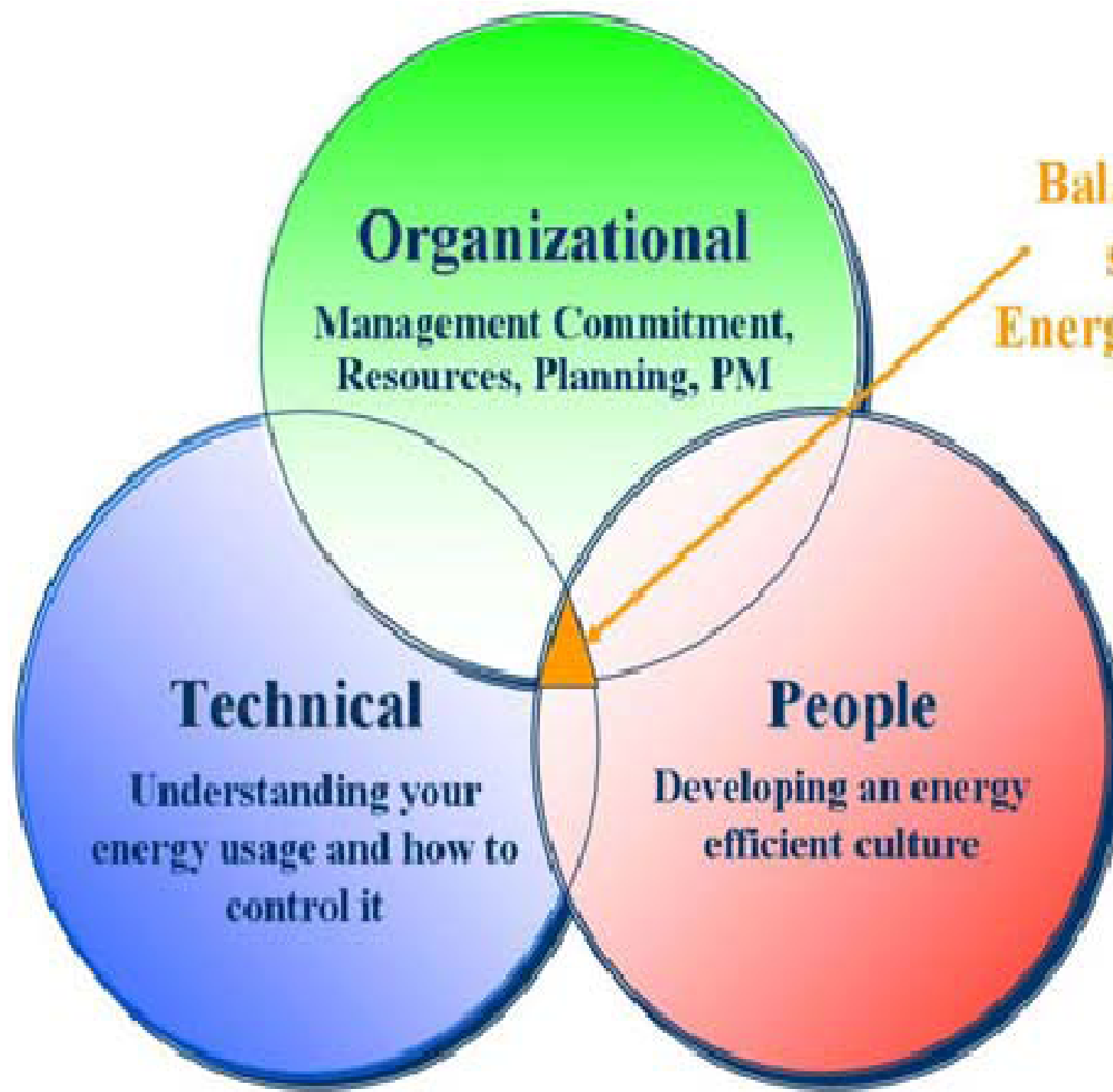


**Let us work on the Bottom of the ECON Pyramid, now
with focus NEXT on Energy Efficiency early !
BUT always eyeing for Renewable Energy Alternatives ! !**

The Energy Pyramid





Balance all 3 for
successful
Energy management

**ECON is a Low Hanging Fruit now.
If left un-plucked now, this will silently eat your
operating profit margin soon & later too.**

- **Having done Energy audit in the industry now, we have given 5 to 10 % savings with One year Payback period.**

