

Infosys®



Guruprakash Sastry

Senior Manager – Green Initiatives

The context...

1,30,000 employees

- Total employees in Infosys at the end of 2010-11

28 million sq.ft.

- Total built-up space of Infosys, India at the end of 2010-11

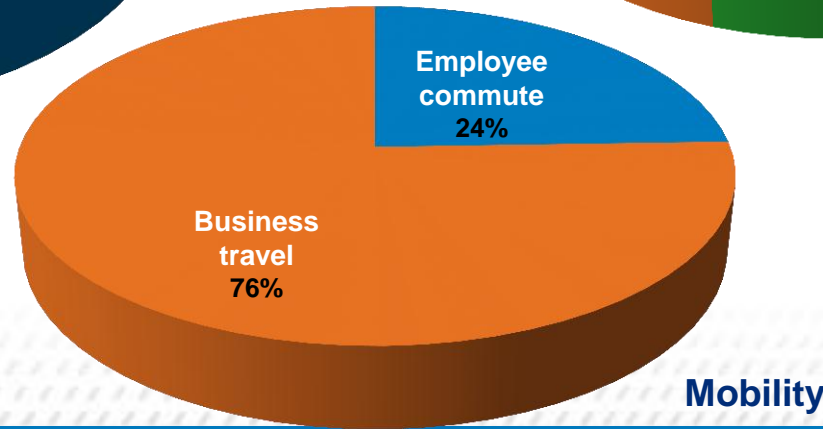
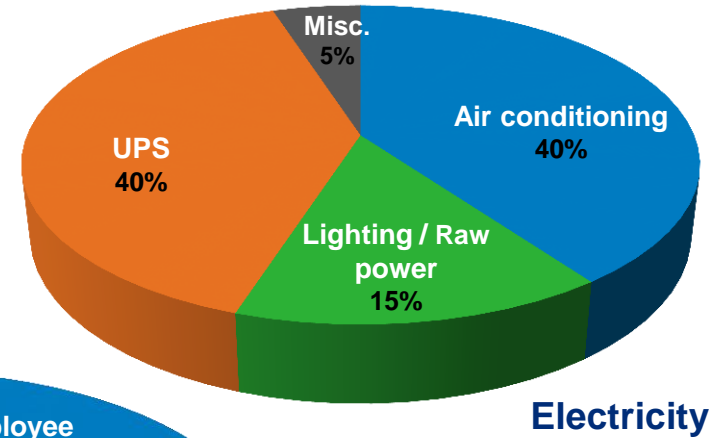
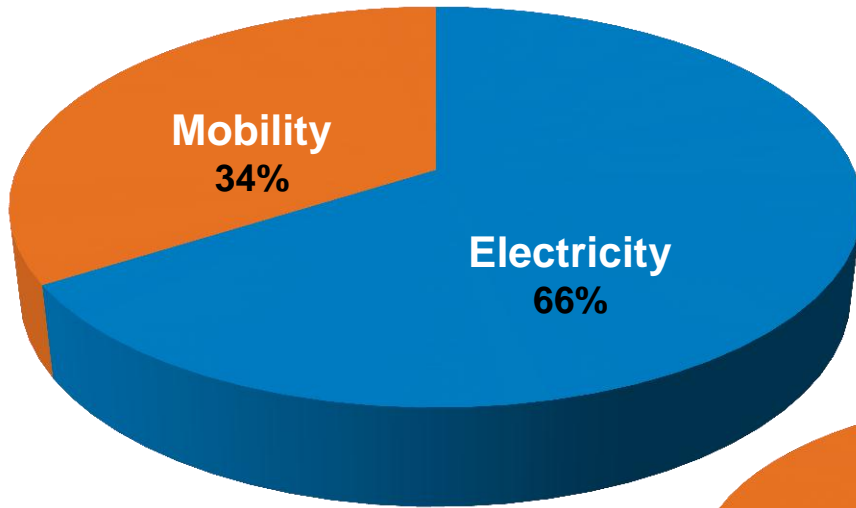
265 million units

