# COST CUTTING THRO ZERO & LOW COST ENERGY CONSERVATION MEASURES

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Post Corona period, during the start up phase or month, Cost cutting in our in-house production will be the key area, every management will focus now. Let us plan for the cost cutting measures, in the zero cost, low cost energy conservation measures, that is again part of pro-active and preventive maintenance measures we had planned to be done during our shut-down period. Please keep in mind, when your machine or process is having a defect inherent in design or defect crept in right from its installation phase, this is the time if possible with your resources for fine-tuning the same, to correct the same.

Our industry is going to limp back to normal workings. It may take few days, weeks or months to revert back to normal production, and all the plant activities are based on the market driven situations. At the moment, many of our industries still have in-house essential staff to keep the plant LIVE but skeleton like. What can be done now within the industry premises, depending on the staff level and condition, to monitor the no-load parameters of all the machines, have a relative comparison of energy parameters of the Tare-load functioning of the machine? Record the same and find out which of the machine is consuming more during the no-load, in each department, in each process, in both the Production machines area, and in the utility area machines.

This is to study the past year's energy consumption figures of many of the machines recorded and where you had already highlighted the appreciable higher consumption of some of the machines that you wanted to take over-haul of the machines. This is the time at least not to plan for the major repair & overhaul. But the industry can identify the lubrication, greasing, friction, wear & tear, leaks, etc problems in the critical machines in production and in utility by opening up the machine / parts of machine carefully.

## FAST RE-PAIR TO MACHINES DURING START UP PERIOD:-

To start with the utility workings, Let us list down. But the initial re-pair measures are common to utility in all the industries, and it may differ in the production machines, based on your industry is dry process, or wet process / either batch or continuous process. The inspection can be done in batches on the Electrical side, and Mechanical side on the machines, auxiliaries and process piping. Always remember, the Electricity Transmission loss is less when it reached upto your Power house, and as well from your power house to the SSB, the loss is LESS only. The Distribution loss from SSB to machine panels, and upto the motor etc load terminals is only MORE. And the loss is visible at load terminals only seen thro Hot spots by your thermal imager at the motor's loaded condition.

## ELECTRICAL AREAS – TO INSPECT & RE-PAIR:-

1. When you have been sanctioned a +++ demand KVA, during the start up phase, you will not even cross the half the demand. So set your APFC to run around PF 0.95 initially, during the startup month.

EFFECT:- to have safe stable voltages without leading volt fluctuations, and can avoid Leading PF voltages now

2. If extra CT is locally available, plan to fix all the 3 CT for the APFC relay to operate on the average of 3 phases, not to exceed.

EFFECT:- This will help to clamp the average PF at fixed value, even when phase wise unbalance Amps is there, practically seen.

3. The thermal images on the transformer HT yard side during fully-loaded condition shows the hotspots and the dry contacts caused by the sparks then and there, the same can be rectified.

EFFECT:- This can avoid industry's future breakdowns due to current and load unbalance & related KW losses further.

4. The Earth pit maintenance can be taken on each pit, record the condition of each pit's Earthing values. If possible with the locally available vendor, to change the conventional Earthing to chemical bonded Maintenance free Earthing type.

EFFECT:- This is a MUST towards Electrical Safety, avoids failure of Electronic Sensitive equipments, to earth switching surges.

5. This is to be repeated in each of the critical machines which needs electrical safety badly and electronic fool-proof operation of components. Here Single end Earthing at load will suffice and multiple loop earthings in the line, to be avoided & corrected. And to implement Surge Protection Devices (SPD), to avoid Electrical Switching surges from grid and fro nearby heavy load machines.

EFFECT:- This will improve the Electrical Safety and will avoid the failure of Electronic sensitive circuits inside machine panel.

6. Record the transformer HT and LT readings and confirm the transformer losses over years, is in line with the OEM specs. Also provide THD V, & A % Audio visual alarm so that industry is always operated within THD norms & alert the user on any momentary hike.

EFFECT:- We must know the daily transformer losses at various loadings, and verify the same with the OEM no-load loss specs.

