-570, Profibus, etc.) with existing Building Management Systems (BMS) or Human Machine Interface (HMI) of any make and model***
- ***OEM controllers are add-on to the existing equipment/system and therefore operational & safety features are not affected at all.***





## **CCCEMC - Customization**

- ***Energy Efficiency of any whole Chiller plant depends on specific site equipment & ambient conditions***
- ***Therefore OEM's CCCEMC is custom designed for each customer site***
- ***Some critical parameters such as minimum pressure required, Chilled water return set point etc. are configurable according to changing site conditions and changing seasons***



# **MEASUREMENT & VERIFICATION OF SAVING**

## **THE IDEAL METHOD OF M & V**

### **● BASELINE MEASUREMENTS**


- Determine monthly energy consumption**
- Determine monthly cooling load in BTU or Tons**
- Determine the monthly baseline cooling efficiency as “kWh/TR”**

### **● POST INSTALLATION MEASUREMENTS**

- Determine “kWh/TR” as described above every month**

### **● PROJECT SAVING**

- The difference in “kWh/TR” between the Baseline and Post Installation multiplied by the total cooling load for the month is the energy saving for the respective month**



**MEASUREMENT & VERIFICATION OF SAVING**  
**THE IDEAL METHOD OF M & V IS NOT APPLICABLE IN MOST**  
**CASES BECAUSE OF LACK OF HISTORICAL DATA**  
**ESPECIALLY THE COOLING LOAD MEASUREMENT ;**

**THEREFORE THE FOLLOWING AGREEMENT OF ENERGY**  
**SAVING WAS REACHED BETWEEN OEM AND THE LEELA.**

**● BASELINE ENERGY FOR THE LEELA PROJECT**

- *Preceding three year average of monthly energy consumption of the entire facility was considered as the baseline energy consumption*

**● POST INSTALLATION ENERGY CONSUMPTION**

- *Monthly total energy consumption of the entire facility is measured; allowance for energy reduction due to any other project will be provided as and when it happens with mutual consent*

**● PROJECT SAVING**

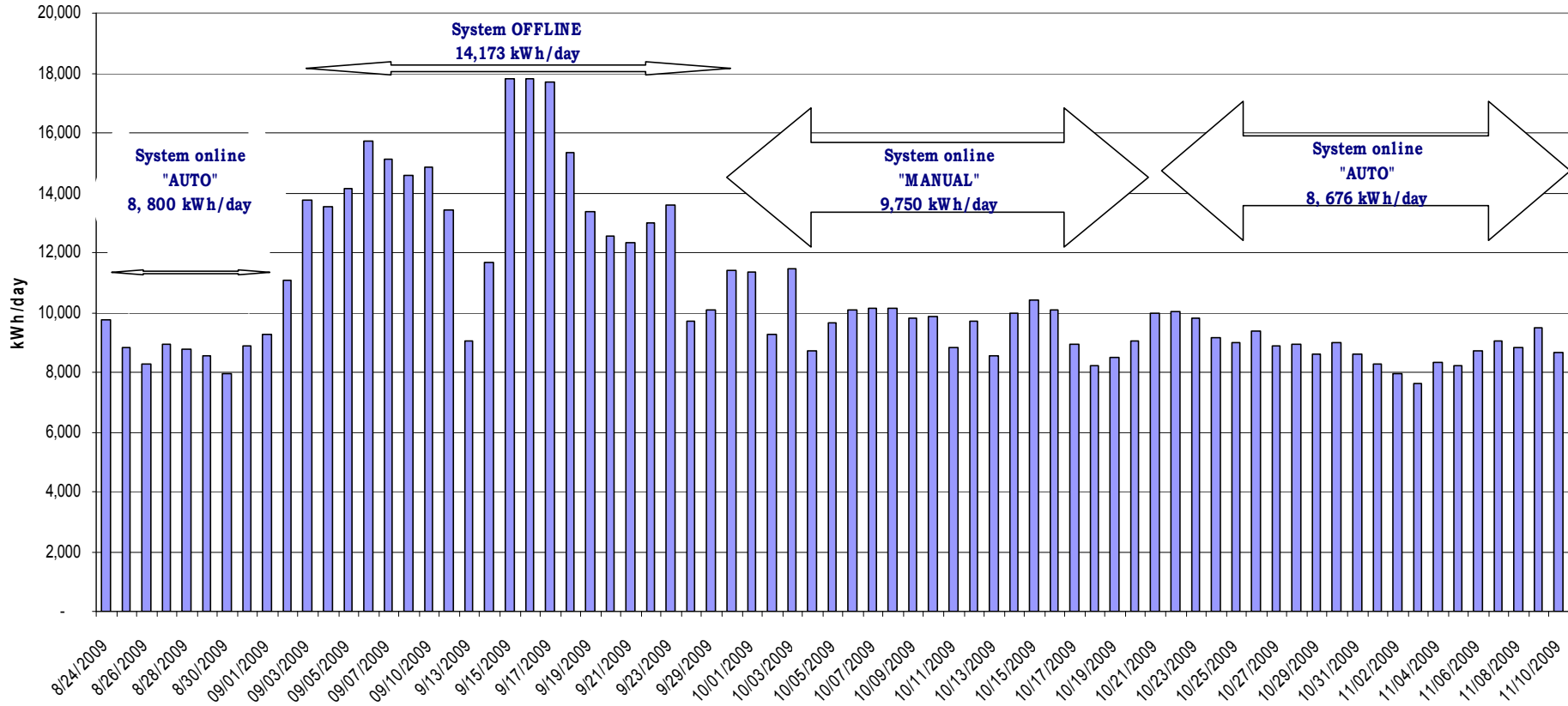
- *The monthly difference between the Baseline and the Post installation will be the Energy saving for the particular month.*



