

ENERGY SAVINGS & AUDIT IN TEXTILE INDUSTRY

Introduction:

Practically we find today is that Electricity consumption is increasing in Textile mills, due to prolonged use of the equipments in inefficient operating parameters. Textile Process comes with a large design safety factor, which has to be optimized after process stabilization for optimum power consumption the energy cost to production cost is around 15 to 20 % and this comes second to raw material. So our focus area now is Energy consumption @ load end and by optimizing the energy usage of textile machines, we can have multiple benefits of less units per kg of yarn and health of machines enhance.

Major areas of Energy Saving potential

The major power consuming areas in textile mill

- Ring frame,
- Humidification process,
- Electrical Distribution network
- Compressed Air distribution.

That is why the mills now have started with power audit, air audit, water audit, lighting audit, capacitor checks, Motor Load Survey, used oil Analysis, Condition based Performance Monitoring. We are focusing on the above areas in the following aspects:

- Spot power – balanced voltage across phases @ motor terminals
- Spot capacitor –capacitor retrofit @ where pf begins to lag
- Spot humid air – the humidified air received at the premises end
- Spot receiver – mini air receiver @ autoconer etc for steady air
- Spot lighting – lumens received @ machine end for visual task

Areas of Energy Audit

- In the study of Energy audit of the running equipment, we first see the visible abnormal symptoms in the inefficient transfer of energy in the system using the II law of Thermodynamics. Smooth energy transfer from one form to other like electricity to the output shaft speed, belt transmission etc does not produce abnormal heating, heavy noise, spark etc. where as
- **Lighting** - sparks, in case of contactor switching, loose joints etc
- **Heating** - in motors, other load equipment coupled to motor Due to Friction, metal-to-metal touch, poor lubrication, misalignment
- **Sound** - from the equipment in form of vibration, mounting on bed, Noise from belts, bearings, metal-to-metal contact etc.
- During the transfer of energy in the running equipment; if the same is perfect & smooth accepting unavoidable losses, then the productive output is more and the wasted output is less. If the transfer is not rightly done ie done with more avoidable losses, then productive output reduces, and waste output increases & dissipated in the form of heat, light, sound which is a sign of visible loss in the equipment operating parameters.

Ring Frame parameters: -

- We are aware that the spindle consumes 30 % of power consumed by ring frame. The optimum spindle speed is the ultimate parameter in the mill, which we are targeting to achieve. The optimum spindle speed is the speed @ which ring frame gives more output speed with less

power input and keeping the prime mover and transmission (by flat belts etc. which minimizes linkage losses) under healthy condition.

- To improve ring frame performance, after looking into the textile-associated savings, let us consider motor and linkage parameters. Condition based monitoring of the following parameters will definitely enhance its health and productivity & minimizing energy costs.

REWOUND MOTOR EFFICIENCY: -

- Rewound motors are working at reduced efficiency. The Efficiency Bell curve indicates peak efficiency of a standard motor at its three quarter loading. Here in rewind motor, the efficiency peaks at the lower loading level only. And the slippage in the motor increases nearing its full load. Hence keep an eye on these motors thermal characteristic, we must not fully load the motor, but match our process to its reduced efficiency.

MOTOR PARAMETERS DAILY MEASURE: -

- In a running plant, condition based monitoring on motors based on Infra red pyro, skin measuring RTD monitor, stroboscope, clamp on power, pf, amp, voltmeter will give us many readings on motor. By daily monitoring with the above non-contact gadgets we infer hot bearings, DE & NDE side, skid, skin, rib temperature, misalignment, variation in speed in motor & load ends, active ventilation, other hot spots in motor and driven system on all 3, 6, 9, 12 O clock positions of shaft etc and take corrective action during planned breakdowns. This gives input to Performance Monitoring too.
- The no load parameters like current, power, slip rpm etc give us the productive value of the given existing motor. Bearing is the location wherein high temp, sound generates in abnormal condition and the same is detected by gadgets. Hence instead of All Purpose Grease application on bearings, High temperature greasing gives longer temperature withstanding capability in this 8760-hour pa run motors. The spindle Bolster surface temperature is an indication of the health of spindle, its oil level condition, its bearings' lubrication level and the same can be measured with skin temperature measuring RTD monitor.
- To improve the efficiency of motor for the given motor & load characteristics, we must advise the user to bring down the motor body temperature for better efficiency. Cleanliness of fins, scaling, visible obstructions, starved surroundings, want of air breeze across the fins all-round, do matter.