- **If your Power & Fuel Bill is Rs.100 Lakhs per year,**

- **you could save 10% thro better energy saving practices**

- **ASK YOURSELF**

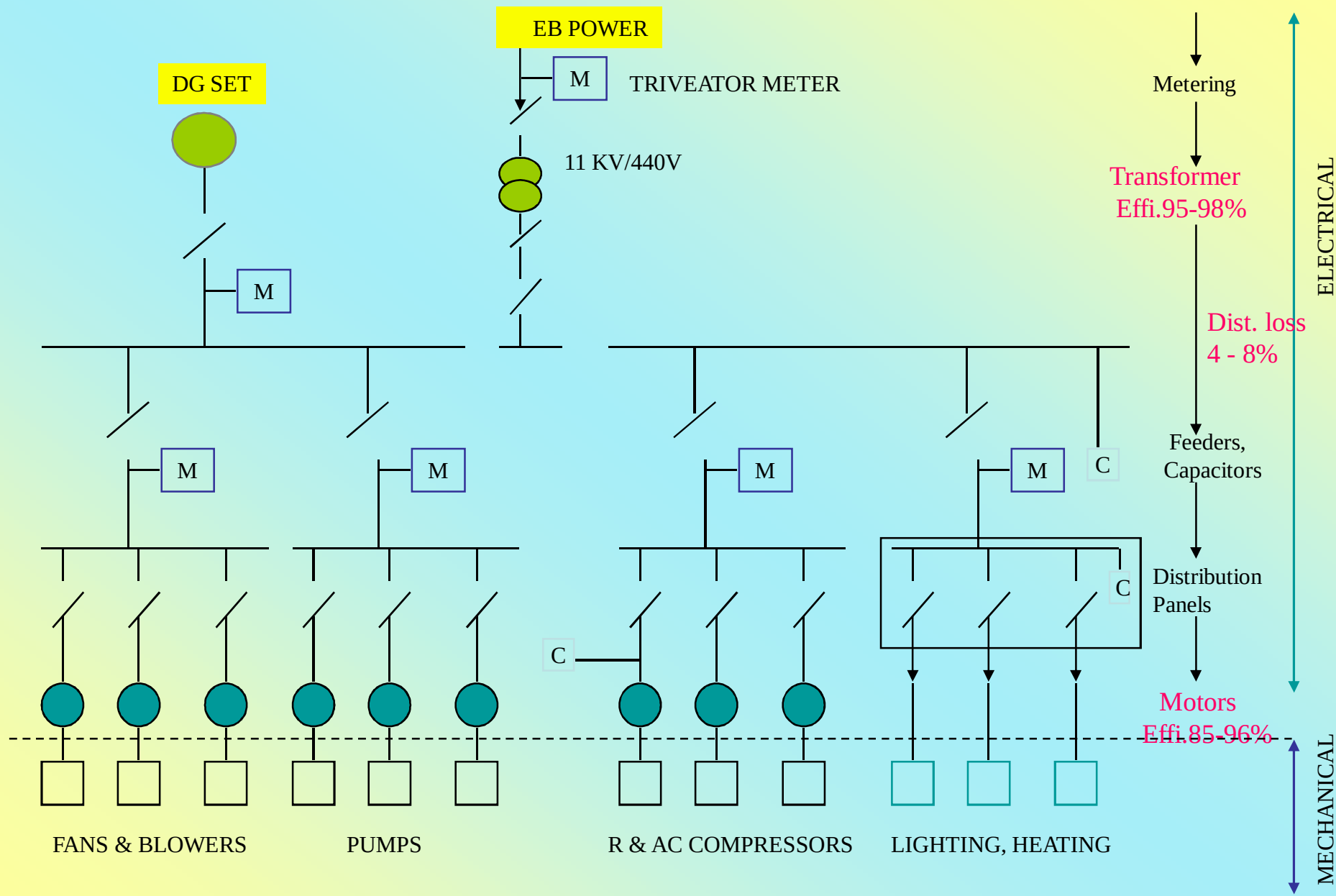
- **How much product to sell to earn Rs.10 Lakhs net / year**

- **This 10 Lakh Rs is within yourself and make use of it NOW³ !**

ENERGY BALANCE in India

- Decreasing Fuels & Industry Consuming More
- Thermal plants generate @ 35% Efficiency
- Transmission & Distribution Losses at 33 %
- **1 kg of coal Fuel gives one EB unit only**
- Due to Energy Transportation losses end to end

ELECTRICAL DISTRIBUTION SYSTEM -- SINGLE LINE DIAGRAM



Consumer Power bill – what is the breakup ?

- When EB is charging the industry in KVA, KW, PF then we should be in a position
 - to measure power parameters of individual equipments
 - & account for total EB consumption.
 - By energy conservation in the industry,
 - we try to recover the losses which go as waste.
- By Energy Measurement, we draw a line between Avoidable and Unavoidable Losses
 - and plan to minimize same.

Energy conservation = short cut to generate Power

- **Our Beloved Past President Dr.Abdul Kalam says : -**
- The cost of generation of 1 MW power is Many Crores of Rupees and takes longer months and years to generate.
- **The cost of 1 MW power conservation is only less than Rs. 1 Crore.**
- If Conservation done in morning of the day,
- the same evening we are reaping the rewards of our conservation efforts.

INPUT VOLTAGE VARIATION	POSSIBLE APPX. POWER SAVING	
	Motor Load below 10 hp	Lighting Load
380 - 400 volts	Nil	Nil & no servo stabilizer required
400 - 420 volts	3%	5%
420 - 440 volts	5%	10%
440 - 460 volts	7%	20%
460 - 480 volts	10%	30%

**The table below Compares the behavior
of 5 hp motor at Higher than 400 volts**
courtesy – Muskan Servo OEM study

Input Voltage	Current	KVA	PF
400	7.5A	5.2	0.8
425	11% More	18% More	0.7
435	19% More	28% More	0.61
445	26% More	38% More	0.57

Load End Compensation enhances KW, KVA savings

Improved Power Factor Correction on typical 50HP Motor gives significant results.