7. Record the THD –volt % during the five segments of the day, in the weekdays and weekend days as part of documentation.

EFFECT:- This documentation will assist in our correspondence to the EB when the THD V % are near the THD threshold norms.

8. Check the capacitor connections individually in the power house and in field, their Amps consumption and their terminations, for any loose connection and condition of discharge of capacitors in each capacitor banks.

EFFECT:- Unbalanced capacitor consumes more power by itself. Also De-rated capacitor consumes power, but no use to system.

9. Check for the Already-marked Hot spots in your MV panel, at the Power house, worn-out contacts in the switchgears, where the bi-metallic washers have to be in place at the busbar areas, the looseness in the cable lugs and in terminals. Better to replace bolt and nut with washers in main busbars and heavy consumption cable terminations.

EFFECT:- Voltage drops in between, can be brought within norms, unbalance & cause of single phasing etc can be avoided after this.

10. Physical check & correction of terminations right from the power house to each machine, motor terminations can be done.

EFFECT:- voltage unbalance de-rates the motor and reduces its efficiency & RPM, the same can be avoided by correcting above.

11. Where the cables are moving type, and where the machine or auxiliary is not grounded rigidly and on unstable support, there the wiring terminations, piping joints can be looked into by opening up the inside areas.

EFFECT:- Intermittent faults due to loosely hanging wire / cable connections can be avoided, otherwise, we will find it difficult later.

12. Also look for the physical damages in the cables, wires and if possible provide loop orientation to the in / out cables in machine panels, so that later it will be easy for you to clamp your CT portable meter to the loop, without disturbing cables. And to inspect the unwanted cable holes and cooling fan function in all individual machine's control panel.

    EFFECT:- Damaged cables is reason of intermittent heavy line current & wild current fluctuations, as it gets earthed now & then.

13. Let us take a leaf out of our Agriculture pump, any pump above 3 HP was fixed with sized KVAR capacitor by the Farmer. It is high time, now in the industry which has mixture of linear & non-linear loads, this Load end compensation of all your motors at the plant, will give many direct and indirect benefits. Why this needs to be done now because, now only we can measure the no load KVAR measured in each phase of of the motor & 90 % of its value is chosen as the capacitor size. This retrofit will help to maintain higher optimum PF during DG running as well. Suggest revisiting to your Basics in Electrical distribution & correct now.

    EFFECT:- less Voltage drop to motor, Line losses reduced, improved motor ***system*** efficiency, less APFC working, less THD A %.

14. Till date, you have not fixed Line Reactance chokes at the incoming of all your VFD. But now to reduce the negative effects of Harmonics thrown from VFD to Incoming and scattering to the adjacent machines, It is time to plan for the provision to fix the Harmonic Reduction choke to your VFD incoming circuit, so as to reduce by 30 % the Harmonic THD Amps %.

EFFECT:- Your overall THD comes down since you are now house arresting the Harmonics at its Source, also this protects your VFD.

15. Wherever critical machines are there and where you cant' afford to have motor burn out, replace with Electronic overload relay / Electronic motor protection relay (this is affordable now and near to OLR price) instead of your existing thermal OLR, you must not allow at any cost, to burn out your motor. Motor burnout can be protected from Single phasing, current unbalance, fool-proof protected against overloading always. Next time, Never Allow your Motors to burn out, as these relays will prevent that.

    EFFECT:- Rewound motor reduces your productivity, & increases your power bills, count your Rewind, not more than TWICE.

**16.** Some of your motors are having High Starting Torque. So you have to use higher HP motor to face the starting torque, but its running KW will be steady at less than 40 %, then retrofit of Automatic Delta to Star module retrofit gives the energy savings in the motor. Compared to VFD costing, this is much lower and affordable to be retrofitted in the existing motor panel.

EFFECT:-When motor runs below half its capacity, its efficiency drops heavy. Here the low cost option is to retrofit the Automatic Delstar. The other options are retrofitting with VFD or motor downsizing with EE motor, both are costly options.

