BEE studies indicate that the power shortages can be wiped out.

•BEE has recently carried out a study on electricity savings potential in each of the 35 states and Union Territories,

• ***and an interesting thing is that in some states with large power shortages***,

• **the energy saving potential is larger than the shortage.**

• We hope this will inspire the states and to adopt and implement energy efficiency programs.

The objective to have Energy Efficient building

The objective is to aim at constructing energy efficient buildings –

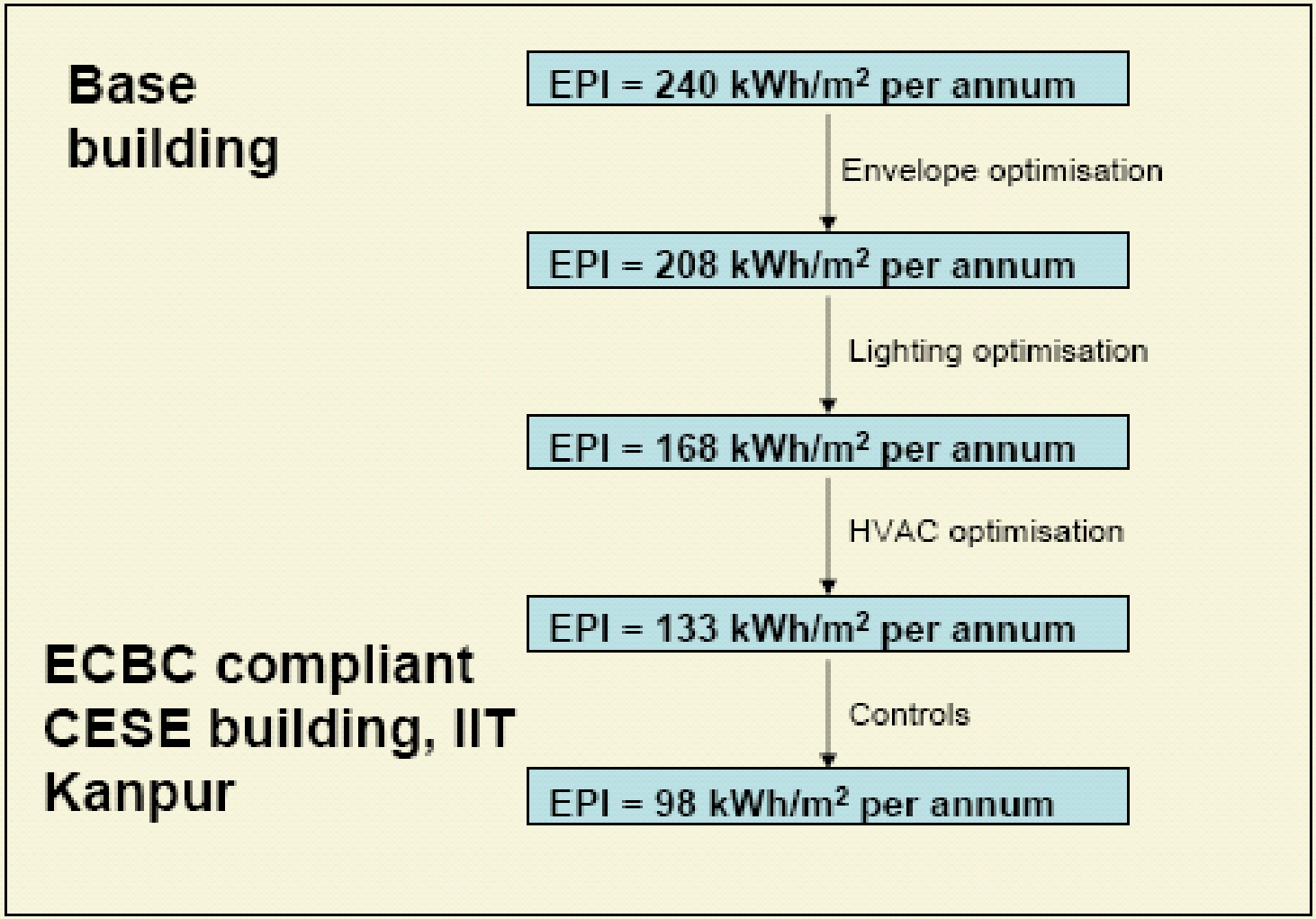
the buildings which would need minimum of light,

minimum of heating/cooling,

would depend substantially on natural light and ventilation,

would use materials which would lead to saving of energy and electricity.

BEE case study showcases to us the Building user, the ways & means to conserve in building



The ways to achieve ECBC compliance – above typical case study

- Envelope optimization - 15 % from 240 to 208 UMS
- Lighting optimization - 20% from 208 to 168 UMS
- HVAC optimization - 20 %from 168 to 133 UMS
- Controls - 25 %from 133 to 98 UMS

- The % reductions from building to building and from application to application

- And depends on the **Annualized Energy Losses** in the existing equipments & Utilities in building

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.**

- In many cases, the pay back period for additional capital cost could be just 2-3 years

Different forms of natural lighting where all & how can we make use of?

