Electricity Lost between the Cup & the Lip in the Textile Mill

Introduction:

- We find now in the textile industry, the precious Electricity is dissipated partially in the form of heat in stages from the Electrical distribution network to the textile machines & textiles' utility. The mill is silently losing energy heavily and the productive output of the mill is coming down. So to improve the output to meet the production targets, the manager is overloading the machines and thus accelerating the ageing of machines. If we improve & make healthy the operating parameters of the active & passive sub systems of the mill, we can achieve steady and gradual increase in growth rate of production and the losses reduce automatically.

Electrical parameters pro-active to production:

- . Presently the textile manager gives priority to its production only ie using the electrical utility to assist only the production and not to record its electrical health. So both instantaneous and trending measurements are important. The low cost clamp on power meter is costing less than Rs.9000, which has become affordable now.

- The instantaneous measurement-using clamp on meter gives an indication of machine health. The cumulative measurement using the same clamp on meter cum analyzer gives indication of production health ie productivity. So the electrical utility should ensure first its best maintenance and equally concentrate to assist textile production in finding UKG per machine.

- In India, Large Scale process industries are contemplating to continuously use the smallest infrared thermal imager costing in lakhs of Rs. to find out where they are losing energy and where the safety is failing in the plant creating fire & safety hazards. The textile mill nowadays needs to resort to use the basic infrared gun to pinpoint where the energy is lost in the mill. This costs less than Rs.5000 only, but the user can take numerous readings using the same daily.

No-load characteristics during Motor Service:

- The open shaft speed, power on no-load before and after the service on the motor on any machine say like ring frame etc. shows the improvement in effciency after servicing the motor. So the service crew must analyze the motor characteristics like electrical parameters of input & output ie the speed on the shaft before taking the motor for service and after service.

Bearing only is protected or motor made comfortable?

- For a motor of 24 hr 365 day running nature in a ring frame like application. The motor bearings facing a temperature of 100 * C and above due to non-stop running of the motor. They definitely need a better lubricant grease ie high temperature grease as well it should withstand the mechanical shear stress capability. After all the motors are belt-coupled to the load and the bearing has to withstand the tangential stress. Hence the grease applied should be right in quantity and more stringent in quality and practically speaking, the grease must remain in shape and color as left before in the previous servicing.

- In many mills, we find the maintenance crew use Multipurpose or all-purpose grease especially for ring frame motor applications. After a month onwards, we find the grease has dried partially in the bearing, or oozed out of the bearing very early. This is a very unhealthy sign. Here the mills lose energy in the motor itself before transmitting to the load condition. That's why many a motors are running hotter even at low spindle speeds and eating the profits of the mill.

- Here we find in some other mills, the extra cautious user sees to it the bearing is protected at any cost and uses high quality, long life, and heavy cost lubricant grease. But we must bear in mind that greasing the motor

bearing is not to protect the bearing only, it should catalyze the smooth working of motor at less power cost ie its lubricity is more important in comforting the motor and not its sturdiness or long life.

- Practically what is happening in many mills is that, many mills are using Rs.80 / KG grease for motors. But some mills spend even Rs. 800 / KG and much above rates for special grease to comfort the motors. Let us think about the losses increasing in squeezed motors and comfort the motors from now onwards for better motor efficiency.

- The motor user must think that his motor running with dried or heavy viscous, or oozed out grease in the bearings is like the bullock cart gliding up the upward slope road. If the same motor is lubricated at right interval with right quality & quantity then it is like the same cart gliding down the downward slope road. Hence the prime mover greasing is given more priority, when compared to the load end greasing.

Electricity is made useful to the mill:

- The Electrical man responsible in the mill must measure and record the details of the power input supplied to each of the motors in the mill like KVA, KW, KVAR, PF, I. But the same electrical man must be motivated to do the following routines intermittently: -

1) To reduce the power input to each of the motors for the given load.
2) To coordinate with the production to reduce & sustain the motor load
3) To run the motor at the band of its peak efficiency.
4) To find the optimum load ie spindle speed for the given count of yarn.
5) For the given count, do the frame-to-frame analysis to study the Electrical parameters on load,
6) Create bench mark in electrical parameters with cross reference to all the Adjacent similar frames
7) Use the specs given by the motor & machine manufacturer or use industry Segment reference

Voltage drop Losses in each motor circuit:

- The break up of T & D losses prevailing in the Indian industry indicates that the losses are much less and steady in transmission compared to losses occurring in Distribution. Also the distribution losses are varying with respect to time, load and other circuit parameters. Hence frequent monitoring and curtailing the distribution losses is part of daily routines of the Electrician in the mill.

- For example, we find in mills, that the voltage drop in 415 volt arm from the electrical room to local distribution loads is less and constant. But we find the voltage drop is more from the SSB to the motor panel; and still more losses occur from the running delta contactor of motor panel to the motor terminals. This is clearly evident and an avoidable loss in the case of ring frame applications running with 34 KW motors and above.