**17.** Take the case of Refrigeration Dryers in the compressed air treatment, those dryer OEM to be appreciated to have welded a TEE connection to their copper tubing on the suction & delivery lines of the Freon compressor and provided Freon gauges to assess what is the normal & optimum Freon suction and delivery pressures. Present day Air conditioner Split, Ducted packages have not provided this pressure gauge in their Freon system. Please allow your maintenance to routinely monitor your AC compressor's Freon Suction & Discharge pressures. With no gauges now, if your Freon system leaks out minutely and your compressor becomes un-healthy, after that only you notice the breakdown so as to attend later, many days lost in between.

EFFECT:- Air conditioning system needs preventive proactive maintenance and not breakdown repair after the fault had happened.

**18.** In all your Air conditioning packages, Electronic Motor Protection Relay (relay is costing slightly above the thermal OLR) which saves the motor against single phasing, current unbalance, overloading as per Inverse Time characteristic, and Under loading (especially when Freon gas leaks out, the compressor goes to under-load, the same can be promptly sensed by this gadget and immediately alerts the AC maintenance crew. This is available in 3 phase version, but the same can be incorporated in the Single phase Split AC types as well.

EFFECT:- Right time for the Air conditioning users, to replace your thermal OLR and incorporate this Electronic OLR, along with Run hour meter to know the compressor run hours, to strictly save the compressor by this OLR against any electrical faults. Being remotely placed and unmanned, you can be alerted initially Just in time, at the start of malfunction of your AC packages & correct.

## MECHANICAL AREAS- TO INSPECT & RE-PAIR:-

1. This is the time, when you can open up your hotter motor bearings as per your Hotspot log book. Remove the grease muck stuck inside the bearing, de-grease the same, put the speciality grease, Polyurea thickened Lithium complex grease to all your motor bearings, openable type. This type of grease is shear-resistant and works better when handling the tangential loads.

   Till now you had used Multi-purpose duty grade grease and in many of the motors, intermediate rotating components like pillow blocks, tin-rollers, jockey bearing, many rotating parts which now need speciality grease, instead of ordinary MP3 grease.

EFFECT:- Motor losses reduce, Heating at DE & NDE dissipates thro fins, & Efficiency improves gradually, but definitely happens.

2. This will bring down the wear & tear of bearings, least residue left in operation, during periodical pump-up, doubling the re-greasing interval, and ultimately the moving shafts, parts of machine smoothly with the best-in-place lubrication done. Also this helps in reducing the motor power demanded by the load, and as well, catalyzes the productivity of the load, which was not possible all these years due to repeated heavy greasing pumped in your machine bearings and that was not allowing you to ramp your speed further. Many a times in the past, your machines tripped due to overload when resuming after service, due to sheer overloading only by extra grease you pumped already & further added now. The same can be avoided in future altogether

EFFECT:- Motor Losses increased due to heavy & frequently repeated greasing; Grease also acts as silent load to motor. To correct.

3. By now, running your motor & machine for decades, you are aware now where to install Roller bearing instead of Ball bearing. So wherever your ball bearing needs replacement now, means this is the right time to implement now. Also your machine application calls for routine re-greasing of the open type bearing thro grease nipple and expelled thro drain plug. Let us confirm the greasing impulse lines are cleaned, cleared of muck and also freely moving out of drain plug of your motor, ensure your machine bearing has a clear way out to expel the old used grease OUT. When you re-grease, your IN & Out color must be same.

EFFECT:- Right type, size of bearing with more rolling surface area, half filled with speciality grease, avoids power loss in the bearing.

4. Next is the power transmission from your motor to machine. Use your stroboscope or non-contact tacho to measure the slip that is happening in the no-load stage running of your machine. When you are able to define your motor's loading range is say around 60 % only after monitoring for many months before, it is prudent to reduce by re-size your pulleys and belts to your machine's average running KW loading and taking to consideration of your motor and machine maximum running capacity.