- North lighting
- Glass strips across the roof
- Sky lights with fiber reinforced plastic (FRP)
- Atrium with FRP dome
- Natural light from windows

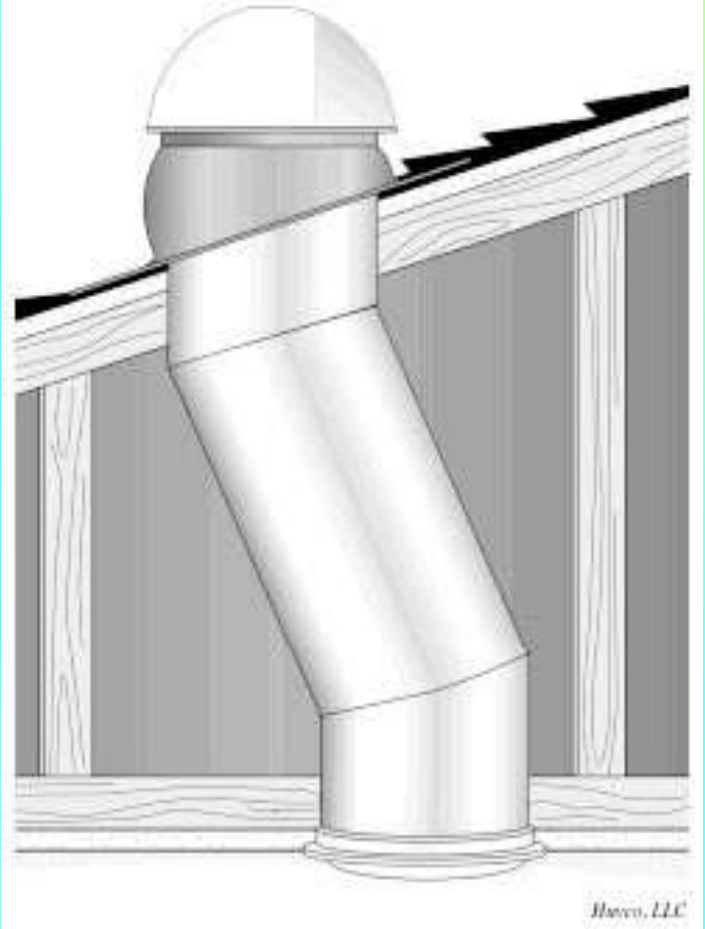
How can Light be piped into building?

Light pipe: This is a reflective tube that brings clean light from the sky into a room, These are Aluminum tubes having silver lining inside

How it works

- **Light collecting dome** exposed to ambient light collects the light
- **Reflective pipe** conducts the light into interiors
- **Light diffuser** distributes light evenly throughout the space

A 13 inch light pipe can illuminate about 250 sq.ft of floor area with an luminance of 200 lux. **A 4 ft length of light pipe of the above size provides a daytime average of 750 watts**



Lighting from SUN grabbed inside building !

A 30 inch light pipe illuminates 900 sqft area

FL & CFL is the order of the day but LED now started taking over

Different types (T12, T10, T8 and T5) different dia diameter decreases and efficiency increases !

Most efficient at ambient temp 20-30*C

LED Newest type of energy efficient lamp

Emit visible light in a very narrow spectrum and can produce “white light”
From exit signs, traffic signals, displays, visual tasking area, and now in buildings too
Significant energy savings: 82 – 93%

Present trend in lighting
T5 Fluorescent Tube Light

- **Slimmer tubes than T12 and T8 tubes**
- **Improved luminary efficiencies by 7%,**
- **with super-reflective aluminum luminary 11-30%**
- ***Mercury reduction: 3 mg instead of 15 mg per lamp***
- **Can only be operated with electronic ballasts and not with existing luminaries**

TUBE LIGHT IS A SOFT LOAD…PUTTING SERVO STABILIZER WILL AVOID THIS WASTE..

Tube light– variation in Light output & Power output

- Particulars at 10% low-210 volt -at10% high – 240 V

  - **Light output *Decrease 9 % Increase 8 %***

  - ***Power input Decrease 15 % Increase 8 %***

- Lighting wants safe regulated working **210 volts only**

  - **Priority is towards Energy Savings in Lighting**
    More priority is in Safety in lighting voltages

- Tube light life increases and inventory comes down
  - Not only for tube lights but also for ballasts also.

The Surge Protection Devices in the building lighting & Soft loads distribution panel prevents breakdowns & electric hazards.

Preventing Surges leads to Less Failures

This is regarding the Internal Protection / **‘ TRANSIENT OVER VOLTAGE ’ (SURGE) Protection devices**.

The ‘SURGE VOLTAGE’ can be defined as short-term voltage rise for microseconds & reaches several times to nominal system voltage!

