

# Energy Consumption in a Building

- Energy consumption is not only dependent on the type of building that is efficiently designed and constructed,

- but also on the interior and gadgets which are used.

- The lighting arrangements, the lighting accessories, the lighting system, the system for air-conditioning, all have a direct impact on the level of consumption of electricity.

- Building design as also gadgets used could increase the capital cost on the one hand but could bring about significant savings in energy consumption on the other.

# **Task lighting is the priority now**

**Low wattage lamps at task  
General luminance at lower level**

## **Benefits:**

**Reduce number of lighting fixtures**

**Reduce lamp wattage**

**Save considerable energy**

**Better luminance**

**Aesthetically pleasing ambience**

# Case Study -Lighting Efficiency to improve

- Source near to load,
- Reflector functions better & Diffuses Better,
- out door lighting give all round illumination



# Case Study - How to make our lighting last longer apart from power Savings

- Sustained & Regulated voltages with higher voltage correction rate in the Stabilizers increases lamp life and reduces Fire hazards.
- 90% of rated volts & regulated supply ensures Power Savings and more than that, the bulb failures come down; life enhances.
- we classify Electrical loads as Heavy & Light loads and consumer has a wrong notion that if has an OLTC, he does not need Servo. But OLTC is slow to react, but Servo is fast for soft loads.
- Why not the Electrical Safety Inspection authority make the Servo stabilizer retrofit along with Switching Surge Suppressors as Mandatory in the Lighting Distribution Boards to protect from high voltages and surges?

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**High Neutral Current leads to Hazardous Hot Spots in the joints through out the circuit**

**In the Existing systems,  
To arrest the Harmonic components using line choke,  
Harmonic filters at the D.B.**

**To plan initially for 3 + 2 in the 4 core cable instead of 3 + ½ as 4 core cable. The Neutral needs to be strong to face the over shoots.**



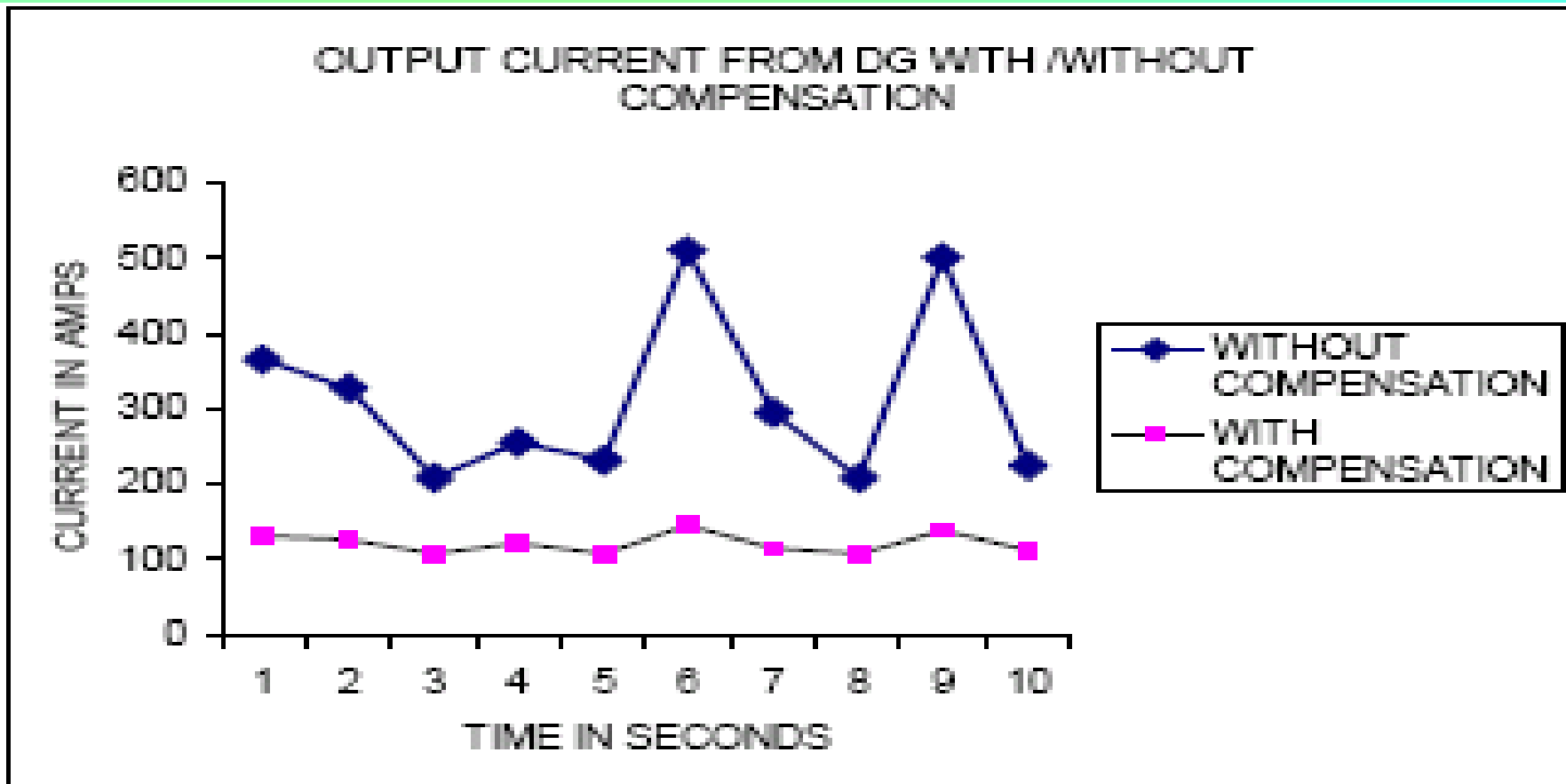
# **DG set Automation to achieve optimum savings in KVA, KW and Diesel**