MOTOR THERMAL CHARACTERISTICS: -

- Though at the time of installation, we provide thermal overload relay to suit to the motor's thermal characteristic. After few operations of overloading the thermal relay's repeatability becomes poor. So keeping in mind the critical functioning of motor and production loss due to frequent tripping or malfunctions of motor, it is better to incorporate electronic overload relay. Nowadays electronic relay also has become affordable, sense overloading, single phasing, or unbalance accurately and alarm the user priority. With this, we can prevent motor overloading, burnouts etc.

IMPROVING MOTOR EFFICIENCY: -

- We have to take care of the motor with positive active ventilation all over. For the same, we ensure strong axial air throw along the ribs of motor so the overall surrounding temperature of the motor comes down. Now the motor breathes normally with the shrouded fan effect at its one end and its efficiency improvement is seen in the long run. The loss to the motor due to this retrofit is very minimal, but overall efficiency of the motor improves due to the above force cooling of fins & the motor itself.

Electrical network: -

• TRANSMISSION Vs DISTRIBUTION LOSSES:

- If we analyze our Indian scenario of T & D Losses, we infer that practically losses are more in distribution than in transmission. If we study the break up of T & D losses, we find the losses in High voltage Transmission is much less compared to the higher losses Low voltage Distribution at 415 volts. Similarly in the plant, the transmission losses in the properly sized conductors are minimum from Transformer, MCC to the factory premises; but the losses increase at the auxiliary field distribution boards inside the factory due to Tee connections etc. Hence if we can take extra care and measure the hot spots at the field distribution control panels, we can bring down the losses to bare minimum.
- Now we are aware that voltage unbalance across motor terminals must be < 1 %. We should ensure that this is kept minimum so that overall motor temperature does not rise; productive output at shaft is more and waste output in the form of heat is reduced.
- Many mills add capacitor to their existing network regularly to keep upto UPF. Any unbalance in voltage, high/ low voltage, harmonics, etc bring down capacitor efficiency. If the charging current is going less than 75 % of its rated current, it is better to replace the cap in consultation with the manufacturer. The symptom of too high skin temp (say 55 °C is the maximum withstanding temperature given by manufacturers) indicates its poor efficacy; as well lower-than- warm skin temp, which indicates its inactivity. Like a ordinary dry cell 1.5 vdc rated, when it goes down below 1 volt it is better to throw otherwise its internal resistance increases. Likewise capacitor is also becoming an Industrial Consumable. Good Capacitor is an asset to the network helping to reduce loss; but a bad capacitor is a liability to the network.
- Reg Capacitor addition we must insist that the user need not strain much to maintain UPF at the MCC to get the fringe benefit of bonus of EB, but maintain higher pf say 0.95 at the load end. Optimally 0.97 is enough for a unit to get the bonus from the EB. Now the industry actually loses more in capacitor compensation more than 0.98 and loses more heavily by addition of more capacitors from 0.99 to UPF.

COOLING HEAVY LOADED TRANSFORMER: -

- We are aware the transformer losses are minimum at its half loaded capacity. But if we are deviating any equipment's optimum efficiency vs. loading characteristics, we have to make the surrounding conditions efficient which enables the equipment to keep its losses minimal, even at higher loading levels of operation. For example we see shrouded fan mounted in the side, facing the fins of transformer to bring down the oil temperature and improve the working of the transformer in the long run in the sub stations and this is being tried in the industry's Incoming Transformer too.
- Reg Transformer loading, consumer must know his optimum loading of transformer and how much he can deviate from that.
- Optimum KVA load of transformer for maximum efficiency =
(Iron loss/copper loss)* 1/2 X Full load KVA of transformer.

Fixed power input to mill: -

- OLTC concept should be given a try immediately by the user in his 500 KVA transformer & above ratings, because he is immensely benefited by steady regulated uniform voltage feeding to his equipments and his assessment of daily energy consumption does not vary due to varying input

voltage from EB say from 380 to 430 volts etc. The consumer will understand to regulate his volt input because this voltage variation affects his productive output badly.

SPOT POWER: -

- The Industry management wants the staff to be proactive. If the subordinates are reactive but not proactive, then the industry does not progress faster but dillydallies. Similarly, The plant wants its electrical input say from the incoming transformer to the machine end to be active and not reactive. So it is better we correct the circuit pf by adding capacitor @ motor terminals ie Improve the pf at where it Lags ie Spot Power correction at load where the lagging originates, thereby reducing the distribution losses in the plant and the amount of pf correction is also less when done at load end.