These SURGES are commonly arises on power line at any input level because of,

1. Natural Lightning
(10/350 Microseconds wave shape. 6000 V +)
2.Switching
(8/20 Microseconds wave shape. 4000V +)

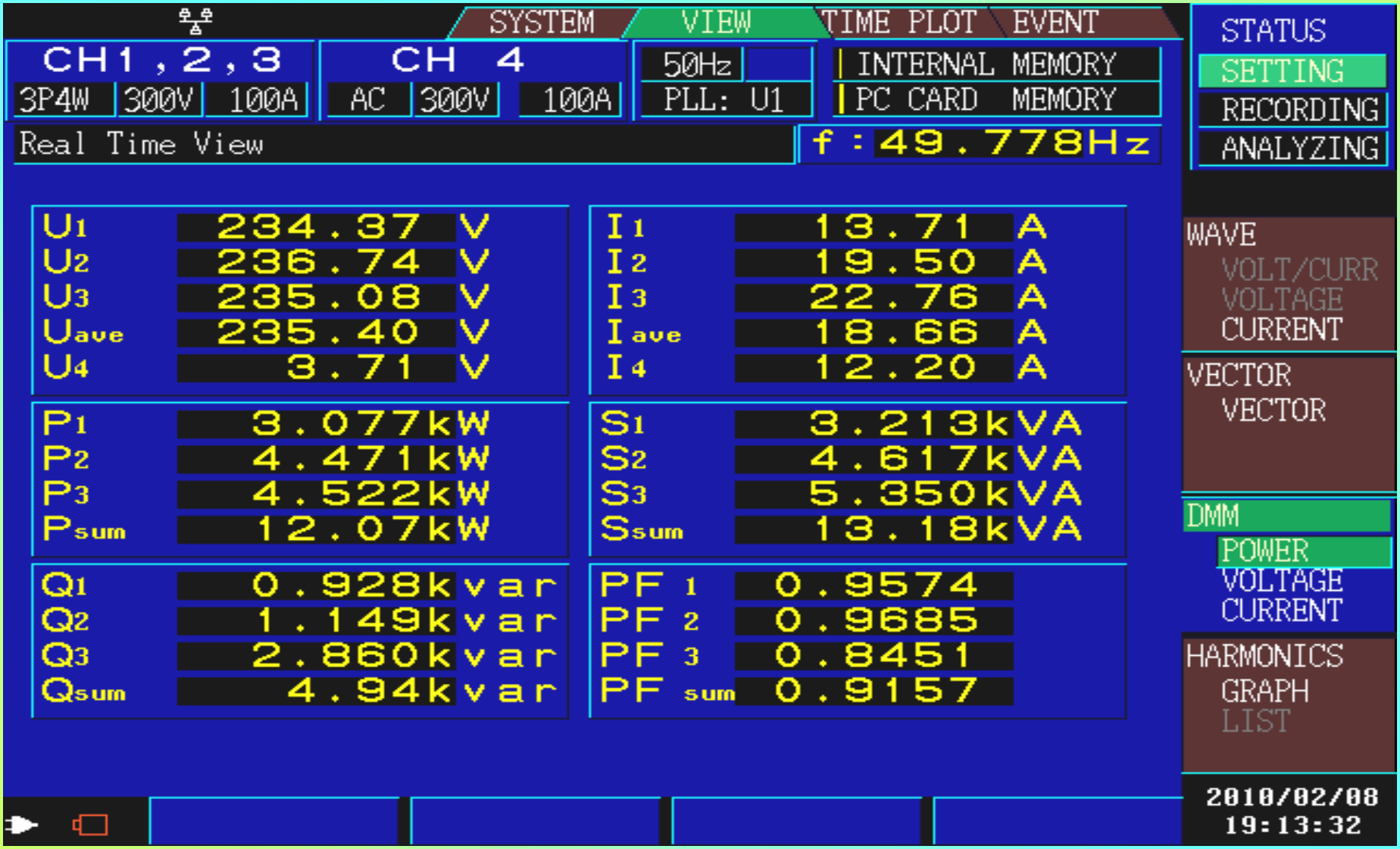
9 out of 10 failures occur due to Switching Surges

- IEC (International Electrotechnic Commission) says around **30-40% failures in electrical & electronic equipment occur because of 'SURGES'**

- .As you are aware the incidence of damage,, caused by **'SURGES', has increased markedly in recent years**.

- The reason being increased usage of electronically controlled devices in almost every field and also the electronic chips of today's developed world **are more sensitive to surges.**

In one of our C.I.T. energy study, in a M.N.C. at Tirupur - the audit findings :-



Current Based Power Quality Problems

- Reactive Power Compensation
- Voltage Regulation
- Current Harmonics Compensation
- Load Unbalancing (for 3-phase systems)
- Neutral Current Compensation

(for 3-phase 4-wire systems)

How can Harmonics be arrested at Source?