- Annual electricity consumption @ Infosys, India in 2010-11

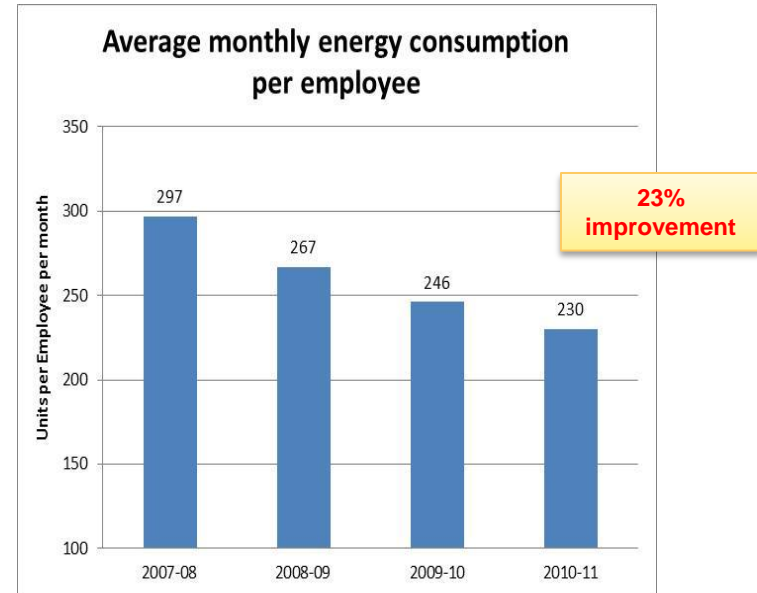
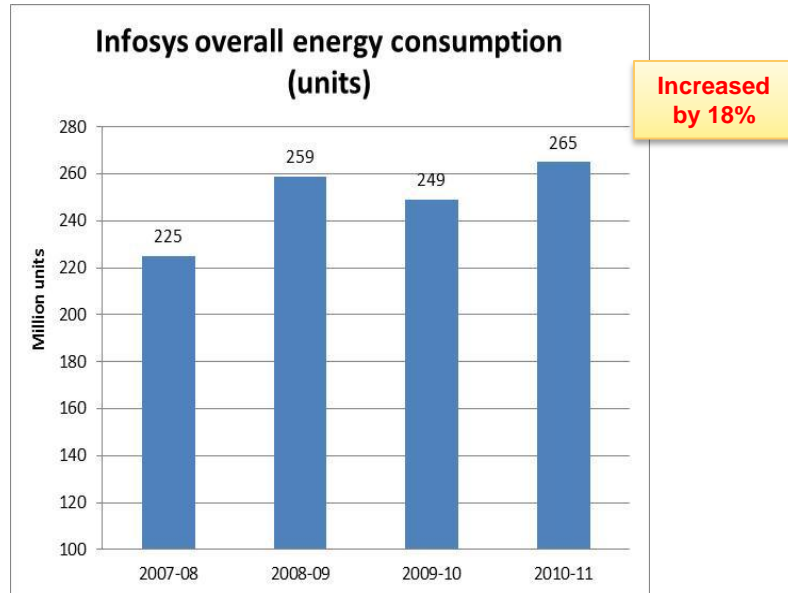
1 million units

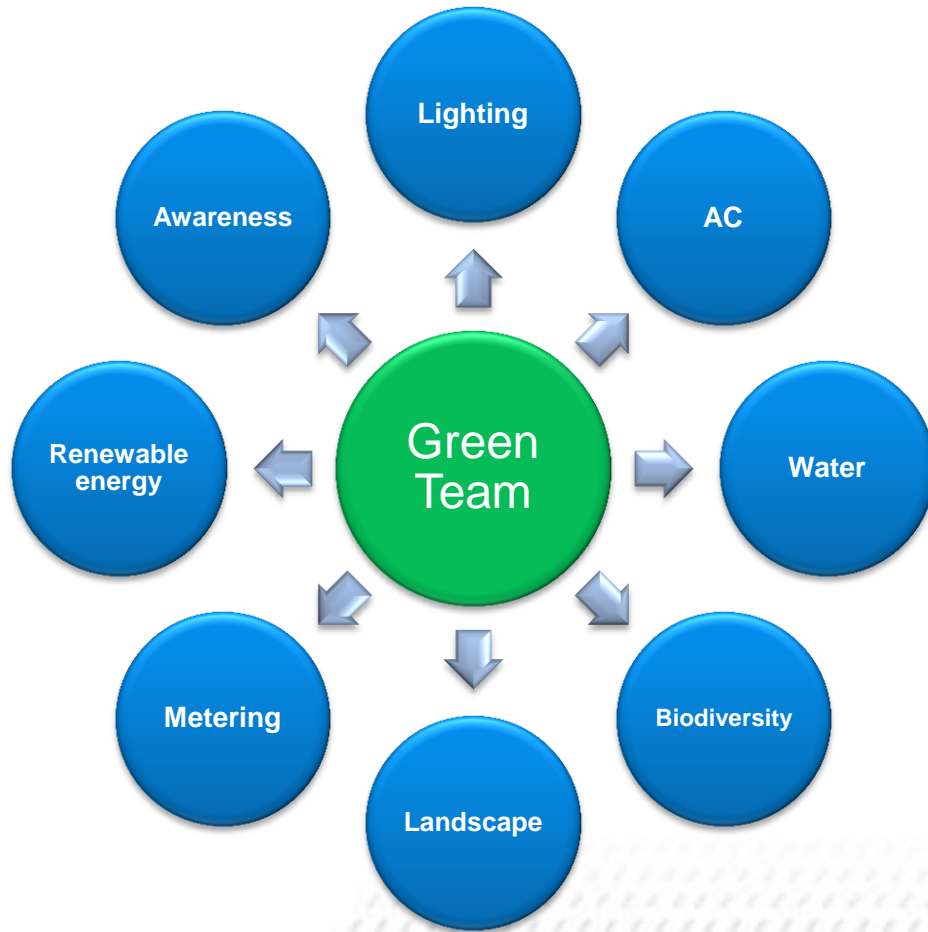
- Consumption per working day @ Infosys, India in 2010-11

