Maintenance - A Knotty Problem

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ABSTRACT

Maintenance - A Knotty Problem has been compiled by the author based on his years of maintenance experience in prominent paper mills like Star Paper Mills Ltd., Seshasayee Paper & Boards Ltd. And J.K. Paper Mills in India and Korsnas Marma in Sweden, during 1960 to 1976.

Reasonable reduction in the shift strength of maintenance was achieved by closely monitoring the inspection and checking schedules in the general shift. A close cooperation with the operations department enabled to utilize every stoppage of 30 minutes and above to check/ inspect minor equipment like pumps, agitators, values, steam joints, belts and couplings etc which are responsible for ugly breakdowns thereby causing a lot of downtime. With close planning the knock down paper machine wire change time could be reduced for about 6 hrs as aganish 10 hrs earlier. The manpower employed for wire change could be drastically reduced from three shifts dreugh of machine and maintenance by about 50%. Thanks to proper planning and scheduling. Earlier the maintenance jobs taken in hand during wire change had to be boxed up without any repairs for one season or the other. It was a sorry sight to see so many people in so small an area, all busy and giving instructions, yet achieving little and costing a lot of man hours.

Then there have been instances when the wire was patched up many times without any mention of time taken for it in the logbook. Even a wire change took place during the time booked under mechanical down time for doctor passing, for pump problem and finally the problem on Electro Reeler. One department gained over other but without any positive advantage. Another time chippers were shut because Silo was full, but then shortly after when Silo space was available chippers needed knife change. Total lack of coordination.

These are some of the problems, which motivated the author to compile this article. The various trips abroad to mills like Korsnas Marma in Sweden, Davidson in Scotland, Appleton and Union Pacific Mills in USA, during 1984-1993 gave a clear picture of mills that were highly instrumented and automated. yet they could not do away with the welltrained & well-informed workforce. The mill was divided into many routes. The mechanic/supervisor took one of the routes on

fixed frequency and literally listened, felt and smelled his machines. The observations were filled in a card and deposited at the end of the round. This exercise took no more than 2-3 man-hours per day/ week or whatever the schedule said for the particular route. These observations helped them to plan the maintenance schedules.

It is these systems which form the backbone of efficient maintenance. It is also necessary that the efficiency of the work done be quantified in terms of cost/man-hours/production. This as explained in the article has been taken from the mills visited abroad on various occasions. Such visits also gave the idea of the rapid pace of technology upgradation in those mills, while we had been busy talking about the "NEW MILLENIUM". We are almost into it now-can we gear ourselves up now and enter "2000" with a bang. Hopefully "YES", if the economic scenario and market in India would permit.

INTRODUCTION

The Indian Pulp & Paper Industry is in a difficult situation. Increasing costs of inputs, plant & machinery and sluggish market condition, have necessitated practice of efficient and cost effective maintenance. Lack of training and skills of the work force has created a vicious situation where the engineer has to spend a lot of time educating his crew rather than planning the maintenance. The right tool, the right spares and the right man, backed by the right "KNOW WHY" are the fundamentals of good maintenance.

The lead-time of spares, dependence on imports for quality reasons, the non-availability of present day contemporary technology from Indian Machinery manufacturers is adding to the miseries of the maintenance engineer,. To what extent will an average mill in India be benefited by installation of sophisticated controls or systems is worth a serious consideration before making any heavy investment in this direction.

PRODUCTIVITY IS MAINTENANCE

We all know that good maintenance is the key to top quality and productivity. We talk of loud sounding systems and high tech design parameters. We forget that even today Scandinavians and Americans have not done away with the basic maintenance techniques like LOOK, LISTEN, FEEL AND SMELL, even though they have the best of condition monitoring equipment. The basic technique still remains training and a caring work force.

It is an easy matter to measure productivity of the production department, but what about maintenance? How effective is it ? And how can we quantify it?

The trend in our own country shows that many large and old units closed down leaving bigger and more modern units. The capital costs of these mills are much higher, and consequently, downtime costs are higher. This in turn, is a major reason why efficient maintenance is increasingly important.