50 HP motor Without Cap	50 HP motor (with Cap)	% Change in parameters
37.3 KW	36.2 KW	3% Decrease
28 KVAR	15.1KVAR	46% Decrease
46.6 KVA	38.4 KVA	17% Decrease
0.8 PF	0.92 PF	15% improvement

Are we loading our motors efficiently ?

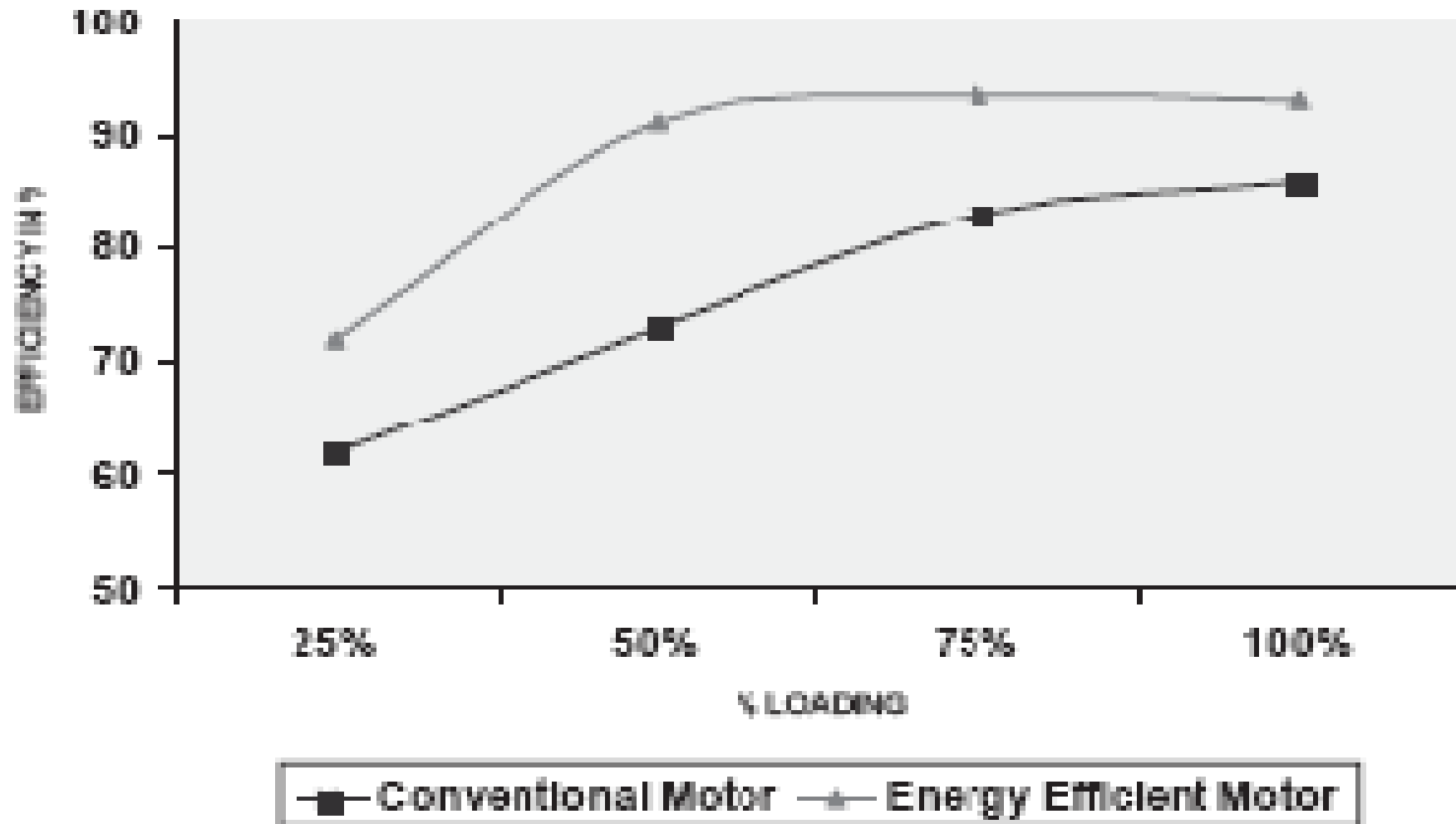


FIG 2: Loading vs. Efficiency

Motor burnout & how to prevent ?