- For VFD and UPS specifically:- **Line Reactors**

  – K-Rated / Drive Isolation Transformers

  – Harmonic Mitigating / Phase Shifting Transformers

  – 12, 18 or 24 pulse Converters

  – Passive parallel / series tuned Filters/Active Filters

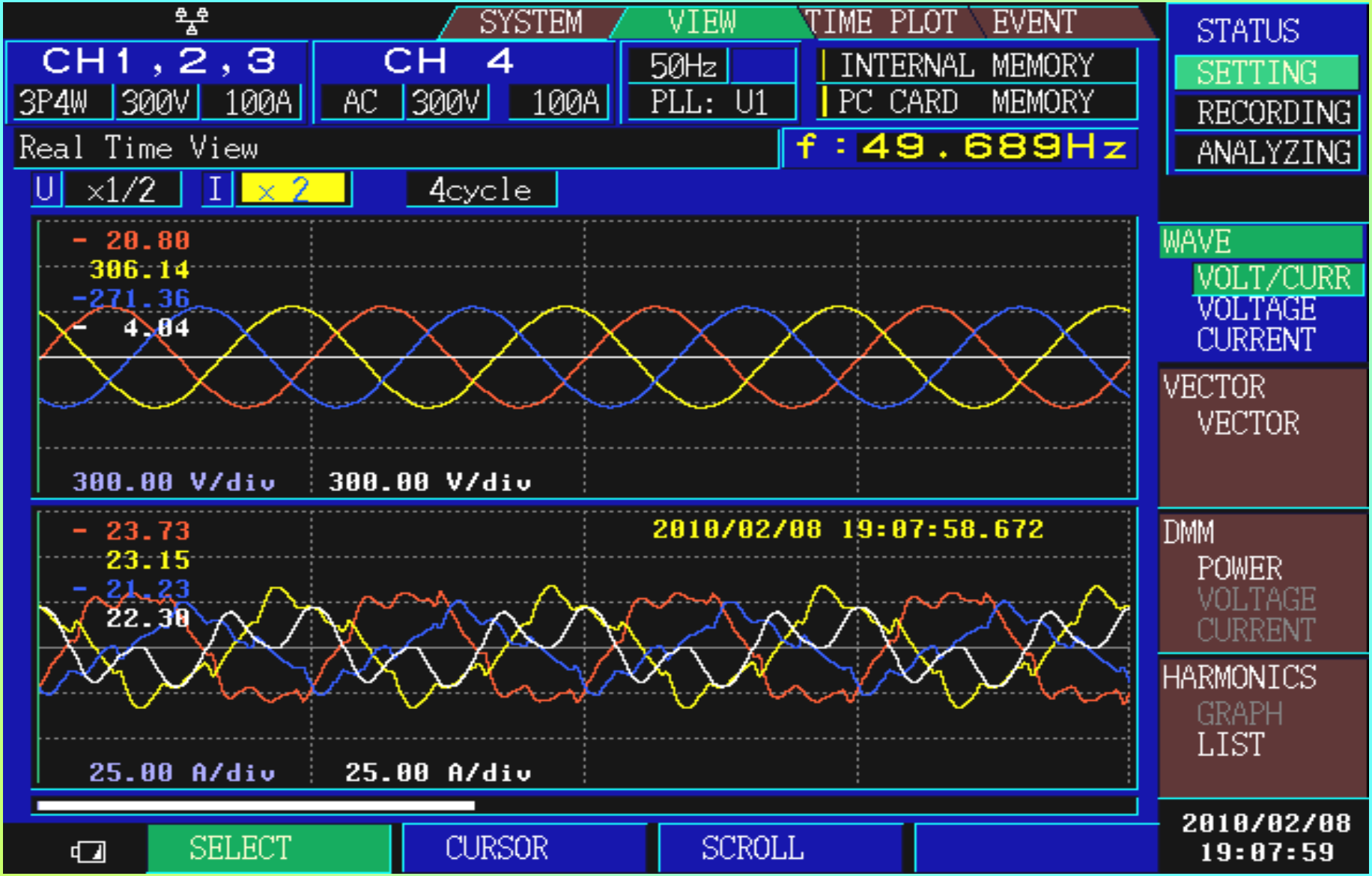
– Isolate harmonic loads separately (with /without harmonic filters)

  - Harmonic mitigating transformers

  - Phase shifting (zig-zag) transformers

- **Filter capacitor bank- this can end-suppress only**

How the Harmonics increase the Neutral Current
The waveform explains how the PQ is polluted.



How can Harmonics be Reduced?