Our Carbon Footprint



Consumption pattern





- *To make Infosys a global leader in environmental sustainability*
- *To be the trendsetter in the industry*
- *Work with best resources available globally*
- *To demonstrate the feasibility of cutting edge technologies to impact the society at large*

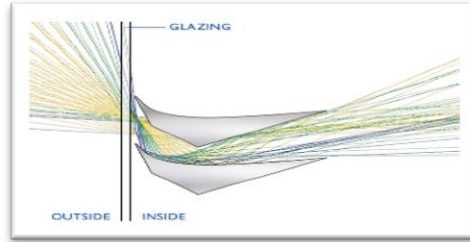
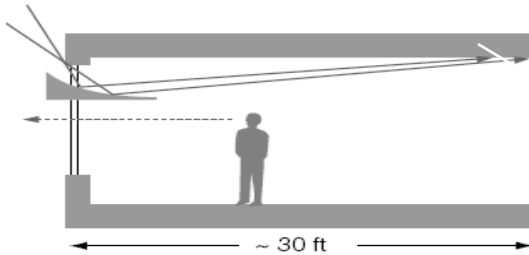
Integrated Design Approach

Question all assumptions

Promote interaction between design consultants

- Building envelope performance as part of the architect's contract
 - Maximum envelope load parameter
- Day lighting criteria as part of architect's contract
 - Day lighting to be achieved as per LEED standards
- Performance criteria for HVAC consultant
 - Criteria on overall energy efficiency of the system

Window Strategies: maximize day light



Light shelves allow daylight to penetrate deeper into the buildings



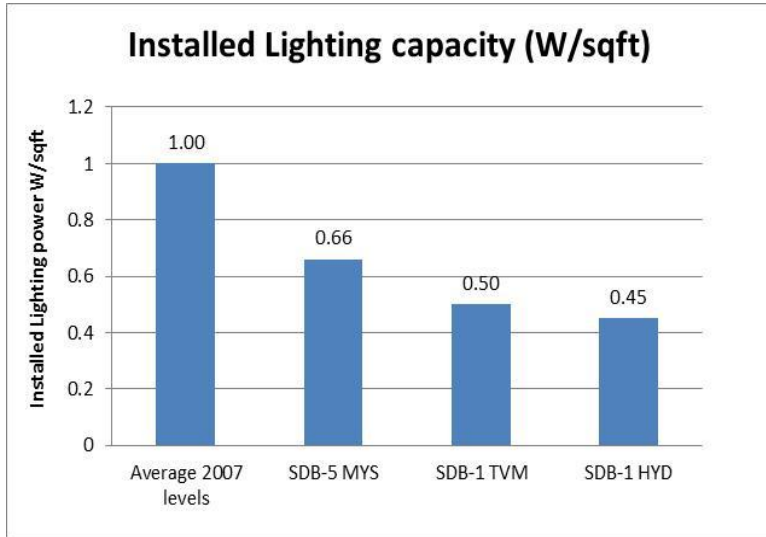
Mysore SDB 5 building with above strategies



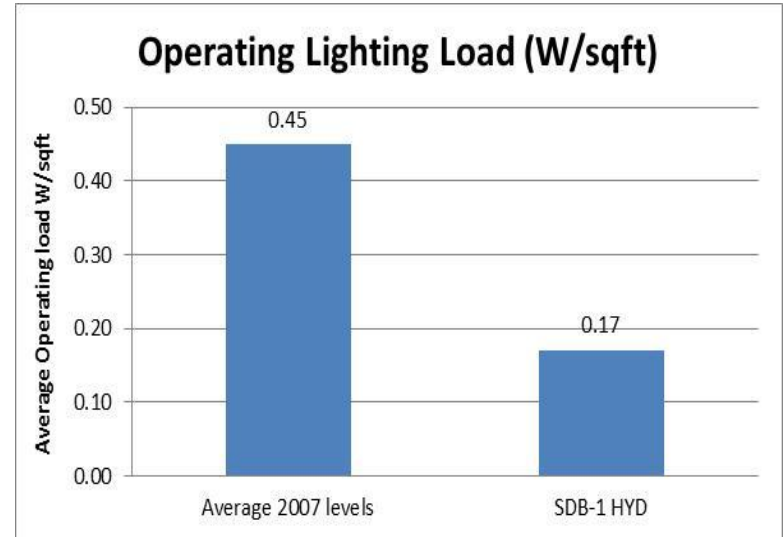
Bright day light without glare at SDB-5 Mysore