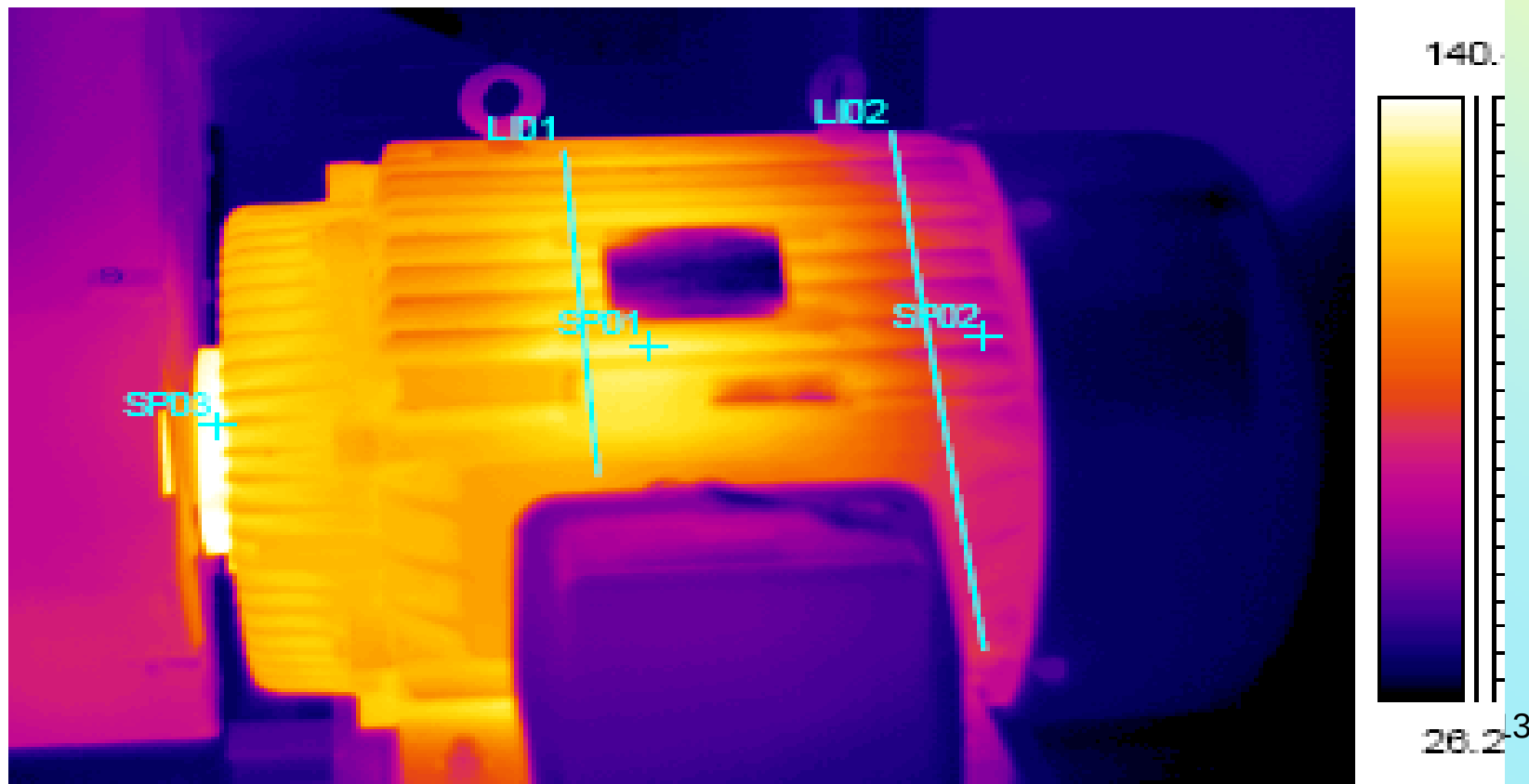
- Motor getting burnt show = poor preventive measures. Each and every rewinding, the efficiency loses by 5 %
- Motors strained why :- overloaded condition, under voltage unbalance, mis-alignment, loose joints etc
- Detected by Vibration Monitors, Skin temperature RTD probe, bearing tester Infrared Gun, tong tester etc
- Electronic Overload relays prevent burnout & follow Inverse Square law at shock, quick Overloads.

Healthy Running MOTOR SKIN TEMPERATURE

To be less than 20 °C above Ambient.

Symptoms for healthy Running –

Warm & not Hot motor, Temperature difference in Drive & Non drive, Left & Right, Top & Bottom' to be minimum



Motor drive transmission efficiency - Visible losses seen in Belt Losses from motor to load