With the automation in paper mills there would be substantial decrease in operating manpower, but the decrease in maintenance manpower shall be on a lower scale. With sophisticated controls, process operators would be functioning like drivers of process from a central control room. But specialization and skill requirement of manpower, for upkeep of sophisticated equipment, will be higher and of varied crafts. In a highly automated mill of today, the maintenance personnel might be as much as 70-80% of the total employees. Productivity will depend more on reliable and maintainable equipment and efficient maintenance, than upon efficient operations. Flexibility

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and the ability to change according to newer systems and equipment are important management assets to remain competitive. A truly flexible and well-trained work force could cut the total cost of salaried and hourly personnel by a fair percentage, thus significantly contributing to staying competitive.

"KNOW WHY" THEN "KNOW HOW"

Improvements in maintenance efficiency and equipment most often mean change. To change equipment involves perhaps 10% people and 90% technology to change maintenance practices involves perhaps 90% people and 10% technology. Tools, like equipment for condition monitoring, repairs, or computer systems are easy to change and use, but people are much more difficult to change.

The keys to improved maintenance and equipment efficiency are information and training. Information concerns "KNOW WHY", then "KNOW HOW". The know how is a part of training. We cannot expect an individual to change before he/she knows why and the benefits for him/her. People understand and accept common sense but too often make things more complicated than they really are, by adopting an approach based on high-tech design philosophy, which is not common sense. Too often we are paranoid about keeping people busy and forget that being busy does not necessarily mean productivity. Work measurements and "percentage of hands on measurement" are examples of methods based too much on the approach that busy maintenance personnel are more efficient than non-busy personnel are. However maintenance costs and equipment downtime may remain high whatever the figures be from such studies of work measure. The people measured almost never accept such work measures. The result of maintenance would better be assessed by dividing prime tons produced by maintenance costs. If equipment is up and running, people are less busy than if equipment is down for repairs.

When equipment is running, people can focus on doing the right things. When equipment is down because of a breakdown, resources have been trapped in a situation where they apt to accept wrong things. The right approach is therefore to prevent breakdown from ever occurring.

"FIX-IT" OR PLAN IT

Most maintenance organizations spend a great deal of time on "Fix-it" maintenance-often carried out at short notice and without planning. This type of maintenance is expensive and results into great deal of downtime.

Unplanned maintenance can be defined as all maintenance jobs with short lead time than same day. These jobs are more often but not always associated with down time. Preventive maintenance has the most significant impact on reducing the unplanned work. This calls for discipline while scheduling a job and setting priorities.

In a mill with effective preventive maintenance system, the percentage of unplanned work can be well around 20% for mechanical and electrical equipment. Mills abroad are striving for 5-10%. An unplanned job always involves "wasted time" which can be defined as all work which is not doing the right thing with the right people and with the right tools. This includes for example, time to find people, time to find out what to do, time to find technical documentation, time to find spare parts, and so on. Such "wasted time" which could be as high as 70% of the total time taken for "fix it" maintenance. This leaves the door wide open for further "wasted time" on the same job in future.

The main contributing factors to wasted time are : low levels of skill, lack of flexibility in maintenance and operation organization, the ease with which spare parts can be located and lack of access to technical documentation and so on.

The most essential ingredient for a good maintenance is the skill of the work force. it is the lack of skill which is responsible for poor maintenance systems in Indian mills as compared to our counterparts in Scandinavia and USA, where the supervisor/engineer does not need to instruct and educate his staff as much as we need to in India. His role could merge with that of planner since he has a good skilled work force. The lower the level of skilled hourly maintenance people employed, the more time a supervisor/engineer must instruct and more the supervisor/engineer needs to be supported by a planner.

To quantify the philosophy described above, the percentage of unplanned work(U) is multiplied by the percentage of "Waste time" related to unplanned work(W), will give the improvement potential , e.g. if 70% is "U" and 50% is "W", the maintenance people efficiency improvement potential will be 70x50/ 100 = 35%. This can be plotted as a graph also.

EFFICIENCY AND MEASUREMENT

The prime goal in a maintenance operation is the equipment efficiency or health. The secondary goal is to deliver equipment efficiency as cost effectively as possible. Most mills seem to turn this goal upside down and focus too much on cutting maintenance costs. This can be done for a short period of time, but has to be paid back later.