3X reduction in lighting energy



2X reduction in the installed lighting load



~3X reduction in lighting energy consumption

Case Study: SDB-5 Mysore (40% reduction)

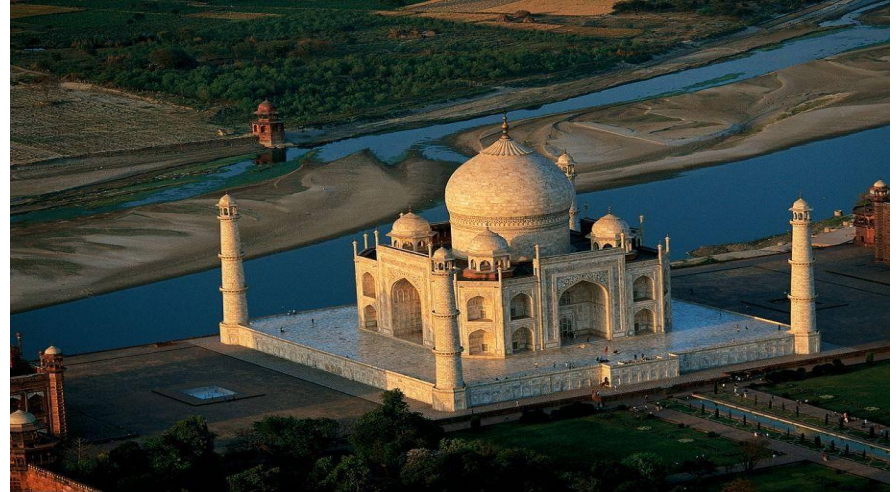
Sl. No.	Case	Chiller capacity required (TR)	Annual energy consumption (kWh)	Maximum electrical load (kW)
1	Conventional building envelope	622	3,244,284	1,052
2	Efficient building envelope	530	3030908	968
3	Efficient lighting design	510	2713390	882
4	Efficient computers	486	2358776	778
5	Variable Air Volume system for AC	486	2080462	754
6	Heat Recovery Wheels for AC	400	2015430	662
7	Ultra high efficiency chiller	400	1992156	650
8	Efficient chilled water system design	400	1960898	640
9	High efficiency cooling tower	400	1946532	632
10	Lighting controls	400	1,775,706	600

The Next Level - Back to the Basics

Cooling/Heating Strategy from old monuments

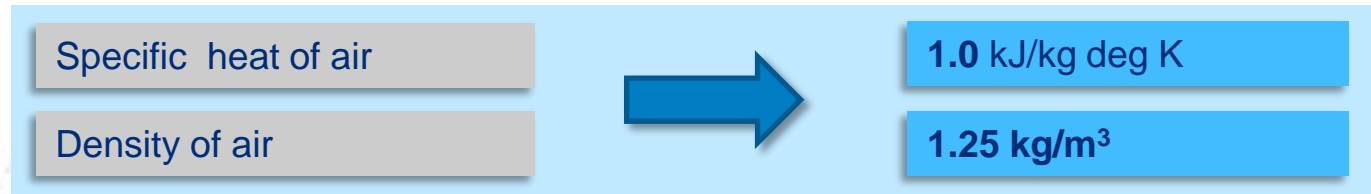
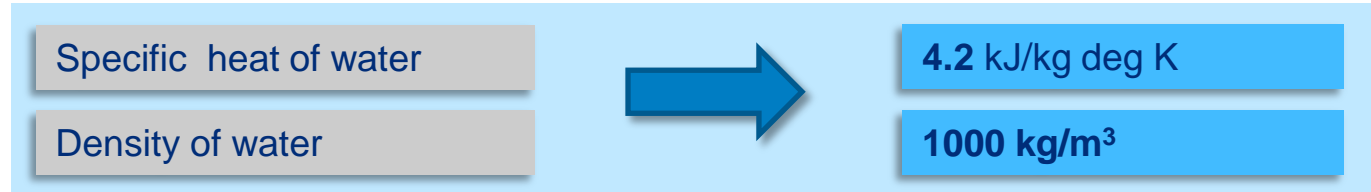
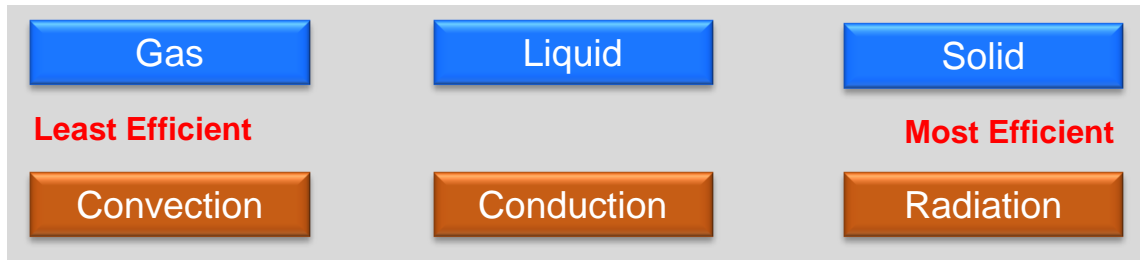