- DG set rated for KVA and hence to have control over the DG output in terms of KVA, KW, and the PF, automation of DG set energy parameters
- So the Maximum Demand Controller MDC if retrofitted to the existing genset then, it will cap the max demand from the load
- The user can think of replacing ordinary KWH meter in his genset with this MDC which gives KVAH, KWH, and average PF and this not only acts to monitor but also controls DG KVA automatically.
- And either the existing APFC is to be made to Dual set point type like 0.8 PF for DG utility and 0.99 for EB utility

**•Case studies done with many clients show the UPL improvement from 3.5 to 3.8 that is 10% saving possible.**

# DG set output current with and without capacitor compensation

*courtesy – Meher capacitors*



**Increase in air intake temperature from 25°C to 40°C, the air fuel ratio decreases by about 5% resulting in increase in fuel consumption in range of 0.5 to 2% , depends on engine design.**



# DG set Air intake to be clean and Maintaing Less choke in the Filter.

## DG CHOKED AIR INTAKE



## Micro-vee Filter for Generator Room

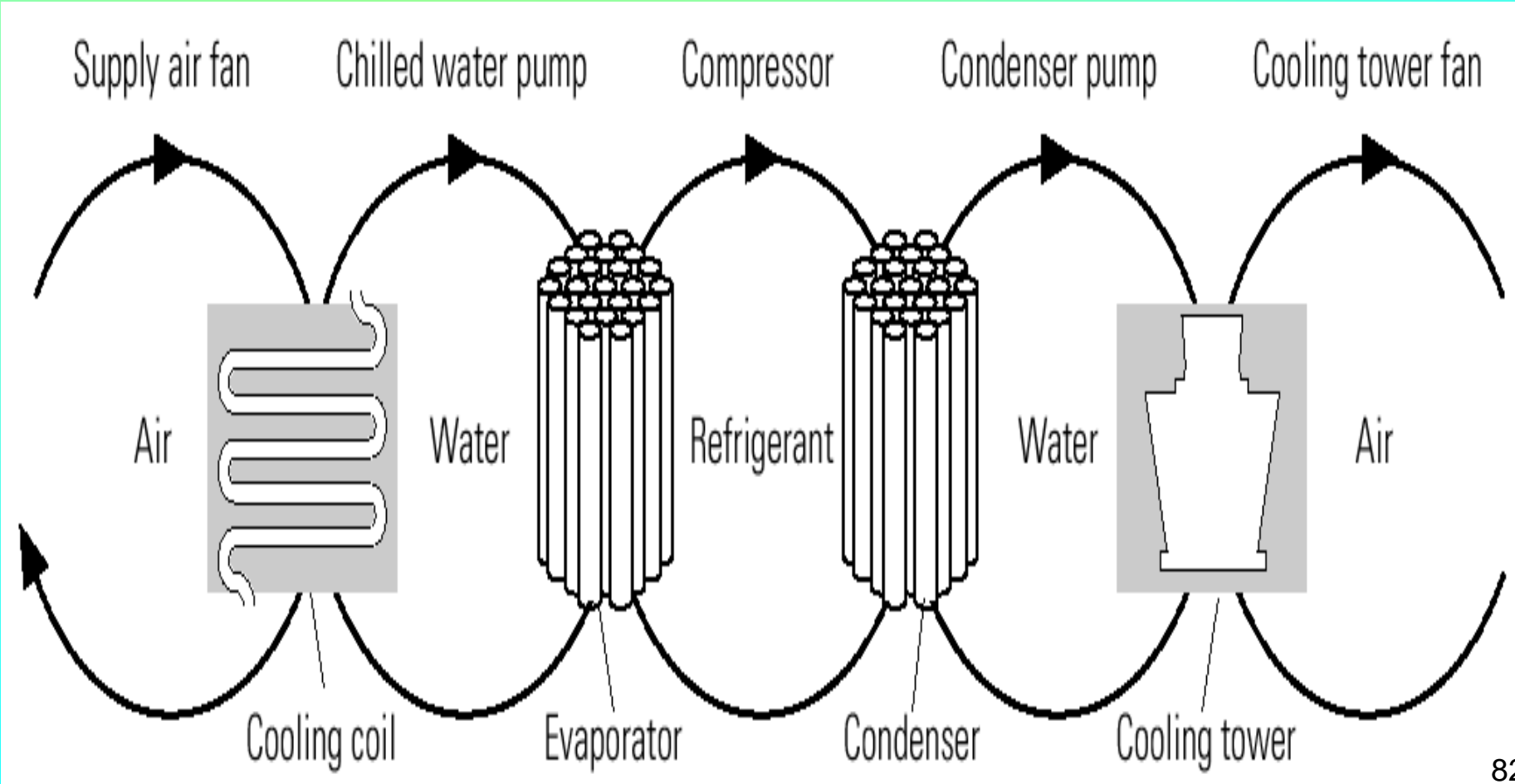
is also suitable for  
compressor intake,  
air conditioning & air handling,  
clean rooms & G.T. Intake etc.

## Salient features of Micro-vee Filter

- Media: Synthetic felt
- Initial Pressure Drop [mm/wc]:6-8
- Final Pressure Drop [MM/WC]:30-35
- Maximum Working Temperature: 100 c
- Efficiency %:98-99
- Recommended Velocity of Air [M/Sec]: 1.5-2.5

**HVAC PLANT –POWER SAVINGS IN EACH SUB CIRCUIT - COOL AIR loop, CHILLED WATER loop, REFRIGERANT loop, & HEAT REJECTION loop**

**INEFFICIENCY in each loop decreases the overall system efficiency**  
**Hence to concentrate on each loop power input / process output parameter**



# HVAC systems – tips on Energy Saving

- Tropicalized condition in India due to dust air pollution:

## To achieve about 20 % power savings, what to do?

- comforting the condenser fans and maximize the heat transfer at condenser & Evaporator, AHU with pre-filters
- umbrella hood to condenser units & the AC, panels on open terrace of buildings
- Temperature settings of cooling tower, condenser fans in evaporator coils to be reviewed & changed regularly.