- PROPER GROUNDING -Neutral to ground conductor connect at one location; at main panel or transformer secondary

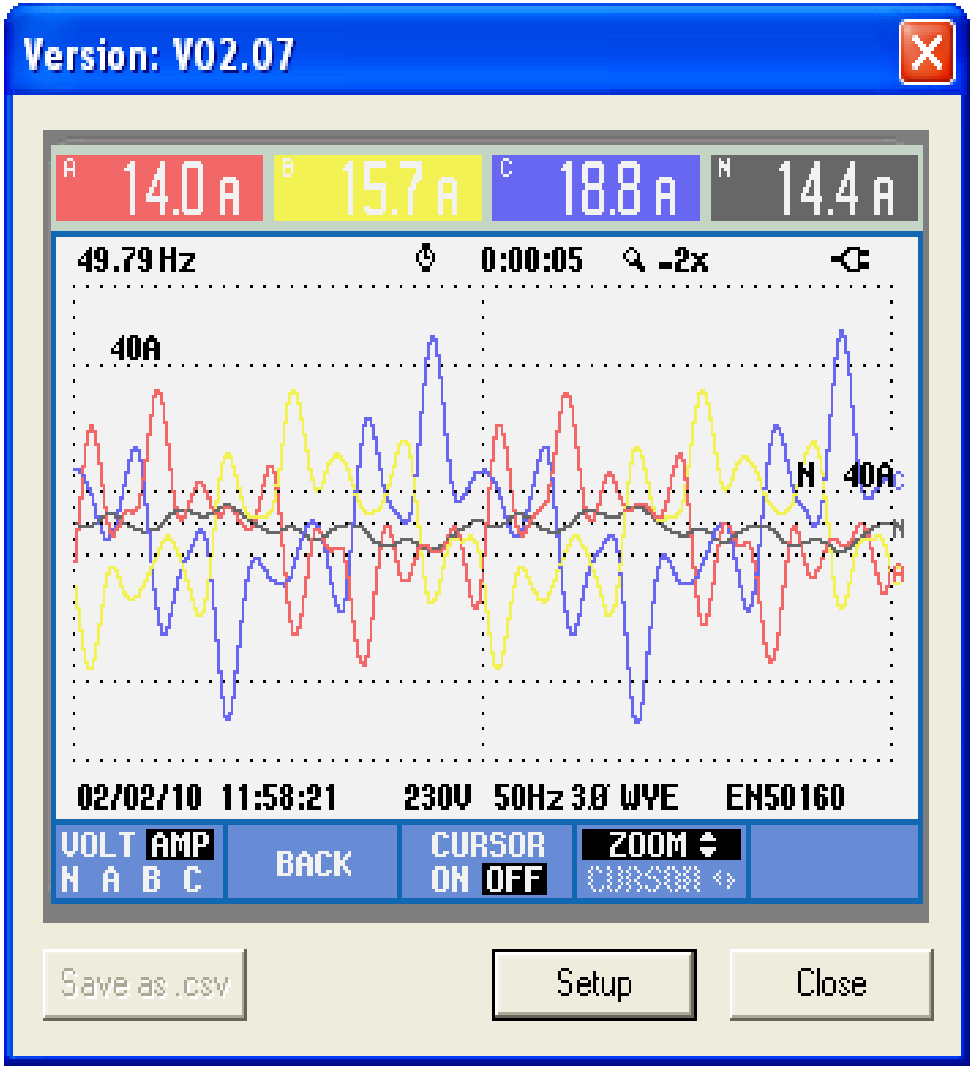
- **When neutral is connected to ground at multiple locations, interference can occur with sensitive electronic devices**.

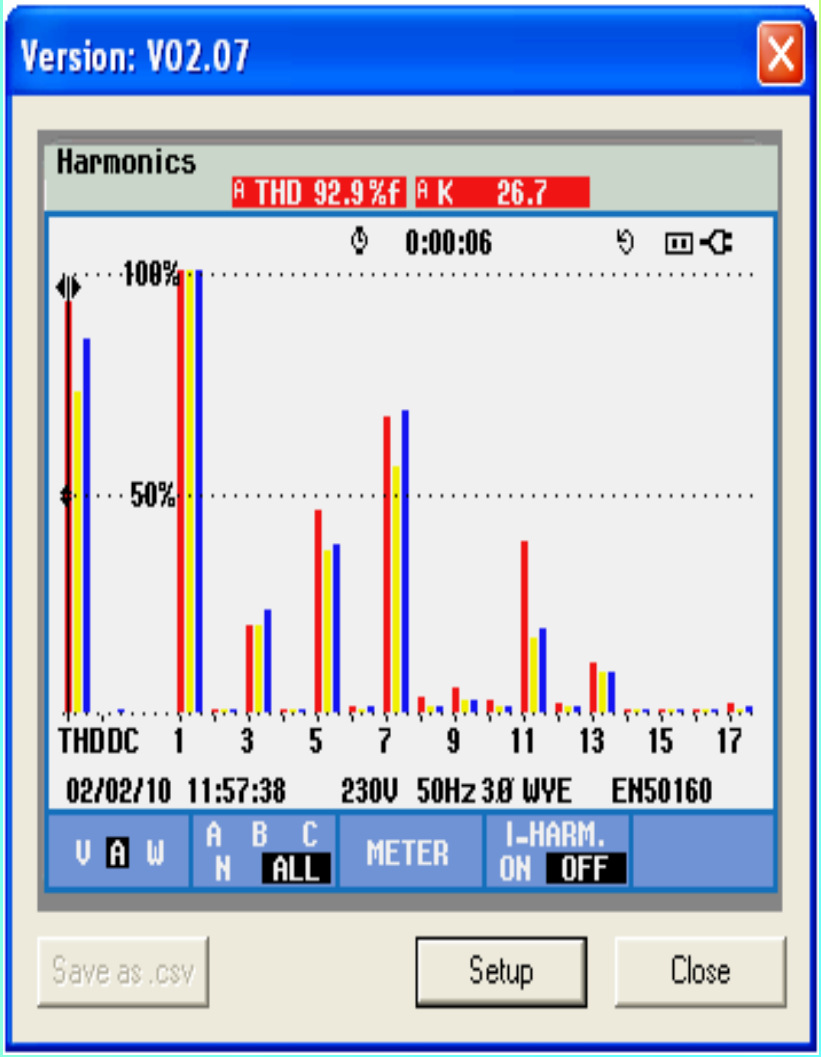
- Run power and control conductors in separate raceways