Thermal energy stored in
thick walls and floors

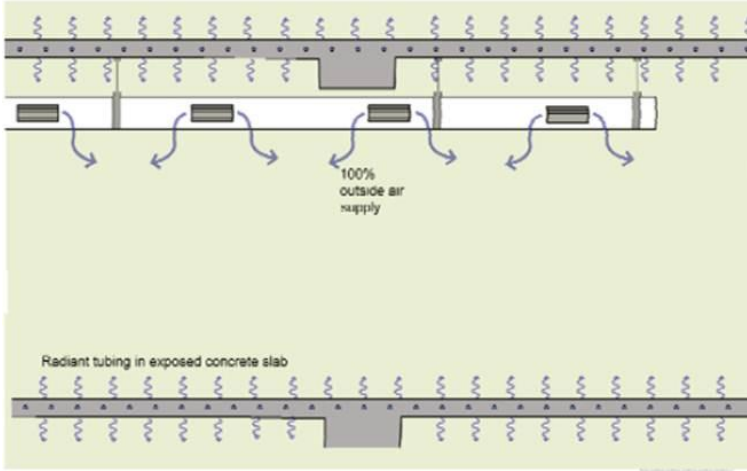


Thermal mass cooled by flowing
Yamuna water

Fundamentals of Physics and Heat transfer



Innovative cooling technology – Radiant Cooling



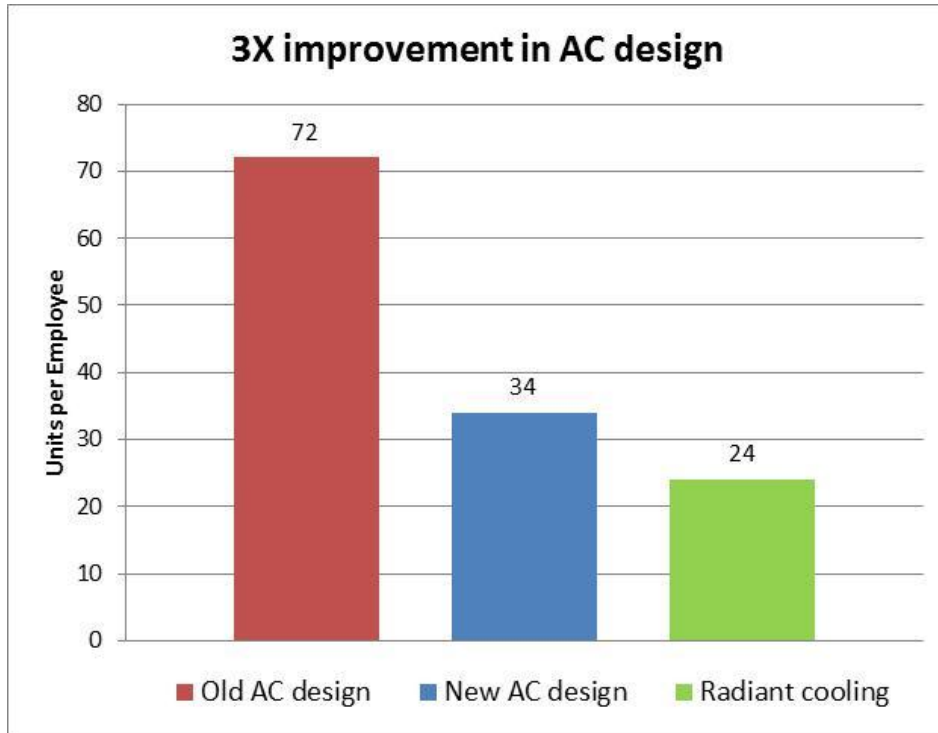
Radiant Cooling – Advantages

- Air system is about 1/5th of a conventional air conditioned building – lesser ducting and lower fan power
- Water is the main medium of heat transfer – pumping energy much smaller compared to fan energy.
- Chilled water temperature in the radiant pipes is 15 to 18 °C – chillers run at high efficiency
- Perception of thermal comfort is higher compared to a conventional air conditioned building