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

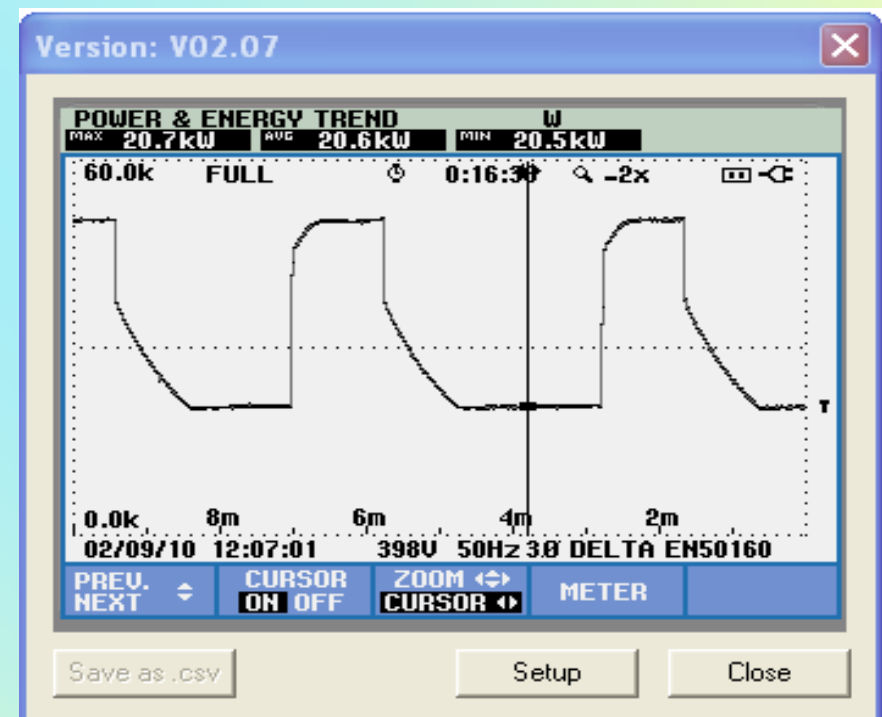
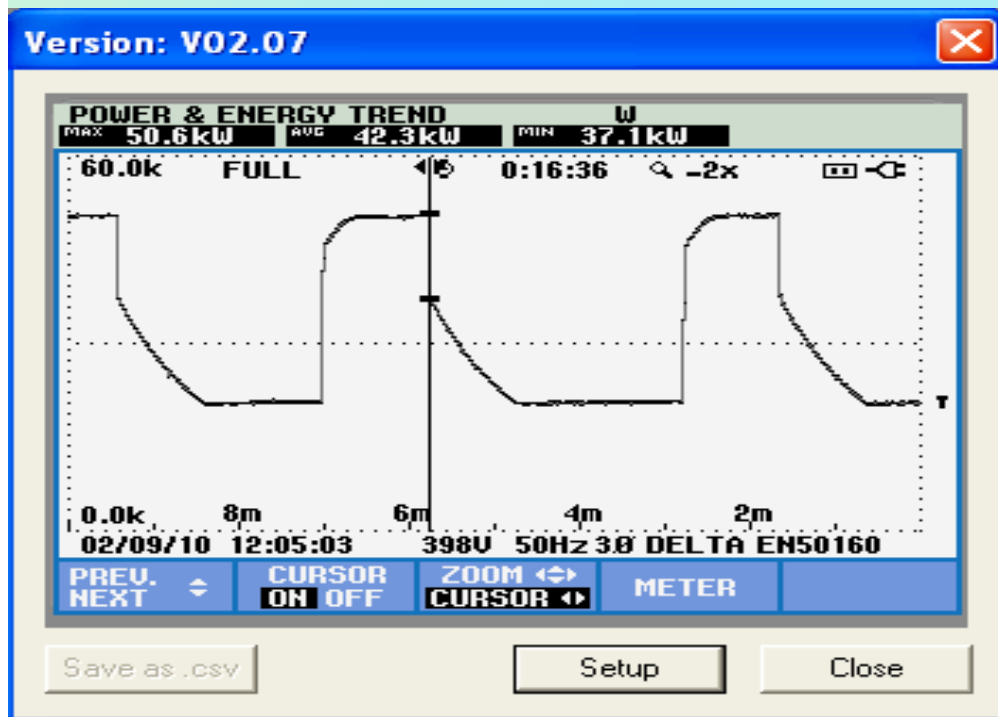
Table 3.4: Losses in V Belts

Sr. no.	Motor HP	Losses %
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



Electricity KWH can be used as tool to monitor daily health of Machine

The machines run from no load to full load in a day;
This custom built panel multi function energy meter can provide
to the user what are the no load KWH and load KWH of machine.



CA system efficiency improves by :

- Reduction of 1 Kg/cm² air pressure
 - (8 Kg/cm² to 7 Kg/cm²) results
 - in 7% input power savings
- Using solenoid ball valves wherever required
 - Installation of after coolers and dryers
- Carrying out pump – up test, leakage test, specific power consumption determination regularly
- Ensuring proper air /water cooling of compressor

Short cut to compressor savings - Feed the FAD Free Air Delivery to Air compressor intake cool & dry air with daily cleaned air pre - filter / exhaust hot air out of compressor house.

- It has been observed that Free Air Discharge (FAD) by compressors increases by as much as 12.5% in some cases by simply cleaning the air intake filters.