# M & V FOR A SHORT DURATION

THE LEELA KEMPINSKI, MUMBAI

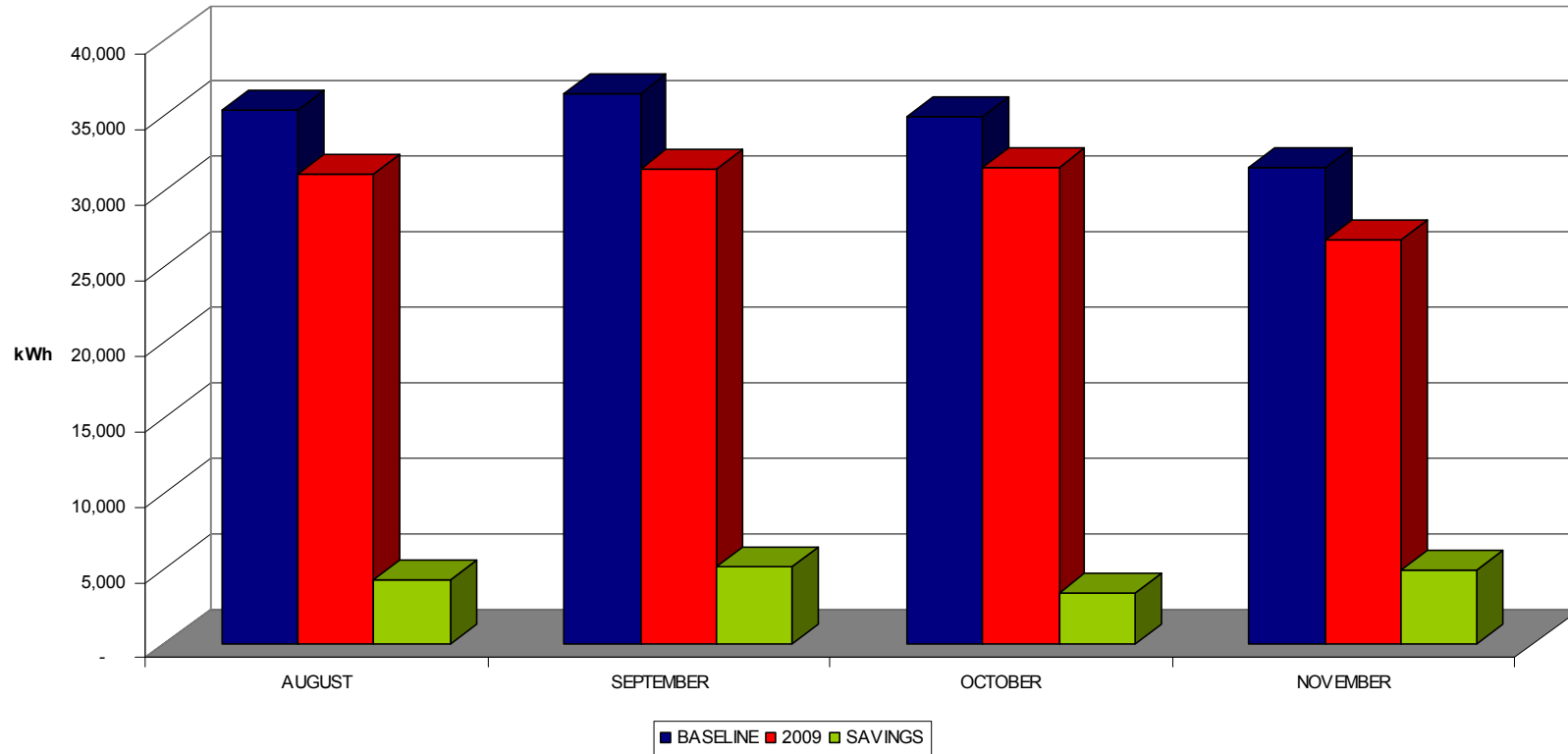
ENERGY CONSUMPTION OF CENTRAL CHILLING PLANT WITH AND WITHOUT OEM'S CONTROLLER





# SAVINGS OF DAILY TOTAL ENERGY CONSUMPTION

THE LEELA KEMPINSKI, MUMBAI  
ENERGY SAVING IN THE ENTIRE FACILITY DUE TO OEM'S PROJECT





## ***Total Units & Savings in 2009-10***

	2006-2007	2007-2008	2008-2009	2009-2010	Diff.	%
April	953,820	1,042,440	1,067,320	1,031,960	35,360	3.31%
May	1,017,360	1,141,340	1,147,100	1,077,560	69,540	6.06%
June	1,005,740	1,146,620	1,107,780	1,068,560	39,220	3.54%
July	1,000,600	1,150,040	1,130,640	1,021,300	109,340	9.67%
August	1,008,840	1,123,380	1,094,920	965,700	129,220	11.80%
September	1,009,100	1,072,700	1,082,900	942,500	140,400	12.97%
October	1,026,580	1,087,340	1,082,360	978,620	103,740	9.58%
November	989,180	1,026,580	1,030,660			
December	1,028,080	1,027,240	997,180			
January	1,002,460	986,460	974,760			
February	920,440	941,200	893,600			
March	1,043,020	1,074,760	1,021,560			



## **COLLABORATIVE EFFORTS**

- ***The Leela/OEM Energy Saving Performance Contract is a collaborative effort from day one***
- ***The Leela provided an opportunity to OEM to install the CCCEMC controller for the first time in India***
- ***OEM stood up to the confidence entrusted by The Leela by customizing the program suitable to the needs and suggestions by the experienced Leela staff***
- ***The Leela staff with the combined hotel operation experience of over seventy years, recommended various improvements in the PLC based OEM program.***



## ***HOW THE PROJECT WAS MADE POSSIBLE***

- RK SINGH had completed similar project in the Kempinski hotel at Beijing and therefore he was confident that the control concept if designed and implemented properly would provide the desired savings. So, he was able to convince the Leela management***