- Sensitive loads not to share neutral & ground conductors.

- Avoid using conduit as the ground return path, run dedicated ground wire with circuit conductors

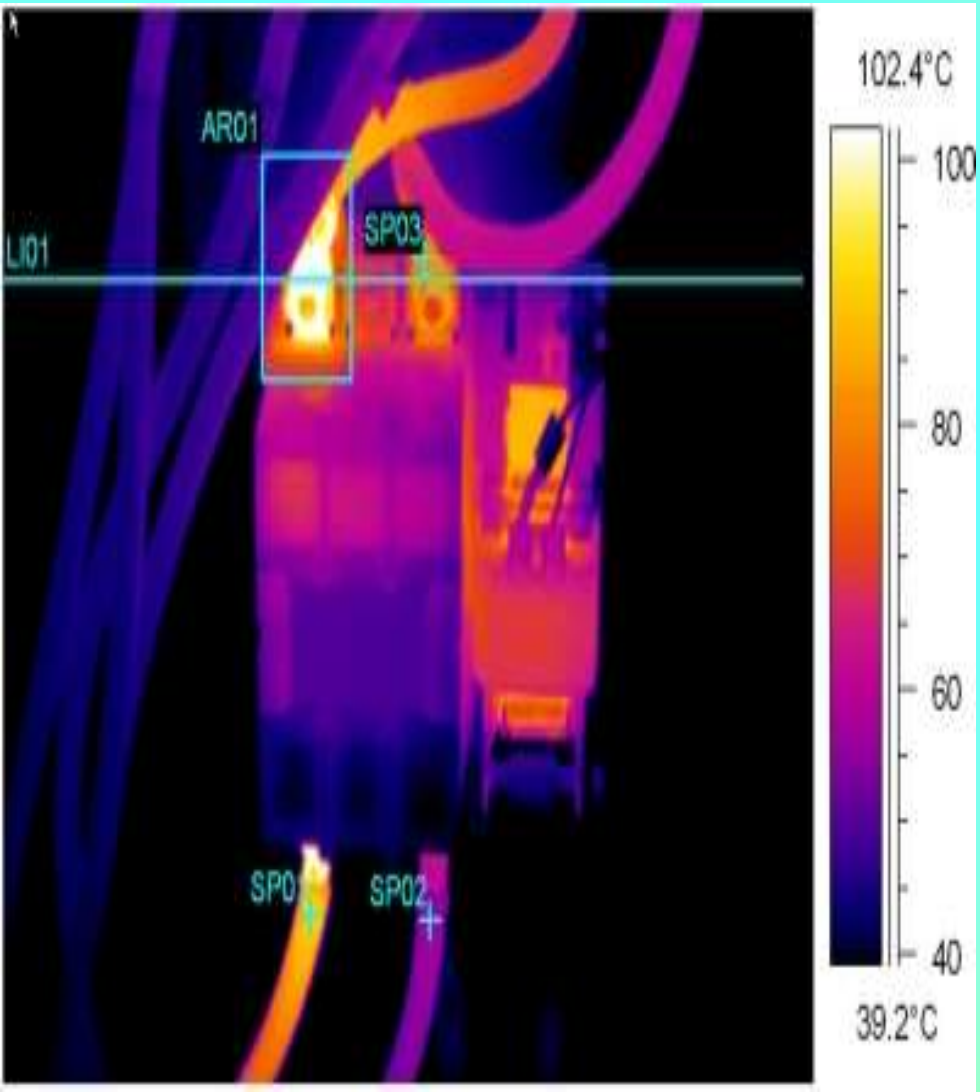
Power quality disturbed in Lighting Circuit as measured in our C.I.T. energy study





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

Thermal Imaging – Tool to Predictive Energy Management & Maintenance



EARTHING TO BE WELL MAINTAINED TO PREVENT THE SURGES ATTACKING THE MACHINES

CONVENTIONAL EARTHING – PAINTING LOOKS OK BUT EARTHING IS POORLY MAINTAINED

MAINTENANCE FREE EARTHING :
EARTHING IS GOOD IN THE LONG RUN and well maintained.