EFFECT:- Machine can be ramped to demanded speed with less power consumption by gripping belt, aim for more RPM productivity

5. If you had retrofitted VFD in production machine, you can down-size the over-designed pulley & belts since the installation. It is high time you can change your belting from Vee type to Cogged belting. Having generated say 15 KW at 1470 RPM at the motor, this is getting lost say more than 30 RPM at the machine. This is a visible loss, you are allowing to escape from your hands, that amount of productivity loss is happening in many of your belt driven machines.

   CONDITON Monitor the same now. Also physically check the inner surface of the V pulley for available of grip / glassy / dished out / wornout. If the surface found smooth and nice, better to replace the pulley with optimum reduction in diameter with cogged belts, also inspect all V belts, for damages and plan to swap with cogged belts. Mind you, your Pulley life is only 40,000 hours say 5 years only and if you run more than that, then your pulley is the main culprit to power transmission loss here.

EFFECT:-To restore your machine's productivity to its rated capacity, pulley resize + cogged belt is the very low cost route to achieve.

1. Motor running assisted by the excellent lubrication of its Drive-end and Non-drive end bearings. But the machine running is ensured with almost near zero slip by GRIP only of your belts, which grip the sides of your pulley drives. Any of your belts, which grips the pulley at its bottom is a loss to the system. The above exercise, you must condition monitor and reduce the RPM associated energy losses, especially in the variable torque load type machines like centrifugal blower, fan, pump, in the production machine auxiliary & in utility machines. First categorize all the variable torque loads and saving scope is more there.

   5% speed reduction there, gives 14 % power savings, 10 % speed reduction gives 27 % power savings. So optimization of the above machines using first by the Belt & re-sized pulley sizes, and simultaneously by VFD retrofit here, you have ample scope of 30 to 40 % energy savings based on the part load efficiency of blower & motor. Follow your OEM's Fan curves which will show you the Best Energy Efficiency point in their curve to operate your blowers so as to match process demanded requirements.

EFFECT:- RPM Reduction gives huge savings in variable torque loads as mentioned above, for the same output delivered & monitor.

2. The mechanical sub systems in your production machine and in utility like worm gear mechanism, Pillow blocks in blowers, have the grease and oil circulation is in place. Only the lubricating oil & grease will work better, the used oil & grease which was stuck inside the gear boxes over much longer period, definitely needs to be removed, cleaned inside, and replaced with the latest speciality type lubricants. This will reduce the tare load power consumption of machine. Confirm the KW reading at this stage.

EFFECT:- Excess Grease inside, stuck in moving parts of machine becomes load to motor and waste to production, TO REMOVE NOW.

3. The axial flow fan's suction side to be fitted with bell-mouth shaped duct and discharge side to be fitted with conical duct to enhance the air power & flow for the given KW input. The centrifugal fan's exhaust duct to outside ambient, to be checked for any back pressure, as this will de-rate the blower. So to expand the duct so as to utilize the blower to its rated capacity.

EFFECT:- Your fans are consuming more power till date, now is the time to enhance fan's power at suction & discharge parameters.

4. The pump will have gland leaks during running days, and what all the leaks that affects the working of pump to be arrested. It is time to remove the pump impeller to check whether it is worn-out and correct /replace. Check the pump seals etc for leakage. When you have two centrifugal pumps, run alternatively without load, and record the no-load KWh of each pump.

EFFECT:- Visible leaks thro glands and scales deposited on the impeller & casing, reduces the pumping volume and efficiency.

## PROCESS & UTILITY PIPING TO INSPECT & RE-ORIENT:-

19. The process piping of pumps at the suction and discharge lines, precisely at the suction and delivery flanges need to be fitted with expander jointing. Piping wise, when there is restriction in piping, and then laminar flow becomes turbulent. The same can be avoided by checking the piping restrictions inside the pipes, Sharp bend pipe fittings etc. PCRA says 70 % more pipe frictional resistance in sharp bends than smooth bends. The same can be changed to longer bends, etc fittings to reduce the pipe friction now. Wherever possible, replace the old GI, MS ERW pipes with Rigid PVC pipe for smooth flow of water in process & in utility.