Radiant Cooling – Hyderabad Building



3X reduction in air-conditioning energy



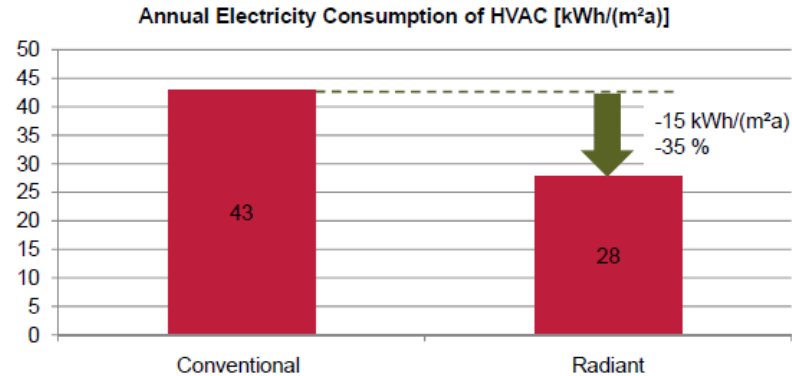
- Figures based on actual measured data in Hyderabad buildings for Mar – Jul 2011
- **3X** improvement in efficiency compared to 2007 design
- Radiant cooling at no additional cost

Radiant Cooling – Third Party Evaluation

Evaluation Infosys – Hyderabad, India

2. Analysis of Energy Consumption

SDB1: HVAC



Evaluation Conventional: HVAC consumption 15 kWh/(m²a) respectively 50 % higher compared to Radiant.



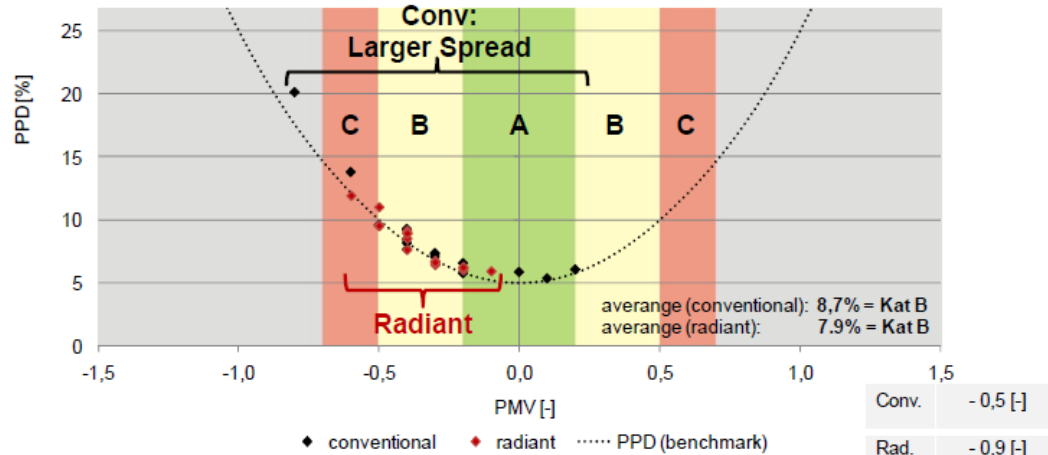
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Radiant Cooling – Third Party Evaluation

Evaluation Infosys – Hyderabad, India 3. Analysis of Thermal Comfort - PMV



Evaluation

Conventional: Good thermal comfort, but **larger spread of comfort situation**

Radiant: Good thermal comfort,
perceived slightly colder than Conventional = better PPD (7,8 %)



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Radiant Cooling – Actual Data



Energy Reports

HH:MM:SS 14 10 37

DT:MT:YR 16 11 2011

Energy Consumption - Conventional Building			
SDB-1 Area	Current KW	Today (KWH)	Previous Day (KWH)
Lighting	7.6	84.5	321.2
Raw Power	23.6	378.7	731.9
UPS	87.4	694.8	1302.6
HVAC	118.1	770.6	1690.5
Total	237.1	1928.4	4046.1

HVAC Equipment			
Chiller	73.8	451.7	955.1
Conv Chiller For DOAS	-6.0	-61.7	-34.2
AHU's	34.9	288.3	532.1
HRW SA & EA Fans	6.3	32.3	64.5
Toilet Exhaust Fan	0.0	1.8	0.0
Cooling Tower Fan -1	0.7	3.3	24.6
Cooling Tower Fan -2	0.9	4.0	24.9
Primary Pumps	4.2	26.4	50.1
Condenser Pumps	4.1	24.4	39.2
Total HVAC	118.1	770.6	1690.5