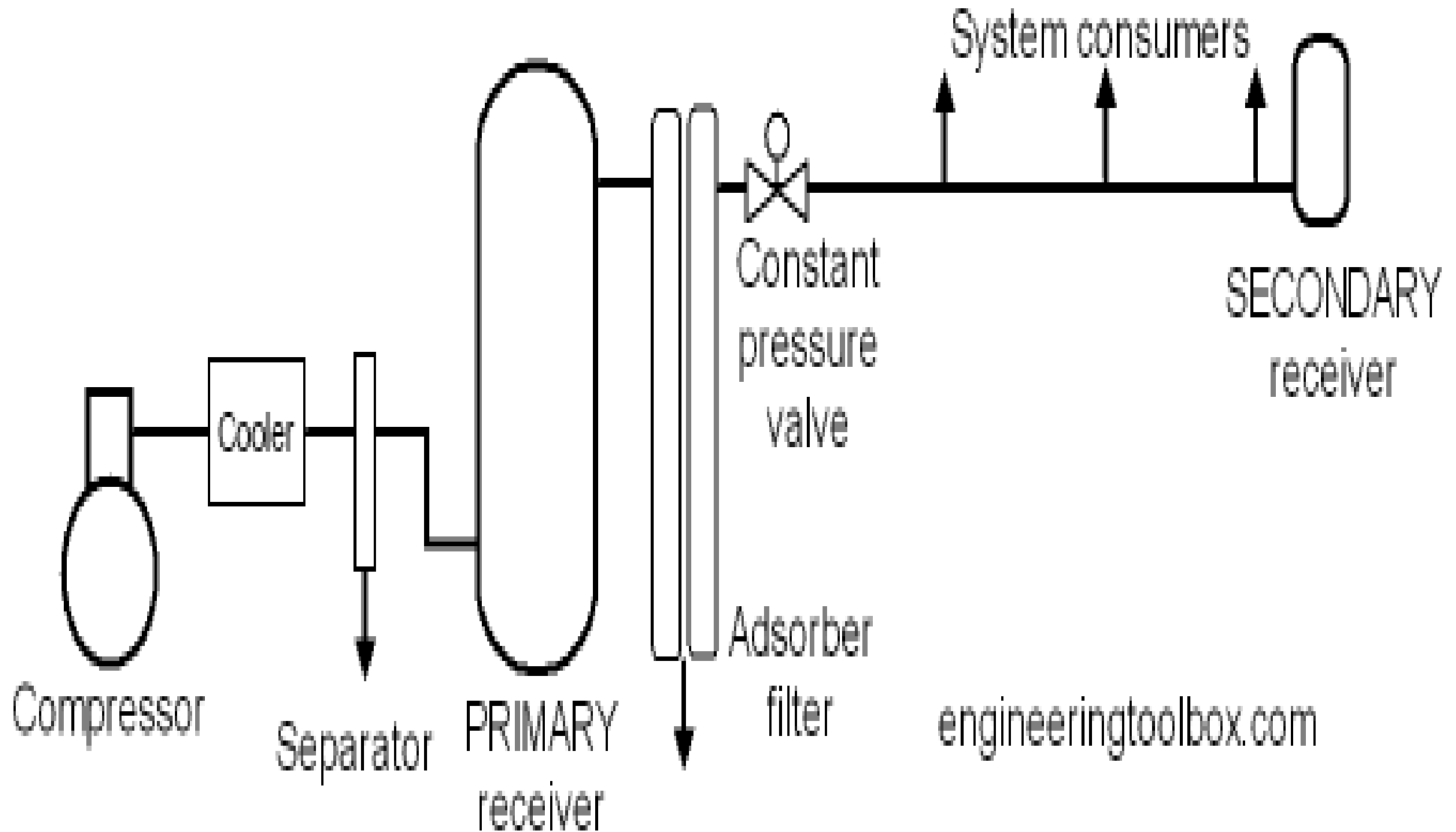


Figure 7 & 8: Choked filters of compressors

Compressor takes excess power due to inadequate maintenance

Worn-out piston ring, gland packing	2 – 3 % higher power
Worn, broken, leaking valves	5 –6 % higher power
Worn, improperly aligned bearings	1 – 3 % higher power
Dirty, non recommended lube oil	1 % higher
Clogged suction filter	2 – 3 % higher power
Low, high temp. cooling water flow	1 % higher power per 4 *C higher water temp up to certain limit

COMPRESSED AIR HEADER FLOW DECIDES DYNAMIC PRESSURE DROP IN COMP AIR SYSTEM



Pumping system – savings

<u>parameters</u>	<u>existing'</u>	<u>new pump</u>
• Motor rating hp	7.5	5
• Suction pipe mm	65	75
• Delivery pipe mm	50	75
• Piping material	GI	White PVC
• Foot valve	local	ISI
• Discharge LPS	3.68	5.03
• Input power KW	6.18	4.35
• Increase in discharge	--	36 %
• Input power reduction	30 %	--
• Saving in Energy	--	48 %

Lighting – Lumens per watt & Bulb LIFE is important now.

Lamp type	Lumens per watt
Incandescent bulbs	15
CFL	60
Fluorescent tube LIGHTS	60 - 100
HP Sodium Vapour lamps	100 – 150
LED TUBE LIGHTS	120
Light intensity from sun	1, 20,000 lumen/m ²
Diffused daylight near window	500 –600 lumens / m ²

Lighting & Fans – Buy efficiently & use efficiently

- Lighting is a Soft load in Electrical distribution. Servo Stabilizer for safe lights & 15 % power saving
- Use **Switch type Electronic fan Regulator for air breeze** comforts, not air blast and Save 30 % power.
 - BLDC ceiling fans consume 35 watts
- compared to ordinary ceiling fans consume 60 watts.
 - Now we are aware BEE 5 star rated consumer gadgets are for tube light, fan, A.C., water heater etc
- Think in the long run, keep in mind your electricity bill now & after using this energy efficient gadget.