EFFECT:- IDEAL time now to remove the piping scales inside which stagnated near fittings, pump will deliver more flow at less power.

20. Especially in the compressor house, your pipe fabricator would have shown the beauty of his installation. But even if aesthetics is lost, it is better to provide 45* directional connection for two conjoining compressed airlines to header, & avoid T and L sharp fittings. Provide Expanded Duct on top of compressor to facilitate exhaust of hot exhaust air to outside of compressor house.

EFFECT:-Compressor housekeeping by conditional monitoring of compressor intake and delivery parameters makes system Healthy.

21. Provision to be done for automatic drain valves based on the Level sensing type at the compressor house, at the receivers, and at the tail end of distribution network. Each machine to be provided with either Automatic / manual crack open type drain valve at the bottom most leg of each machine's pneumatic Incoming feeder line.

EFFECT:- Water present in compressed air line, will reduce line thickness by scaling, & pneumatic components fail inside machine.

22. Each machine which consumes compressed air can be provided with an air bottle of say 50 liter capacity, like 10 feet x 6 inches dia pipe can provide this 50 liter buffer capacity, so that the machine does not starve due to any sudden demand from adjacent'

EFFECT:- compared to Electric Lag, Pneumatic Lag is more & slow, so these tail end load buffer tanks will ensure smooth operation

23. Thermal imaging during process run hours will indicate the hot spot of non-movement / restricted movement of process flow. The same can be checked now inside the Piping components like Y type strainers, line filters, NRV, check valves etc for any chokes etc. This will ensure free flow of process in the process and utility flows.

EFFECT:- If possible, provide pressure gauge provisions at end to end of the above piping process, to know the normal pressure drop.

24. This is applicable to boiler and steam distribution pipings. Lagging insulation to be maintained not only on pipes but also on fittings using box type insulation measures. Moist Insulation is a killer, & this will become good conductor than worse insulator.

EFFECT:- Steam becomes wet at points, where it is opened to breathe out thro nakedly thro the flanges & fittings. Minimize them.

25. The steam lines right from the boiler delivery to all the usage branch headers, near to the load end, the moisture separator costing around 10 K Rs to be fixed so as to improve the steam dryness fraction and improve the productivity, more fuel saving, and less run hours. This is not at all done in all the package boiler areas. If this is done during this period, this will give sudden improvement in steam based indirect heating process to the industry. It gives many benefits direct and indirect to the users.

EFFECT:- PCRA case study shows 10 % fuel saving & productivity improved by adding this Moist Separator in small size package boiler

26. This is not only applicable to steam header. The steam header needs this Moisture separator retrofit near the boiler, in the Header pressure reduction station, at the intermediate header and at the tail end of header before entering the machines. Provided the machines need only indirect heating of steam. This is very much used in the compressor house as water separator. If not provided or not working now, it is better to make them work, to avoid moisture ingress in the compressed air header.

EFFECT:-Moisture ingress in airline increases pressure drop. In steamline, this Moisture separator reduces steam based productivity.

**27.** The steam enters the load first and after coming to condensate header, have two types of traps like the Float trap, Thermodynamic trap. Strip open the traps and leak correction to do now to reduce the steam reject to the condensate drain. Air vent in the steam header pipe to check for fool-proof working, its malfunction will dramatically affect the steam system.

EFFECT:- Airvent, the neglected device, during boiler startup, but very vital to make it function ok, dramatic improvement instantly. Traps silently drain the precious steam to condensate line, to correct the minute leaks now by opening up and correcting.

28. Read PCRA's steam conservation tips, the condensate return line needs to enter the feed water tank from top, reach near to the bottom of tank, have perforations at the bottom leg, to increase tank temperature, and reduce Flash steam to get out from top.

EFFECT:- Condensate return means water + but high temp steam must return to feed-tank, around 70 % steam returned back.