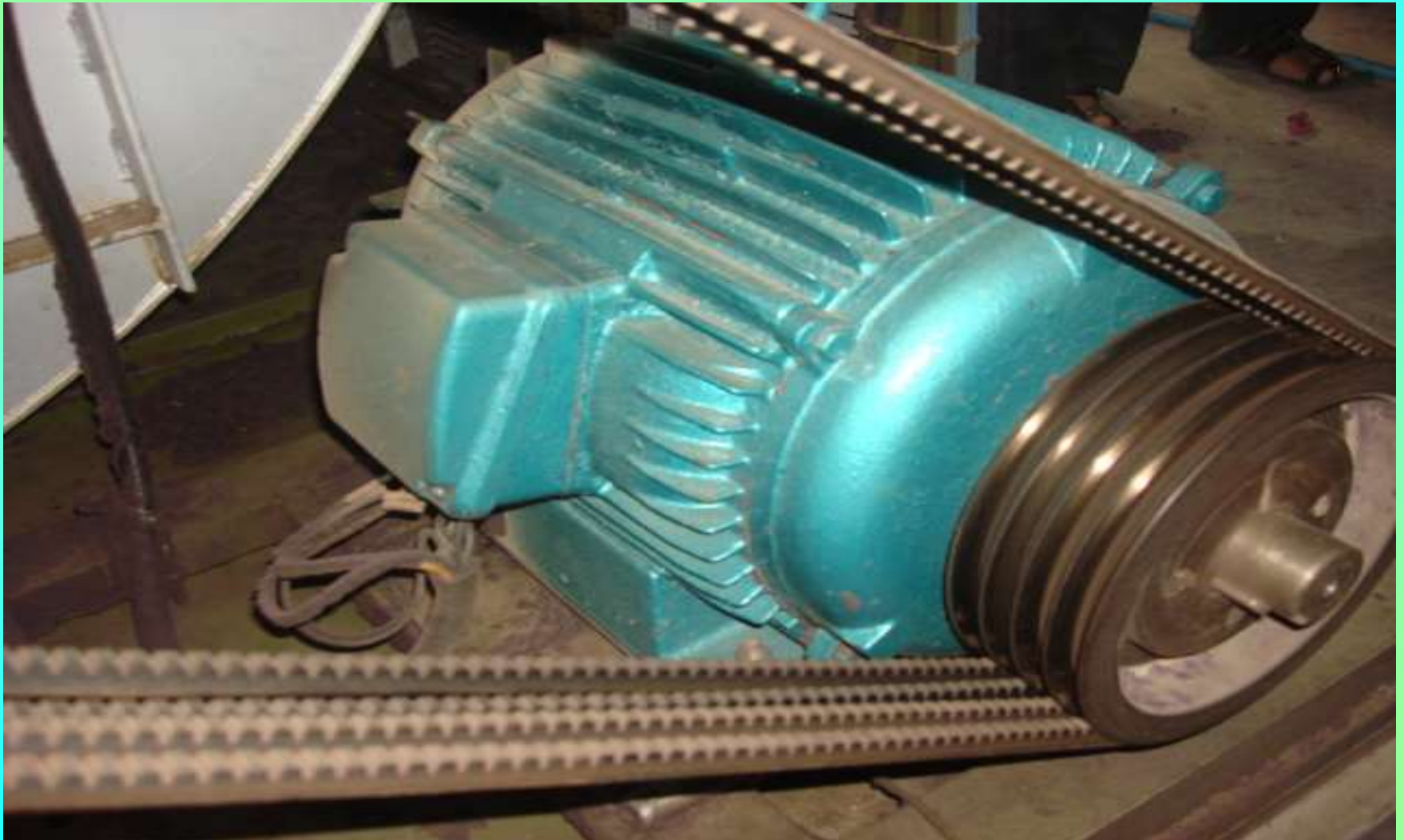
# Energy savings by better Heat Rejection in HVAC

## Case study – Relative Condition Monitoring

### 12 % savings scope by improving better heat rejection.

- When all the six fans are run, the chiller takes still less consumption and hence the condenser fans operation by thermostat control to be altered so that more fans operates for the given loading.
- That is temperature settings for the condenser fan cut in and cut out to be reduced now to near ambient temperature say or as per the OEM recommendations.
- I set HX fans running HVAC incoming power – 76.1kW
- II set HX fans running HVAC power - 87.9 kW
- The difference in above - 11.9 kW
- Hence by setting the HX fans to reduce the above gap.