Lighting:

- Now lighting trends are changing from general application to visual task oriented, let us highlight the first priority of setting lower voltage of say 200 Vac to lamps for reduced consumption and longer probable burning hours.
- Alternative approaches can also be mentioned whether power-consuming servostabiliser can be used, or parallel inductance hooked on to circuit type lighting controller can be used.
- For example, in the Telephone Exchanges, Task lighting in the switch room is now installed at about 2.4 meter (8 feet) above the ground as against the earlier practice of 3 meter (10 feet) above the ground. It has been seen during their Lighting Study, that illumination level increases by 1.7 times when the mounting height is reduced. This is very much applicable to the mill. From aesthetic sense of fixing at 14 feet ht, many mills have brought down to 10 and 8 feet height. Ultimately the worker is more benefited with the convenient visual tasking.
- When measured with lux meter, the existing T 12 tube loses light output say by 30 % in 2000 hours; this is very bad deterioration of lumens, and this poor lighting affects the worker's visual task. Unless he complains of poor lighting and his quality of work is poor, the manager does not replace lighting. C II bulletin March 2002 pdf says reg human performance, 1 % increase in lighting improves productivity by 6 %. So let the user to opt for T 8, T 5 lightings which do not reduce in lighting levels after prolonged use. So lighting has to be frequently checked by lux meter and not to complained to by worker i.e. grievance feedback & corrective action.

IS Humidification Efficient in mill?

- Textile mill stalwarts have understood now that by running HP (humidification plant) scientifically they can improve production. To be precise, if we concentrate on HP, precisely at the Spray Dwell Time of humidified air in the spray chamber, then we can improve the HP performance and this definitely gives a boost in output yarn produced.
- Usage of High Efficiency FRP fans (properly sized to the air throw & cfm specs and installed correctly) instead of M.S. or Aluminum blades consume less power input for the given air output.
- Spot capacitor @ the motor terminals inside HP premises is more important and this aspect is often neglected in many mills.

PLANT UMBRELLA is COOL: -

- Now we are allowing the solar heat to enter the premises from the top and then do false ceiling to suppress the heat further. For example, we feel the difference when we stand under the sun, walk

under the sun or go by two-wheeler under the sun. The impact is least felt under the sun when we go by two-wheeler because of the air breeze.

- Similarly the roof or the attic is made ventilated by force like the lateral high volume low pressure exhaust fans or by self propelled roof extractors. This brings down the under roof temperature by say 5 * C .The existing attic hot stale air is out and heat is not felt in false ceiling as well in supply ducts.
- Generally the roof heating by solar radiation causes 50 % of the heat load in any premises. Though we have gone for false ceiling to avoid the same, still the plant needs to be insulated from the climate extremes of day & night and that of summer & winter. What we suggest is that two-stage insulation at an affordable cost will improve the ambient. If the roof of HP is concreted, we can think of covering the open terrace in patches with the standard asbestos sheet at a height of say 2 feet above the terrace. This can be done above HP chamber, MCC, compressor house and wherever open terrace on RCC roof. This primary insulation is meant to avoid the solar heat load. In the secondary insulation i.e. under deck insulation, the attic fan definitely helps to remove the stale hot air under ceiling & insulate false ceiling from solar heat load. This method of attic ventilation and cross ventilation inside premises is low cost energy saving type compared to high cost cooling of equipments & premises.
- **Remember:** A few degree temperature drop of air inside duct at the start; and at the outside duct due to attic ventilation is easy to achieve and consumes less power. Compared to require temperature reduction inside the premises and this consumes more power and difficult to achieve.

WATER AUDIT: -

- For humidification plant, water Softening plant is the first priority. Frequent Water analysis is a must before putting the water to use inside the equipments so that we know the TDS, pH etc parameters of the incoming water and the used water; this will help to ascertain the scaling effects in the wetted parts of the equipments and pipe lines etc.
- In boiler, prevention of feed water scaling is cost effective compared to blow down losses considering overall boiler's health. Similarly the industry has still now accepted to use whatever water is receives. Giving forethought to wetted parts of the equipments in the long run future usage, we must give only softened water as water input.
- Rainwater harvesting done recently in mill premises definitely helped to improve the condition of existing water to improve its hardness etc.
- The water pump is being downsized to half in mills now. To increase the spray dwell time in the spray chamber, the pump discharge is around 2 kgsc. Provision must be made to measure the water pressure at pump discharge and at the spray header end after the spray nozzles, whether it is clamp on PVC nozzle or gunmetal Bulk nozzle. Nozzle must spread water mist at low pressure than jet out water at high pressure.
- These pressures are indicative of correct atomization at the rated pressure of nozzles and show us the shoot up in pressure in case of choke in nozzles. Let us first check whether we are pumping water at the rated pressure of nozzle regularly.
- The temperature of the cooling water sump will indicate (on continuous monitoring) the water circuit resistance in the air washer area and its choking status & the need to clean up the air washers.