The measurement of goal for maintenance operation should be as stated above. Prime tons produced divided by cost of maintenance i.e. PT/M. This factor stresses two things, firstly quality and secondly contribution made to output by maintenance.

The approach that maintenance firstly delivers equipment efficiency and secondly does so in the most cost-effective way, is the prime concern and sole aim of good preventive maintenance system. The quality of equipment available in our country makes the task a little more difficult, e.g. as compared to our counterparts in developed countries. They not only use about 70% more stainless steel as compared to our mills but also have easy and economical availability of equiment with present day technology, which in turn makes them energy efficient and long lasting.

Maintenance is a long-term undertaking that starts when equipment is designed or a production base line is designed and ends when equipment is scrapped. this is called life cycle cost (LCC).The concept should be well considered before going into the lowest priced equipment.

The goal of reducing downtime and quality losses has to be a joint venture between maintenance and operation personnel. It is a common practice to divide downtime and quality losses into maitnenance and operations losses. If the maintenance department manages to have some maintenance downtime reclassified as operations downtime, the maintenance people might feel happier. The operations people will feel the opposite, and nothing is accomplished in overall production output. This constant argument between operations and maintenance is an international phenomenon. Therefore measure of overall equipment efficiency is

$$\text{OEE} = \frac{\text{UP TIME}}{\text{UPTIME+DOWNTIME}} \times \frac{\text{SALEABLE}}{\text{SALEABLE+REJECTS}}$$

Assuming that available days are 365/yr record downtime and quality losses by symbols and not by department. Use this information to analyze the cause.Design out the problem.

MEN AND MEANS

Change from unplanned to planned maintenance can only be done by changing people which can only be done by "KNOW WHY" training and information to increase acceptance.

Believing that we have planned the maintenance because we have planners and systems including even work procedures do not hold true. The truth is that often planners do not plan because they have nothing to plan. They are "go-fors" for foremen/workmen or if at all they do plan, only a small percentage is executed as planned and the balance contributes to a high "U" factor because of add on jobs. The reason for this situation is often that it is not based on a common sense approach and too many jobs are planned starting at the same time. thus the planning efforts are wasted.

If our preventive maintenance system could be based on condition monitoring, it would be an ideal situation. this would include basic measures such as observing the wear of chain, pulley or a rotary joint carbon ring, through more sophisticated methods using infra cameras, wear particle and vibration analyses, and information fed into a computer. Due to multiple variables from machine to machine and mill to mill, today there is no computer system package, which can provide a composite maintenance module.

Therefore with the data from condition monitoring devices, the work will go back to the planners of the preventive maintenance system, of course with the computer to aid them.

Basically in a paper mill, there are a lot of areas which do not require the high cost sophisticated condition monitoring equipment. These areas can be covered by committed and trained people using accepted basic maintenance techniques like; look, listen feel and smell. Even in the advanced countries, inspite of availability of high tech equipment, these techniques are still in vogue.

With a caring work force attention paid to lubrication practices, pumps, gearboxes, agitators, fans, their couplings, chains, belts, flanges, valves and motors and switchgears which constitute a high

percentage of equipment spread over a large area, in most paper mills, a lot of unplanned downtime can be saved. As compared to major equipment like refiners, boiler feed pumps and paper machine itself, they may appear insignificant, but the fact remains that they do cause a lot of wasted time. Once they are under control the left over equipment is few major ones, which are always under the watch of operation and maintenance organization. Everybody is concerned about their health. A computer aided inventory control and data bank together with modern gadgets for condition monitoring would certainly make maintenance more effective; but the very base of efficient maitnenance will always be trained and skilled people, using basic techniques of listening to their machines and feeling them to develop statistical data to determine "KNOW WHY" and plan out efficient maintenance

CONCLUSION

It can be concluded that it is not possible to incorporate condition-monitoring systems in an entire mill, since there is no such versatile software package that can cater to the highly variable conditions from mill to mill.

The well-trained and educated workforce shall always remain the backbone of efficient maintenance. The attempt should be to achieve maximum percentage of planned maintenance and minimize the breakdown repairs for best, cost effective maintenance. Modern information technology should be extensively used in developing statistical data to plan out the efficient maintenance, reducing unplanned work. Measure overall equipment efficiency and record downtime to analyze the cause. Avoid logging downtime under departments.