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.**



Boiler Sub Systems Efficiency to improve

- ✓ Water treatment system
- ✓ Feed water system

- ✓ Steam System

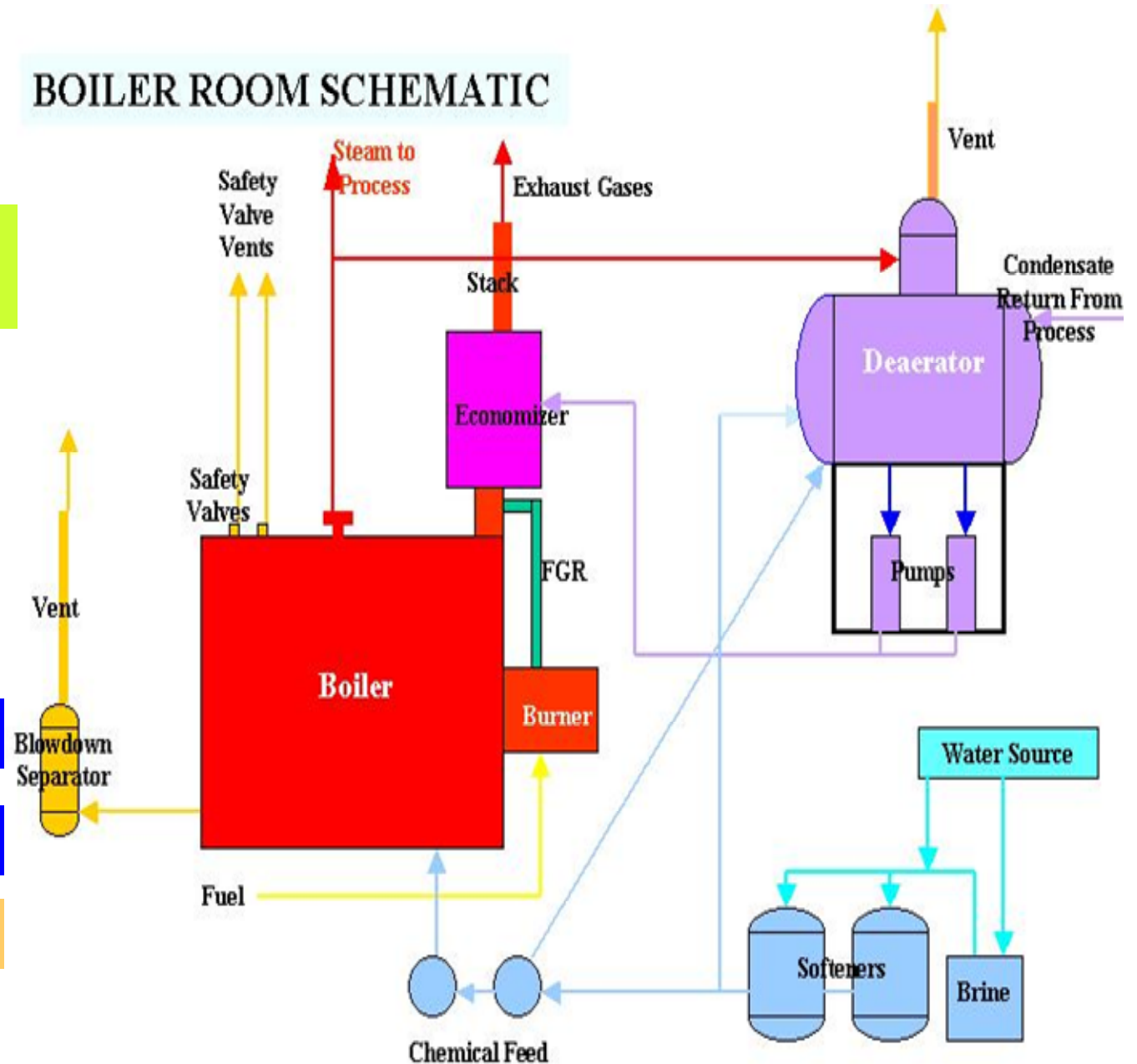
- ✓ Blow down system

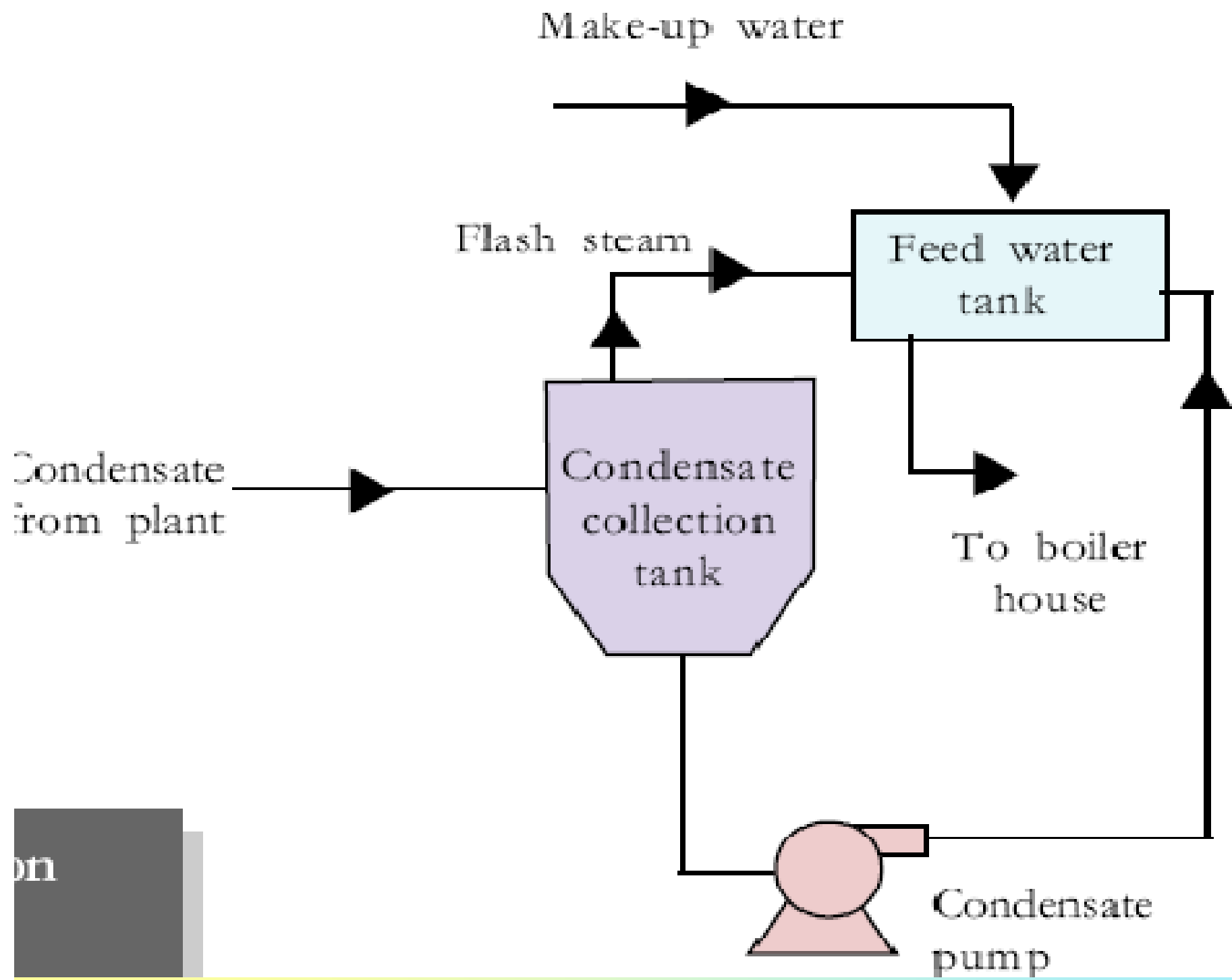
- ✓ Fuel supply system

- ✓ Air Supply system

- ✓ Flue gas system

BOILER ROOM SCHEMATIC





CONSERVE ENERGY & SERVE NATION SAVE 1500 UNITS OF ELECTRICITY ANNUALLY USING SOLAR WATER HEATER

- But we have to be rational in using Electricity the high grade energy to be used in High grade application in industry & domestic and not for low grade applications like boiler, heat treatment, kettle etc pre-heating
- One 100 liter solar water heater at home or industry saves 1500 units/year. So Serve nation by Conserving at home.
- Energy Auditing leads to Creative House keeping and this craving habit of energy recovery from all possible angles in premises will lead us to pollution-free environment apart from cost effective production.

Shock, Relief & Delight

- The three stages of accepting results of an energy study
Shock, Relief and, finally, Delight !
- The general wrong opinions about Maintenance
"Maintenance is a necessary evil"
- "Nothing can be done to improve maintenance costs"
- Please remove the opinions & now Remember:
Where Safety (Conservation) Fails, Pollution Starts.
- *Maintenance is a Tool to Productivity*
- Utility to process is like Medicine in bottle to our body.
- *Shake bottle before use & shake our body after intake*
for quick & better results of medicine.

Energy Audit shows where we stand

- What to do,
 - where to start,
 - at what cost and
 - for what benefits
-
- First step is start with Preliminary Audit with existing Data.
 - Second step is Detailed Audit & Generate more Data.