Saving Possibility in Existing pump: -

Description	Existing Pump	New Pump
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	--	36.7 %
Input power reduction	29.66 %	--
saving in Energy	--	48.44 %

- Above listed are the possibilities mentioned in the existing pumps as found in PCRA bulletins. Instead of existing motor, but using Monobloc pump is operated @ rated pressure of nozzles, and transmitted thro friction less rigid PVC pipelines, we consume less water, less power, more air and a higher amount of humidified air reaches the premises.
- Here again care is taken to avoid or remove sharp bends in the chamber and in the duct for smooth flow inside premises.
- Provision can be made in the HP to measure the air circuit resistance across HP fans, filters. We can know what is the actual pressure drop in few inches water column across them during commissioning or routine cleaning maintenance schedules and we can follow the same
- Humidity control inside premises can be made automatic or at least semi automatic if possible. By semi automatic means, the Humid stats & Ambient temperature sensing Bulb Thermostats (available at affordable prices in R & AC market) can give visual alarm to the user and he can operate the HP fans one by one in the Multi-fan arrangement system.

Compressed Air System: - please keep in mind:

- Compressor is like a Submersible pump working in air.
- Compressor needs air to suck in, and to surround, to deliver more air.
- Cool Compressor delivers more air.
- Continuously run Compressor delivers less than an intermittently run Compressor.
- Tune your Compressor cut-in / cutout to deliver more cool air.
- **AIR PIPING LOSSES:**
- Similar to electrical T & D losses, the breakup of losses in main air header is less compared to distribution losses. Precisely the loss increases in branch Tees and elbows, fittings and in Hose connections. Hence the industry started to replace the Elbow fittings in headers and other CA lines with the standard L bends. We are aware that 70 % frictional loss arises in the Elbow fittings compared to the Standard bends as per PCRA bulletins. The elbowing of process in pipes increases turbulence in process; similarly in human relations too in the industry, turbulence starts when knee-jerked reactions spring up instead of streamlined flow of relationship.
- The leakage starts more in hose connections than fixed main & branch headers. That's why mills have switched over from nylon braided hoses and clamps to Poly urethane hoses used in helical form and mating connections done with compression type fittings (visualize modern auto garage with helically coiled colorful PU hoses fitted with condo nozzle air guns used for cleaning of vehicles) to avoid distribution leakage.
- In the existing MS headers (long back mills started to switch over from GI to MS) wherever welding is not possible, they use branded soft and thin Teflon tape to reduce air leaks to bare

minimum (as we all know Teflon is the slipperiest substance known to science), and this serves as good buffer in the fitting connections to arrest leak.

ACCURATELY MEASURE AIR: -

- Similarly when we talk of Compressed Air pressure in the plant, we talk only as 6 or 7 or 8 KGSC and not as 6.3, 7.5, 8.3 KGSC etc ie As far as compressed air is concerned we must talk in decimals of Kgsc only. By this we are monitoring more precisely and then we can control.
- We are reading air at 7 kgsc in a dial gauge of 25 kgsc which reads quarter scale only wherein both resolution and accuracy, or repeatability is poor. This is the existing practice because of over design of instruments to suit to design maximum of process parameters. Instead we start reading at 10 kgsc or 14-kgsc dials to read the standard 7kgsc pressure, we know we read it correctly. This is not only applicable to pressure sensors, but also to many other measurements wherein the linearity, repeatability is more important when measured **HALF SCALE OF THE INSTRUMENT.**

CUT IN - CUT OUT SWITCHING CA SUITABLY: -

- In the plant utility, the one equipment which is on / OFF cycle in automatic all the 8000 hours per annum is the compressor. If the cut-in cutout switch of the plant compressor is adjusted in such a way so that the range and differential pressure settings allow the compressor to run comfortable duty cycle. When the pressure switch and the cyclic timer control duty cycle, the compressor gets rest as well gives more output in the intermittent running. To achieve above, we need to have standby compressor and Air Receivers as buffer stocks operating at the load ends. If the CA system is big, and if can afford to, then we can think of variable speed drive in compressor or online pressure controller cum valve for conserving air.
- For example, we switch off the fridge in the house say for two hours in the morning everyday. Since fridge is the one which runs 24 hours 365 days in a year, giving rest to the fridge, cools the compressor, defrosts the inside tray, and as well makes the compressor more efficient and power savings.