## PROIVISON TO MAKE IN PIPING FOR CONDITIONAL MONITORINING MEASUREMENTS:-

1. Provision of Basic, Power and Energy parameters in the Multi-function meter in all the SSB at field and in MV panel. BEE recommends to KWH meter for any motor above 10 HP running for two shifts a day or 6000 hours/year. If possible install a Run hour meter costing only Rs.400/- if your machine is not run fully always. Both the KWH & Run hour will indicate loading health.

2. Provision to be made in the piping so as to measure the compressed air parameters, to measure air intake FAD, (this is there for name sake in all the air screw compressors, need to measure accurately now) Pressure points to provide to measure the Difference in pressure across the Ref dryer, across the filter, pressure and temperature gauge in air receiver, and dryer.

3. Refrigeration Dryer healthiness can be confirmed with temperature gauge monitoring at dryer feed pipe at ambient Plus 5*C approx and at its delivery pipe as ambient Minus 5 *C approx in your daily routines, or the difference in temperature between the feed and delivery pipe must be around 10 *C near the Ambient. Digitalize the pressure gauges at compressor house, distribution ring main header, end-to-end, near heavy load ends, and in tail end receiver, or at heavy consumer. Provide Audio visual Alarm in the pressure gauges, to monitor any sudden fluctuations, when any leak occurs or any phantom load chips in.

4. Provision to be done suction and discharge pressure gauges (impulse line to be given in helical coil format like seen in automobile garages, and resistant to vibration) and temperature gauges (if pump used for heat transfer application) thro impulse lines, and the gauges to mount on pipe stand or wall near to piping. What we see in existing pumps is that, pressure gauges on pumping lines, with the gauge needle thrown out of scale due to pump & pipe vibration damaging gauge in few days.

5. Process & Instrumentation diagram for any industry calls for Block and Bleed type Isolation valves to be fitted on the pipe and then run impulse lines to the pressure gauges in the machines, process piping. Pressure sensing point can be mounted on any header, so as to measure the streamlined pressure and not to fix adjacent to any pipe fitting near, as they will make it turbulent.

6. For the temperature gauges, provide over-sized longer Elbow bends first in the line, at the bend point and facing the direction of flow, weld the thermowell to house the temperature gauge into that later, taking care elbow is not inserted to much to obstruct the flow. Because Pressure is a fast varying process variable and temperature is slow varying process variable, the selection of the sensing point to fix the above is to be done as per your OEMs recommendations and the process experts.

7. Provision for the pressure and temperature gauges (with matching range & size) across all the In & Out pipes of Heat Exchangers, cooling towers, and especially in the Refrigerated Dryer In & Out piping in your compressed air system, in the process and in utility machines, and plan to hook the gauges with impulse piping to allow the gauge to work for longer years.

8. When the present machine OEM started fixing digital pressure indicator in a 2 inch square box in your FLR, Air Filter Lubricator & Regulator, he wants you to follow that he feels precious about compressed air. Plan to fix minimum 4 inch dial gauge for compressed air measurement in your compressed air line, and 0 to 10 Kgsc Bourdon range, and not to over-range to 16 or 25 Kgsc. Your reading resolution is lost. Also you may provide a digital pressure indicator in the compressed air header, viewable with audio visual alarm by all in the department; the compressed air user must know why the compressed air pressure drops suddenly, when they open up any machine or for cleaning or any huge intermittent leak that goes un-noticed till date.

9. Check all your Pneumatic connections inside the machine panels, open out, and remove any water inside the air impulse tubing. Check the FLR, Air filter-lubricator-regulator is clear and clean and the oil filling & re-filling duration in the lubricator is as per the OEM's instructions. This is the time, the Poppet type Air solenoid valves, Electro valves, and Bleed type valves need to be opened out in case of any suspecting mal-function, lubricate the Neoprene O ring liners, not to allow them to brittle further.

10. We have to attend to the cause of any malfunction, the moment we are alerted from the monitors. If you prioritize in your breakdown to focus on the Cause and not on the effect, this type of maintenance related breakdown will not repeat again.