Few Rs. More in Electrical panel gives much more savings:

- From the electrical distribution, we see lot of network losses. First we check again the proper cable lugs of correct metal and size is used in machine end terminals. We see joints, terminal connections getting loose, heated up, damaging the sheath, terminal strip etc and motor goes for single phasing & load unbalance results. In some mills, still the round type closed terminal strips are used even for motor power connections. Here the flat type open terminal strips of suitable higher current rating is a must to replace. The contact surface area will be broader, mating of lug with terminal is fastened broadly and this reduces risk of unbalance.

- In a given panel it is easy for the electrician to check on line with the voltmeter. He checks that the voltage drop on the same phase between incoming & outgoing wires across the switchgears etc components in the panel is very much less than a volt. He can have cross-reference with the other two phases at the similar points in the panel. Nowadays, the electrical power loss in the panel is going more and goes unnoticed often.

- Here is where the electrician makes use of the infrared gun conveniently and quickly to assess the panel health. The basic principle behind infrared imaging on the electrical systems is that high resistance usually indicates the electrical faults. When you pass a current through a high resistance point in an electrical system, heat is generated at the point of resistance and spreads.

- Normally in any electrical system, when the fault occurs, the first symptom is abnormal heat rise. The second symptom that occurs only next is the change in voltage levels, & the current levels. Hence it is the alert electrician who first finds the fault (that time, the fault is also minor) before the next stage where the fault leads to electrical parameters change and consequently the electrical breakdowns, fire, unsafe hazards etc.

- The mechanical maintenance man also alertly finds first the abnormal heat especially in alignment or bearing or coupling. Before the next bigger fault like vibration, bearing failure, belt problems etc happens he is prepared to prevent and rectify the fault before becoming from minor fault to major breakdown resulting in loss of machine available to production.

The Existing motor is Efficiently working or not?

- We know for example on a 34 KW ring frame motor, not all the input power is converted and transmitted to output shaft, due to the loss of energy conversion and transmission. So to reduce the losses, which exhibit outside the motor as heat in the fins, we have to ensure forced cooling positively. After all, the motor manufacturer has enclosed the motor cover with fins so as to quickly dissipate the heat from the motor. So let us take care to remove the fluff, which falls, & covers the motor fins and allows the motor to breathe and not starve. In some mills, the user fixes a netlon mesh on the fan cowl especially in short frame motor so that he clears the fluff hourly which sits on the mesh and ensures the motor gets good throw of air surrounding the motor.

Motor cooling by hot / cool surrounding air?

- Here in mills in the ring frame area, we notice that the motor itself runs hot and the motor is washed with hotter pneumafill air. This is analogous to the man who sits in the room below the open terrace in the building feels hot due to the summer heat. He switches on the ceiling and now he finds himself more hotter, to make the things worse. Similarly, the hot ring frame motor becomes hotter on motor washing with hot air. Hence the mill should act upon this problem to provide relatively cool ambient air to force cool the motor.

- 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.

Few watts loss yield better motor productivity?

- As per PCRA booklet on motors, one Motor manufacturer uses a cast iron impeller instead of plastic fan in his EE motor design for forced cooling off the ribs of motor; and the same manufacturer uses plastic fan in his Standard motor. What we must understand is that few watts more loss at non-drive end will definitely improve overall health & efficiency. Active ventilation and forceful throw across motor fins will show few more watts input but in the long run this reduces the losses of the motor

Loading Vs. Efficiency

- Generally speaking we study the Efficiency of any machine and then only decide its optimum loading. As an analogy we ask ourselves whether we eat to Live or Live to Eat. If we are Eat to live people we eat for us and productive to others. On the contrary if we live to eat, then we are living on earth only to eat for ourselves only & we are unproductive to others. Similarly we study the ring frame motor load & no-load characteristics and decide whether the motor serves the mill or a liability to the mill.

- We try to load the motor in healthy way such that the full DOFF position is attained at the 90 % loading maximum of the motor and not more than that. In some mills, motors work around 100 % capacity and we find motor struggles to maintain the output due to slippage. It is like a man starting to run like 100 metre dash in the cross-country race 10 km run he has participated. He gets tired due to his quick burst of running but he could have achieved with sustained steady running from the start. So we have to run the motor at its optimum capacity for better benefits in the long run. We have to check the motor characteristic with the manufacturers' test certificate. We first check how the motor can run its optimum loaded condition COOLY and the rate of temperature rise is gradual.

- In mills, where condition based monitoring have become daily routines; the electrician checks the power factor of ring frame motor often (in the capacitor cut-off condition at motor end). This higher PF at empty and full DOFF positions is one of the symptoms of motor and alignment health. So he shrewdly diagnoses the motor condition inferentially. We have to see that the PF index is steady over years of running of motor right from the manufacturer’s test certificate at the time of commissioning till date. If the motor by itself can maintain a PF of 0.8 and above from empty DOFF and above, it is one of the good signs of running well.

Conclusion:

The textile mill must adopt a stage-by-stage approach on regulation of the mill ‘ electrical inputs. The stage wise regulation in voltage, power factor (nowadays the APFC panel finds partial usage in spinning mills) gives the mill immediate payback The textile manager is now fully concentrating his attention in yarn input and output of the mill as the electrical inputs at the load ends have now been regulated, metered, steady and safely entering at the textile machines.

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