STANDBY 2 – 1 CYCLE: -

- We humans are awake for 16 hours and sleep for 8 hours a day. This two one concept of work sleep schedule is universally practiced we go from zero duty of sleep to light and heavy duty daily. Similarly giving frequent on-off cycle to the duty standby units in the above auto switch mode in consultation with the manufacturer can operate the compressors or any other similar equipment coolly & efficiently.

TROPICAL AMBIENT CONDITIONS: - why Pre-filters

- We have to see that the sophisticated equipment in the plant is tropicalised and Indianised in such a way that it withstands the high humid & dusty ambient environment along with the variations in the inputs in air, and water etc. Otherwise we need to add retrofit gadget ie pre-filter in air and water inputs to the equipment. Caution is that the pre filters to kept out of the equipment package and not be built-in the equipment. Even in the air consuming equipments in blow room & carding & post spinning units, the air sub header fitted inside with auto drain valve and FLR can be kept outside the equipment This enables easy daily monitoring of incoming filters to equipment. The costs are minor and the maintenance is made easy and convenient; and frequently done online based on the condition of pre- filter. This saves the main equipment from incoming input faults and increasing machine availability.

AIR COMPRESSOR VS SUBMERSIBLE PUMP: -

- The Air Compressor in the Utility in any plant is similar to Submersible pump in functioning. Water is the sucking medium for the pump inside and same water is cooling medium outside. Similarly Air compressor starves if its air filter is choked and as well compressor-surrounding temperature gets heated up locally. We are aware that in the boiler it is relatively cost effective energy saving to soften the feed water and increase its temperature compared to the post combustion methods. Similarly it is cost effective to ensure cool and correct volume of air is ensured at the Air compressor suction than to strain more to reduce the discharge heat and reduce wear and tear of internals.

DAILY ON-LINE CLEANABLE FILTER: -

- Instead of providing the Suction air filter very near to the equipment skid, it is better to extend the suction of CA system physically out. Bigger & more visible Primary mesh pre-filter is to be provided in addition to the existing filter. And the pre-filter is located conveniently so that the same is on line cleanable daily. The retrofitting pre-filter with nylon material much bigger in size than the existing suction filter is made slide-in slide-out type. This retrofit mechanism suits not only to the Compressed Air system but as well to many other stationary engines at their air intake position. This enables the equipment to daily breathe clean and correct volume of air during running. . Shift by shift this can be cleaned conveniently and airflow & volume to compressor is steadily maintained. Here we see how the existing filter was clogging but what we must see and visualize is that how much of dust has gone inside compressor already wearing out the internals' faster.

SPOT AIR:

- Similarly we find now the wake up call is given to the industry to cautiously use the precious & costly air utility. We find the pressure drops as major barrier in Air distribution line due to improper airflow and turbulence. Cost effectively if we add adequately sized Air bottle or mini Receiver in conjunction with the solenoids at load end ie every air consuming equipment, we ensure uninterrupted flow of air to the equipment and its working is not disturbed due to want of air. This condenser is similar to capacitor retrofit at load end. This retrofit due to its buffer stock at load end, helps to reduce header pressure say around 1 kgsc more than the equipment operating pressure. Thereby reducing CA header pressure gives power savings

Cut-in Cut-out Switching:

- Similarly the cut in cut out pressure switch mounted on the skid decides the loading & unloading of the compressor. Care is taken in mounting & to calibrate the switch. Then counter-check with the local gauge whether the cut -in - out is operating precisely correct. In some mills we find this switch is also chosen for higher ranges. We take care that the range of switch is matching to our operational pressure settings instead of maximum design pressure settings. Here we use Hour meter recording to make use of this switching economically. Alternatively we can choose variable differential of cut in cut out to generate only minimum pressure required.

CA system HX study:

- Heat exchanger in the CA system supplied by some manufacturers is air- cooled type. Firstly we have to see for sufficient air throw & cooler ambient temperature on the compressor skid; Secondly we have to improve air-cooled HX gets cooler ambient air for better heat transfer. Especially in screw compressors the hot exhaust from the air-cooled heat exchanger need to be ducted out of the CA house. Care is taken that the CA house is well ventilated and that room temp is close as possible to ambient temperature. This situation applies to Generator house as well. Room temp increases in rooms with battery of compressors; this problem is severe when compressors with air cooled intercoolers & air-cooled after coolers are used in same location.