Energy Consumption - Radiant Building			
SDB-1 Area	Current KW	Today(KWH)	Previous Day (KWH)
Lighting	11.7	159.5	295.9
Raw Power	38.4	448.7	925.2
UPS	97.5	661.6	1283.9
HVAC	75.3	537.8	790.2
Total	223.2	1807.4	3295.2

HVAC Equipment			
Chiller	41.5	281.3	504.1
Conv Chiller For DOAS	6.0	61.7	34.2
Cooling Tower Fan -1	1.3	9.9	12.6
Cooling Tower Fan -2	1.4	10.2	15.4
Primary Pumps	5.2	41.3	61.3
Condenser Pumps	8.9	49.6	68.4
HRW & RACoil Pumps	0.0	0.3	2.0
DOAS - 1	4.5	33.2	51.4
DOAS - 2	4.3	30.5	47.1
Exhaust Fans	2.5	20.4	27.9
Total HVAC	75.3	537.8	790.2

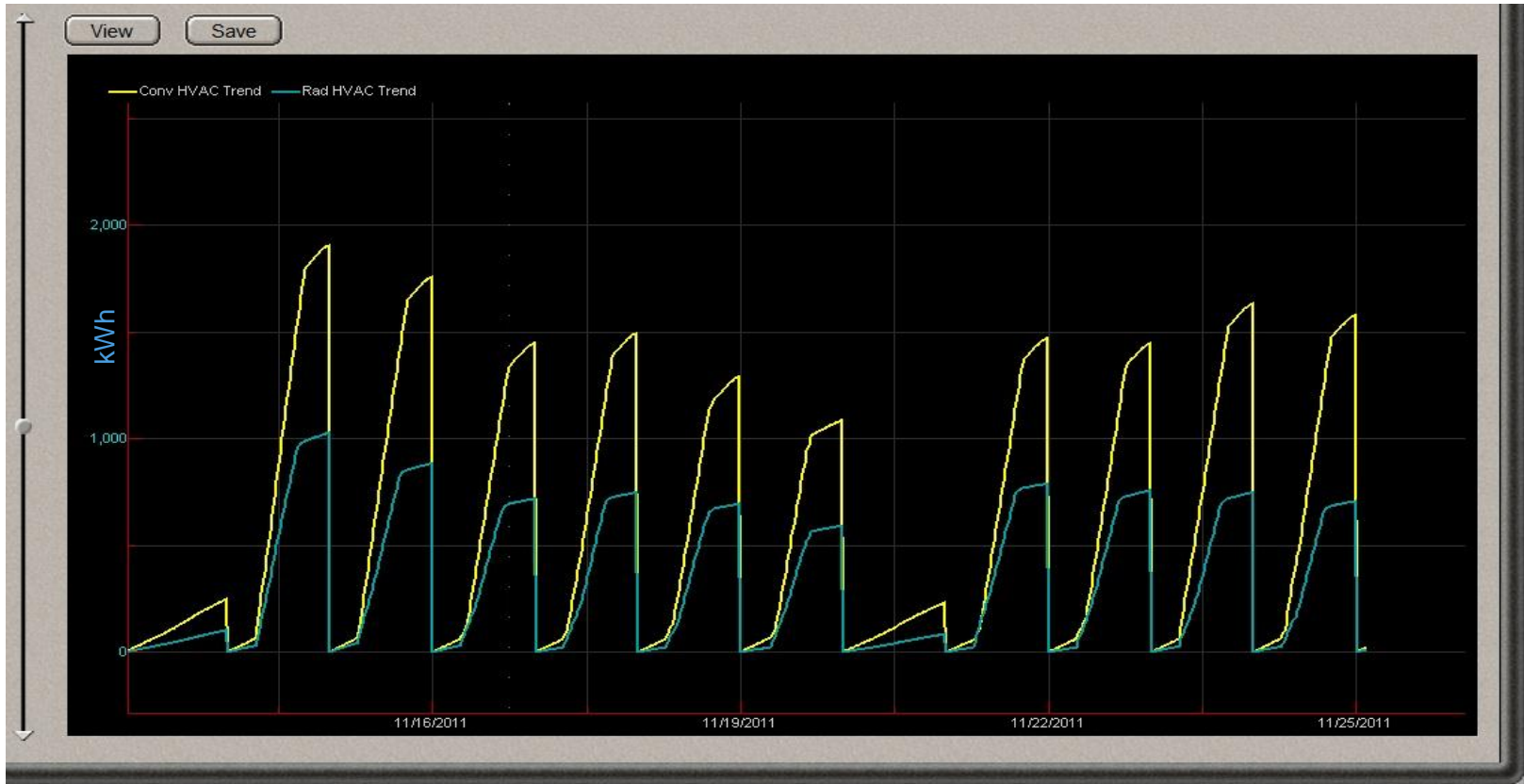
	Conventional	Radiant
Chiller Kw/TR	0.60	0.32
Plant Kw/TR	0.68	0.44