-
- Indicative saving potential to achieve
-
- | | |
|--|-----------------|
| • Good House-keeping yields | 5 - 10% |
| • Minor Investment gives | 10 - 15% |
| • Reasonable Investment pays back | 20 - 25% |

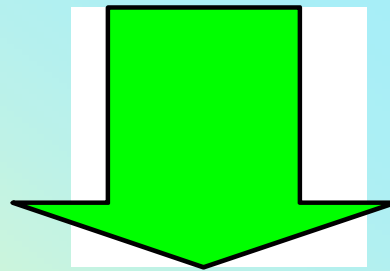
FIVE COST REDUCTION MEASURES OF ENERGY CONSERVATION

- Identify inefficient energy use
- Upgrade machinery & process
in the context of energy efficiency
- Improve maintenance practice
- Promote employee awareness and
- Conservation in domestic consumption.

Collectively Act & Consistently Educate

$\Sigma(\text{Little Ideas}) = \text{Big Result}$

$\Sigma (\text{Wisdom} + \text{Effort}) = \text{Reduction of Energy}$
Cost Without Investment



Many Drops Make a SHOWER

Energy Saving improves Operating Profit Margins

Energy Efficiency



IS THE KEY TO **SURVIVAL**

Save on Energy Costs and
get an edge over your competitors.

- **Energy Auditor Can work well with the Industry**
- **only when the Industry Management feels there is energy loss & wastage**
- **in the process and this needs to be recovered.**
- **Energy Auditing is a Tool to facilitate the recovery of energy losses in the plant**
- **happened due to mismatch in the design, operation & maintenance of equipments in the process.**



We do not work alone
We work in partnership
We draw as much upon you
as you draw upon us
and
More you draw upon us
and
More we help you in your pursuit

Thinking & Acting on Conservation Measures
catalyzes our social responsibility,
caring for others and
sacrificing our selfish comforts.

Thank you

- **S.ASHOK, BEE Accredited Energy Auditor**
Mail to : ashok@energymeasuretosave.com,
udtreliablesolutions@gmail.com

Please visit :- www.energymeasuretosave.com

**“Conserving energy is our collective
responsibility for a better tomorrow.”**