MEASURE & CONTROL OF ENERGY

- The major initiative towards ECON in mills, what we are concentrating now is that we need to measure the Energy inputs (Electricity, fuel oil, water and Air inputs) fed to the mill and that how they are affecting the UKG. There is considerable amount of cost saving in the mill if we switch over from breakdown maintenance situation to a Condition based monitoring & control of the machines & utilities.
- The three main aspects of monitoring the mill is Textile, Electrical & Mechanical. Presently most of the mills have concentrated on Textile associated savings like Energy saving spindle, reducing wharve dia, using Energy efficient spindle oil, reducing spindle weight, matching ring dia, efficient spindle tape etc. Now if they concentrate more on Electrical Energy input to machines and their Mechanical Maintenance by Predictive and Performance Monitoring, we can derive maximum productivity

Different Measuring Instruments: -

Let us list out the must-have instruments required for their routine energy study and see to it are made mandatory to keep in use.

- For ex/-, if an infra red gun is used, the consumer is told to look for hot spots say from the transformer bushing, joints @ cable, bus bar, panel, starter, etc in electrical; and alignment variations, heat due to friction etc at load end.
- Apart from power analyzers, skin temperature measurement using RTD surface monitors, manometers, pressure gauges to monitor air and water circuit in HP, digital stroboscope for speed, digital sound meter, engineers' Steth, revolving sling psychomotor to measure grid wise temp and RH, earth leakage checker, insulation meggars etc.
- Textile is an air operated industry; hence portable anemometer is a must to measure air velocity at humidification fans, supply diffusers, return ducts, air movement across hot spots, exhaust passages, attic ventilation.

ENERGY PARAMETERS ON PUBLIC DISPLAY:

- In the industry what we see is that the energy inputs available at the entrance do not reach fully at the load end. This is in the case of water, air, electricity, and fuel oil and gas. Either restriction in the supply or generation end and restricted due to narrow transmissions.
- We still talk about 390, 400, etc volts in the plant electrical network. Let us consider digitalizing voltmeter etc readouts so that we can read volts more resolution in each and every node of distribution network especially in the ring frame area which consumes more than 60 % power of mill. In fact frame-to-frame analysis with built in voltmeter, ammeter, pf, KW etc power parameters is becoming MUST now.
- The voltage, pf, current, KW parameters at MCC, humidification plants, blow room, carding, autoconers etc pre and post spinning departments and air pressure, hour meters at compressor house, etc is monitored regularly. But the same monitoring of electrical parameters and other utility inputs need to be monitored at source end and load end. The parameters are displayed publicly in big (eye-catching) sizes.

MLM Vs MLA: -

- If **MLM ie MICRO LEVEL MONITOR crew** are put to daily action in the plant and they record maximum number of energy readings daily in the plant, then it is easy for the **MLA ie the MACRO LEVEL ANALYSER**, their supervisor and the experienced hand in the plant

maintenance can analyze the energy readings. The portable tools like non-contact infra red thermometer, Non contact speed measurement using Stroboscope, tong tester gives us hundreds of readings in a short time that too without disturbing the process or equipment compared to other cumbersome measuring modes.

LOOK NOT VISIBLE GAINS BUT HIDDEN PROFITS: -

- Take the case of Objectives of Energy Conservation in the industry; the management is **first** interested in: **VISIBLE GAINS ONLY BY ECON**. We get Reduced Energy Bills, Competitiveness in the industry segment, increase in productivity, reduction in wastage, and improved profits. But the management is obviously contented with reduced energy bills, which is a visible symptom of ECON. And they attribute the other benefits of ECON to other process and commercial parameters. It is a satire. The industry needs to understand that the continuous, never ending ECON measures enhance the machines' health, prolong its life, reduces its downtime, wear & tear and ultimately the profits improve.

Conclusion:

- Improving operating parameters of plant towards safety & better efficiency. The above are some of the finer points of Energy Conservation measures being tried and to be tried in the industries. Strictly speaking, the above measures are aimed at running our existing equipments to the maximum possible efficiency. We want to reduce the avoidable losses to the maximum in the transmission of energy from one state to other in the equipment. So to say, we are trying to match our existing efficiency of equipments to suit to process. Simultaneously we try to improve the existing ambient conditions surrounding the equipments to suit and comfort the equipments so that they can give better output to process.

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