- OEM provided a flexible control platform and was open to any and all suggestions of improvement brought out by The Leela staff***
- It was a complete team effort between The Leela, OEM and the vendors like Fluid Control System (OEM) & SEVCON (supplier of the VFDs).***





## ***LESSONS LEARNED – THE LEELA PERSPECTIVE***

- Each installation is a separate entity and needs custom designing, even if principle is same.***
- Savings need constant monitoring on daily basis and comparison with historical data.***
- kWH and Btu metering if provided can result in much better savings.***
- One has to be very pro-active and cannot depend on systems installed only.***
- The settings may have to be adjusted on regular basis, based on Geographical location of plant.***
- If a link between the Chiller and CCCEMC can be achieved, savings will be much more.***
- Load side management, linked with CCCEMC will result in much better savings.***



## ***LESSONS LEARNED – OEM PERSPECTIVE***

- TO ENSURE SUSTAINABILITY, GET THE ACCEPTANCE OF THE FRONT END OPERATOR OF THE PLANT***
- BE OPEN TO ALL SUGGESTIONS AND IMPROVEMENTS EVEN IF IT COSTS MORE MONEY. IF CUSTOMER IS HAPPY MONEY WILL FIND ITS WAY IN TO YOUR POCKET***
- EDUCATE/TRAIN THE CUSTOMER STAFF ON THE PROGRAM BASICS AND CONFIGURATION CHANGES***



## ***IMMEDIATE FUTURE PROJECTS***

- ***Two other existing Hotels of Hotel Leelaventure Limited***
- ***Two future (2010) Hotels of Hotel Leelaventure Limited***
- ***Flagship hotel of a leading Indian Hotel chain***
- ***One hotel each from four internationally known hotel chains of the USA***
- ***Private hotels & property owner from the South of India (three hotel and two shopping complexes)***
- ***Sample project for one of the many office building complexes of a MNC***