HVAC systems – tips on Energy Saving

• Tropicalized condition in India due to dust air pollution:

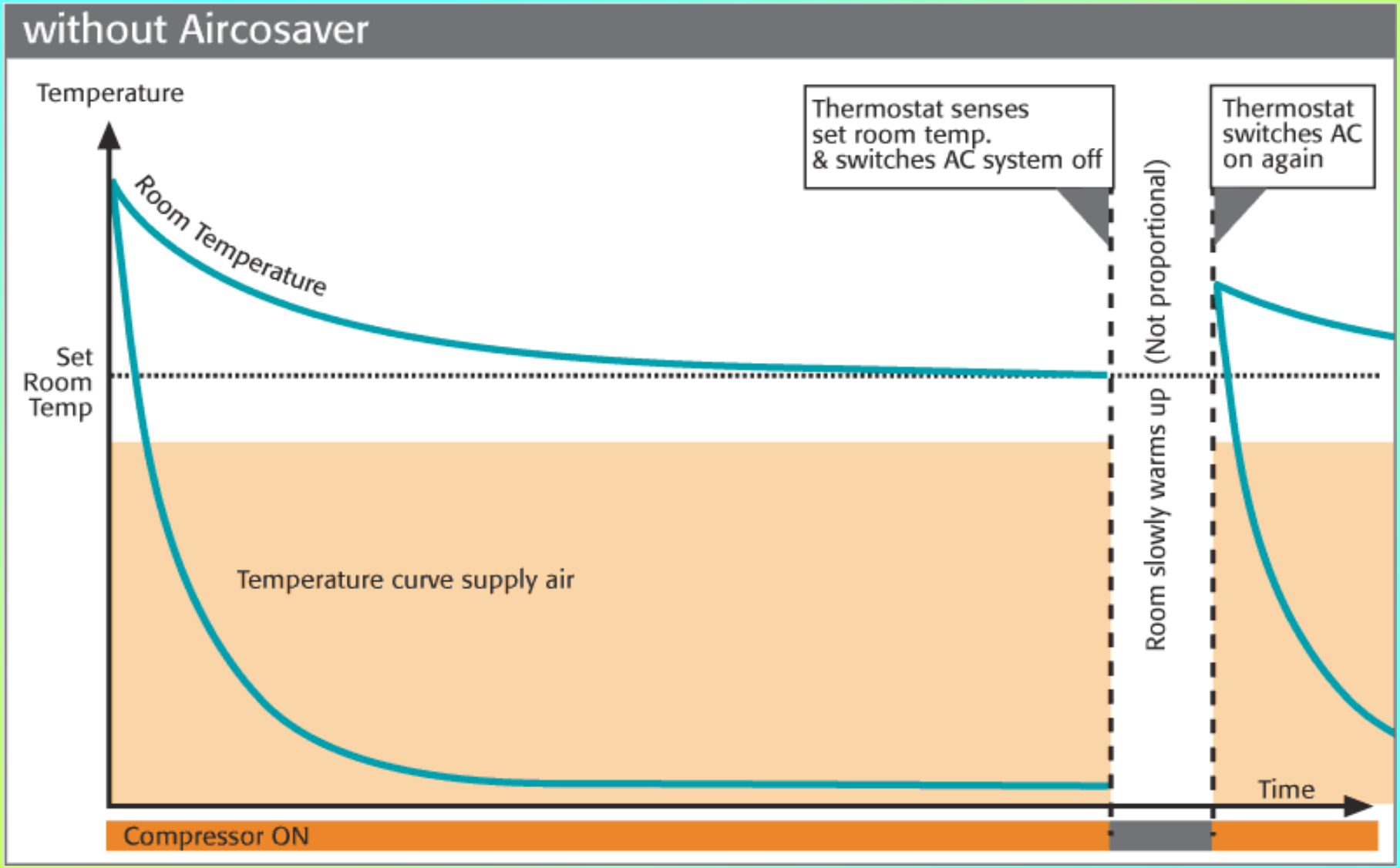
To achieve about 20 % power savings, what to do?

•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.

How to optimize our air conditioner power consumption using Thermodynamic Saturation



Ventilation and some sunshine

- GENEVA: ***Ventilation and some sunshine***

•could go a long way to reduce tuberculosis risks

•in hospitals and prisons,

- two strongholds of the contagious lung disease,

- the **World Health Organization said**.

•**Now it is a MUST in high rise Buildings too.**

CONSUMER POWER BILL – WHAT IS THE BREAKUP ?

® **EB charges the industry in terms of KWH, KVA, PF and we in the industry maintenance must measure the same KW,** KVA, PF, KVAR and Harmonics at our load end machines.

- By energy conservation in industry, **we try to recover the losses which go as waste as Excess input, and wasted output** of machines.
- By Energy Measurement, **we draw a line between Avoidable and Unavoidable Losses and plan to minimize same**.