**Case study in AHU - Raw Cogged Edged Belt  
reduces transmission loss from motor to load by 3 to 5 %  
compared to Vee Belt.**



# **BEE Guidelines - Motor drive transmission - Visible losses in Belt Losses from motor to load**

## **Please look for Overall Efficiency in system.**

The efficiency of mechanical power transmission depends on grip between pulley and belt, further depends on  $\mu$  (Co-efficient of friction) and strength (Tensile) of the belt. In case of

*Table 3.4: Losses in V Belts*

<b>Sr. no.</b>	<b>Motor HP</b>	<b>Losses %</b>
1	2	8-15
2	3	7-13
3	4	6-12
4	6	5.5-10
5	8	5-9
6	10	4.5-8.2
7	20	3.5-7
8	30	3.2-6
9	40	3-5.5
10	60	2.8-5
11	80	2.5-4.5
12	100	2.5-4.5

# case Study - ACTIVE SPARE BURNER CONCEPT

## - To treat LPG burner head as Annual Consumable

- Existing Practice on the commercial LPG stove:- User in hospitality segment now maintain & clean their LPG burner kit. This Destructive Cleaning procedure decreases the efficiency of the burner in the long run and soot is not removed instantly.
- Instead they can buy an Active spare burner head & burner and swap the same alternatively every week / fortnight; later do professional & solvent soaked cleaning methods leisurely and keep ready for next.
- The hotel which consumed 100 cylinders a month did this exercise of Spare burner Swap & clean and got LPG savings of 5 % monthly over the past 6 months, vide their report projected 60 cylinders per year saving
- & detailed reporting in my website [www.energymeasuretosave.com](http://www.energymeasuretosave.com)

# ACTIVE SPARE WET PART concept

## applied to Storage water heater, other wetted parts etc

- The buildings in hospitality segment still running Electric Storage water heater. They have to definitely changeover to Solar water heater to save 150 units per month in each heater usage.
- EXISTING PRACTICE -Our Mind-set is that we buy and use storage water heater for many years with one built-in heating element. Even then, we don't take steps to correct the same with a mind set 'as long as it runs, don't fix it'.
- PROPOSED PRACTICE Instead if we buy now its spare heating element @ Rs.200/- only, then twice a year before winter and after winter, we can swap our existing heating element with the new element.
- For a family, new water heater takes around 2 units per hour for and three year old water heater takes up to 4 units per day,
- That extra time to heat up is not there now and that is around 10 to 50 % power savings of your existing daily water heater consumption.

**Human Body +10 \*C = 47\* for bathing water temperature**

**Human body 37 \*-10\*C= 27\* for AC setting room temp.**

- Our body temperature is 37°C we have to set our Air Conditioners at is 10\* minus our body temp. 27°C (instead of 22\* C now). It saves on power and mild cool is better for health than chill cool ! And operate your fan too, Cool air breeze is better to health than Cold blast of air & 15 % power savings.
- First check your ceiling fan down rod is just 1 foot or 2 feet from ceiling. The vendor gives minimum size rod only and you increase the size so that your fan don't hug to ceiling but allow to breathe and we will be comforted by Evaporative cooling and better air circulation in our well ventilated rooms.
- Also, we have to set our Electric storage water heaters at that is 10\* plus our body temperature. 47°C (instead of 60°C now). Warm water is better to health than hot water & 20 % power savings

# Safe working practices leads to Energy savings automatically.

- Thinking & Acting on Conservation Measures catalyzes our social responsibility, caring for others and sacrificing our selfish comforts.
- When we are safe and healthy, conservation prevails. If safety fails, conservation fails and Pollution starts.
- So comfort your building utilities to get more savings from them & comfort them efficiently and pave for sustainable environment.
- Showcase your building with LED lighting, Solar Light piping, and put Banner on reception that you are in Energy Saving mode so that others will follow you to appreciate Nature & not Abuse further

# Conserve Energy & Serve Nation

## Sharing Knowledge to save *OUR* Energy

- Thanks to the Participants - for your kind attention Please.
- Thanks to BEE to express my views on this Energy Knowledge Platform.

- **Thank You S.ASHOK,  
BEE certified Energy Auditor,  
Energy Advisor, PCRA Faculty,  
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Please visit my site for detailed information about the above case studies and the related Energy saving tips & give your valuable Feedback.

[www.energymeasuretosave.com](http://www.energymeasuretosave.com)