Savings - Radiant Cooling	
KW Savings in % - Current	36.26
KWH Savings in % - Today	30.20
KWH Savings in % - Prev Day	53.25

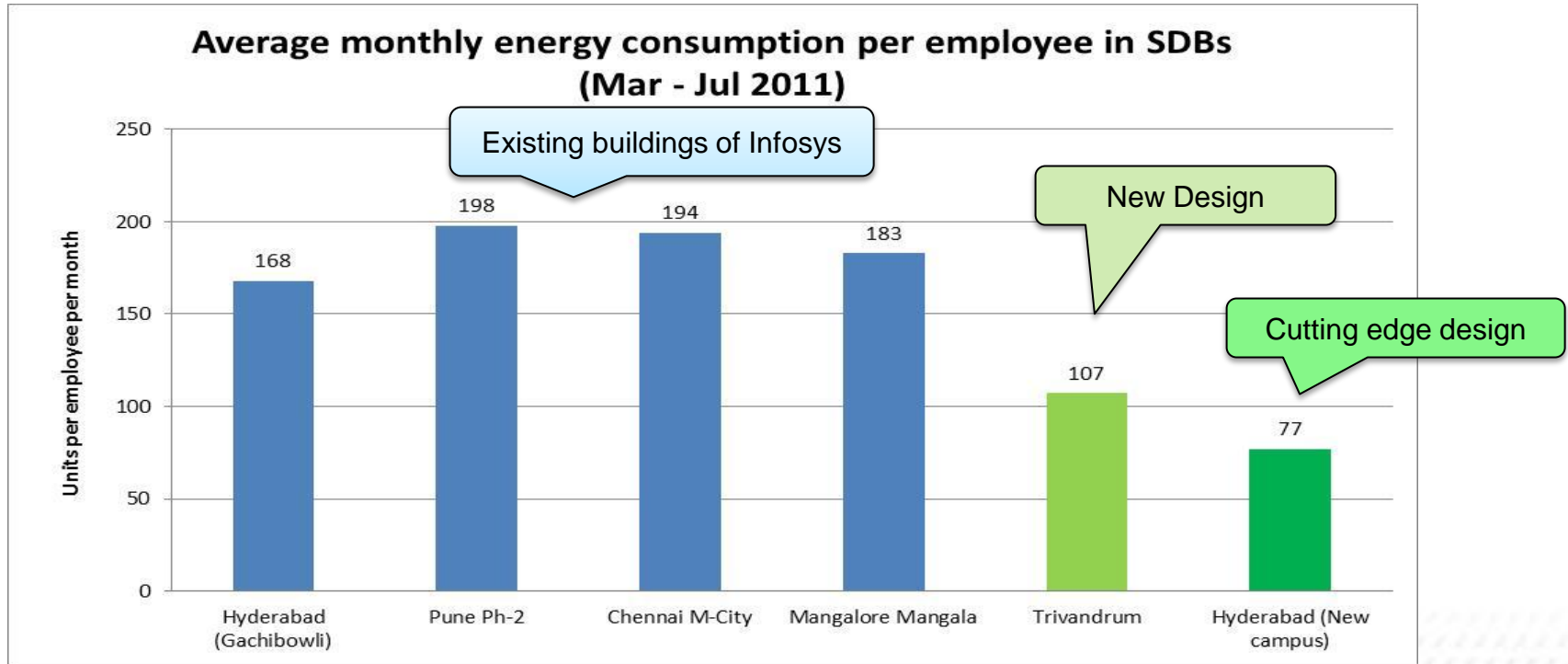
	Conventional	Radiant
AHU IKw/TR	0.28	0.20

CONV SYSTEMS
RAD SYSTEMS

Radiant Cooling – Actual Data



>200% improvement in overall energy efficiency of new bldgs



Redefining the standards

- Building envelope heat load not to exceed 1.0 W/sqft
- More than 75% of the office area to be naturally lit as per LEED standards

Breaking the barrier.....

- > 550 sqft per TR of AC area
- < 0.4 W/sqft for lighting design
- < 0.5 kW/TR for chiller plant design
- < 3.5 W/sqft for electrical design

Experiences / Conclusions

- Set unreasonable targets
- Efficient buildings do not cost more, but need a little effort
- Good design = job half done !
- Question all assumptions and get the sizing right
- Select right sized efficient equipments and smart controls
- Measure, monitor.....Measure, monitor.....feedback....
- Seeing is believing.....Welcome to Infosys.



THANK YOU

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