Meter is your tool to show motor is a efficient or not and your Machine is healthy or not, ***instantaneously.***

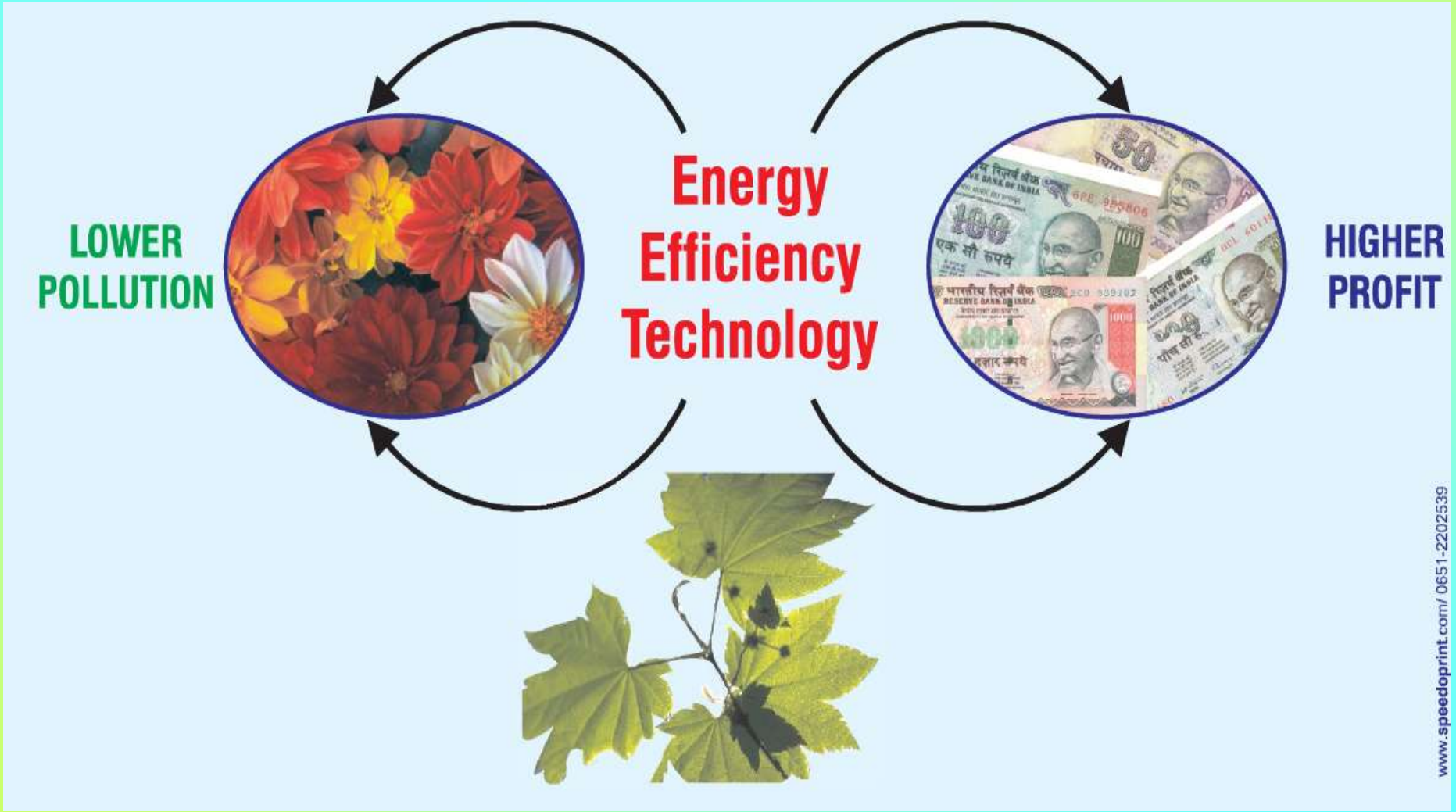
- **Low cost Clamp on Multi function Power meter less than Rs.10 K**

- Active power (KW) ,
- Reactive (KVAR),
- Apparent Power (KVA)
- Power Factor (PF) & Harmonics too.
- other parameters for 3f 4W,, 1f 2W, etc.
- Triple display : KW, V, A easy to read.
- Reads V, A, KW, KVA, KVAR, PF, HZ etc

Automation – a Tool to improve productivity with less power consumption

- Automation with Human intervention even Semi-auto.
- Reduction of Peak Loads
- Environment Protection.
- Improve Safety and Health.
- Easy diagnosis of fault & Reduce Maintenance.
- **Minimize Energy consumption**
- **Reduction in Resources**(water , energy etc.)

Be Sustained Energy Efficient to gain higher profits and keeping only lower pollution



Conserve Energy & Serve Nation
Sharing Knowledge to save *OUR* Energy

- Thanks to participants - for your kind attn Please.

- Management Initiative ***ONLY*** can Catalyze Energy Savings

- **Thank You S.ASHOK,**

BEE certified Energy Auditor,
Energy Advisor, PCRA Faculty,
COIMBATORE – 05.
cell : - 9 4 4 3 7 - 2 0 2 2 0
ID :*ashok.anbesivam@gmail.com*

Please visit my site *www.energymeasuretosave.com*