11. Also the Electronic Motor Protection Relay which saves the motor against single phasing, current unbalance, overloading as per Inverse Time characteristic, and Under loading ( especially when Freon gas leaks out, the compressor goes to under-load, the same can be promptly sensed by this gadget and immediately alerts the AC maintenance crew. This is available in 3 phase version, but the same can be incorporated in the Single phase Split AC types as well.

**12.** Plan in your DG system, to condition monitor the air intake gauge pressure, Units per Liter of Diesel, with a multi function meter to show the basic, power and energy parameters including the THD values. Like compressor, DG also needs cool dry air intake and not to be starved by choke in air intake filter. Plan to provide the Condition monitor to DG air intake filter.

**13.** Also duct out the DG air intake to a cool dry zone in the DG room. Like compressor house, DG room needs not only adequate but more sufficient ventilation all around, so that the DG house temperature is not crossing 5*C above the ambient. Also plan to retrofit thermostat operated Diesel air cooler so that the Diesel returning to tank is regulated around 40*C temperature, as Diesel combustion is better at its optimized viscosity CST around 38 *C.

**14.** Provision to be done for measuring the boiler feed water temperature near the boiler entry point of feed water line and confirm the % savings of feed water rise by every 6*C (In many installations, temperature drops from feed water tank to the point of entry in the boiler due to naked piping & fittings, moistly insulated as well), Flue gas temperature with Audio visual Alarm to alert the operator about the need of putting the fuel slowly and steadily inserted.

**15.** Provision for static pressure measurement in the productive side of blowers, (till date, industry has not measured this Static pressure as there is no provision done) and as well in delivery, temperature of fluid across blower, fan and Delta pressure monitoring across the pipe line filters, etc. All the above parameters contribute the blower's running efficiency.

**16.** Provision for compressed air header flow meter monitoring, at compressor house, at the heavy load area feed header. This is going to define the compressor SEC on daily basis giving the totalized CMH per KWH consumed by compressor package per day.

## CONCLUSION:-

Macro viewing the industry now at this time of crisis, cost cutting in production is first and foremost point, industry needs to focus in first few months of production. This paper not only speaks of reducing energy proportion with respect to varying production levels, but also asserts that this is wake up call to the industry to overlap your maintenance practices from time & safety based practices to the condition monitoring & maintenance based practices in your workings of production and utility machines.

Ex/- Instead of allowing your air intake filter in your compressor, to choke to the maximum Pascal of 5000 Pascal till the stipulated hours mentioned by the OEM say as 3000 hours to replace, you can condition monitor the filters based on the Delta P monitors that prompt the choke level of filter, start cleaning the same once it crosses 1000 Pascal filter pressure drop and repeat the same on condition basis to maintain the pressure drop at 1000 + Pascal till the 3000 hours & extend its useful life. This improves compressor health, Free Air (instead of starved air) Delivered during run hours and its SEC is maintained. The same example can be applied to water, process fluid, Diesel, Oil etc lines and see to it that you get optimized output from them on condition monitoring.

A machine or system with defect inside, cant' catalyze you, but only act as barrier to achieve energy saving or conservation or optimizing the same to the required norms, compared to others in industry. So remove the defects in your system in the first stage and then only plan for next ie energy saving. This is Easy and Affordable, cost-effective route to correct the energy losses as Nipping in the Bud stage, the wrong ones. Kindly remember what our Beloved Past President Dr. APJ Kalam said, the T & D losses is the first priority area to be corrected in the National Electrical Power distribution segment. The same is applied here to the industry on the micro level monitoring aspects. Your industry is paying huge Electricity & Fuel Bills every month; you can see now what the same T & D LOSSES is seen inside your industry under your surveillance. What is the Energy Total parameters received at your gate, and what is the sum of Energy output parameters given to the load at each machine, there is a big difference from 10 to 30 %.

This is the Losses Between your Cup and your LIP. Refining of the energy input to the machine and process at machine & process end is the first and foremost, BUT the least-expensive route towards energy conservation in any industry. BEE Manthra always says, KYC, Know what your machine consumes, where you note the difference between name plate specs and the running parameters, & now, there is scope of energy savings, especially in TARE Load Energy consumption of your machines & utilities.

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