Modern maintenance practices and import substitution in pulp and paper mills

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ABSTRACT

High productivity in pulp and paper industry can be achieved by efficient use of modern maintenance techniques available. This paper deals with the preventive as well as corrective maintenance methods used for the various equipments that can be classified as rotating systems, pressure vessels and the structural. The causes of equipment failure and the various techniques available to present day maintenance engineer have been discussed. The use of computers can be of great assistance in information gathering and retrieval on various aspects of maintenance and spare parts management and result in considerable cost reduction. Various areas where import substitution can be practiced have been identified.

INTRODUCTION :

Maintenance has to play a very significant role in pulp and paper industries to improve productivity by reducing costly downtime.

To achieve this we may have to introduce several modern maintenance techniques which are further dealt in detail. Now a days, computer aided maintenance system is being introduced to have right data at right time to facilitate maintenance functions to work efficiently to achieve the goals.

MAINTENANCE FUNCTION :

Maintenance, may in simplest form be defined as all such activities which enable the plant to run at optimum level and this involves following conduced approach :

a) Plants and machineries are available as per production need;

b) Plants and machineries are giving desired output of specified quality norm;

c) Plants and machineries are maintained to fulfil its life cycle expection;

In paper industries following points are to be considered while planning for maintenance.

1. High speed/high temperature/high pressure equipmente;
2. Corrosive environment ;
3. Varieties of material of construction;
4. Advanced Instrumentation and control system.

Equipment may be classified in the following major types :

1. Rotating systems : Pumps, Compressors, Rolls, Gear boxes, Turbines, Chippers, Refiners etc.
2. Pressure Vessels : Boilers, Condensers, Storage tanks pipe lines, Heat exchangers etc.
3. Structurals : Support structures, Frame works etc.

The major causes and resultant feature could be because of vibration, tribological fault, fluid action, high temp., electrical fault, metallurgical deterioration/ faulty material and environmental attack.

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Basically maintenance can be broadly divided into two main groups :

1. Preventive maintenance :
   Activities carried out to prevent the failure or detect a failure before it develops into break-down.
2. Corrective maintenance :
   Activities carried out to correct the faults.
   These maintenance types can be further sub-divided as below :

1. PREVENTIVE MAINTENANCE :

Direct	Indirect
	Condition monitoring
	Corrosion monitoring and control
	Tribological consideration
	In site repair & reconditioning
	Inst. & controls

2. CORRECTIVE MAINTENANCE :

Unplanned : Planned

DIRECT PREVENTATIVE MAINTENANCE :

The normal practice of avoiding breark downs include regular cleaning of the machine parts to avoid foreign material entry into the system. Lubrication of all parts in all sections is undoubtedly an age old practice. The method of lubrication may depend on the approaches available. Classic examples are the crease lubricating system, oil lubricating system and for non approachable places the central oil lubricating system (eg. for dryer group bearings). These type of adequate preventive maintenance have been practiced before the advent of modern tools of preventive and predictive maintenance. Added to these, replacement of susceptible parts earlier to failure after fixed time intervals will help in preventing break downs. Also bearings and parts of pumps needing replacement can be changed so as to have smooth runnability after the equipments start up. Such a preventive maintenance on stand by equipment is important for minimising production loss.

INDIRECT PREVENTIVE MAINTENANCE :

1. Condition Monitoring :

Under this heading several techniques may be adopted as follows :

a. Visual monitoring.
b. Performance monitoring.
c. Vibration monitoring.
d. Shock pulse monitoring.
e. Temperature monitoring.
f. Wear debris monitoring.

a) Visual examination some times reveals, sign of failure. Simple aids like microscope, stroboscope dye penetrants etc. can qualitatively throw much light on types and nature of defects developing in the components. For example in pin and bush type couplings, the wear of rubber bush can be easily checked by marking the cupling halves. Under load the marks gets separated.

(b) A machine operating condition can be assessed by performance assessment of comparing inputs and outputs. The component behavior can also be assessed dcpending upon the type of component.

a. Stationery and stressed components	:	By strain measurement crack detection.
b. Bearings	:	Temperature measurement, shaft position/ clearnace measurement.
c. Seals	:	Leak detection.
d. Pumps, pipes/valves	:	Pressure drop/flow relationship.

In case of refiners at CSRMP the power consumption per ton of pulp is used as criteria for disc replacement.

c) This technique ean be easily applied to rotating machinery. All the rotating machinery components vibrate. The nature and magnitude of vibration of a particular item of a machinery can provide valuable information about its condition. There are wide range of electronic equipments, by which the vibration parameters can be regularly recorded. By analysing vibration parameters such as vibration velocity, vibration amplitude, vibration accln. against frequency most of the defects of rotating machineries can be identified. This technique can be utilised for critical equipments by frequent measurement of vibration values. Thus the equipment health can be monitored on a continuous basis. This technique is more suitable for dryer section

equipments because any maintenance on dryer section needs more down time resulting in loss of production.

d) This technique utilises monitoring the condition of antifriction bearings. The shock pulse meter is used to measure the shock impulses produced by the impact between rolling elements and the surface defects. The interpretation is simple and fairly straight forward.

e) Measuring temperature yields substantial information about machinery condition. Simple aids like temperature crayons and temperature tapes are handy in monitoring temperature of bearings, motors, gear boxes etc. Any abnormal increase in temperature indicates symptoms of unhealthy running of machinery. This technique is being adopted for monitoring temperature of machine drive gear boxes, vacuum pump gear boxes, etc.

f) Wear debris monitoring involves the monitoring of lubricants for presence of wear particles. The relative movement between components gives rise to various types of wear processes. These processes generate typical wear particles which after examination can be correlated with the part which is wearing out as well as type of wear taking place.

For taking up condition monitoring in plants following steps may be followed :

Identification of parameters to be monitared in equipments like vibration level, shock pulse values of bearings, temperature level.

Identifi ation of monitoring techniques and thereby selection of right types of instruments.

Frequency determination of monitoring based on criticality of the equipment.

Base line data development of various parameter.

Training of personnel, placement of personnel for carrying out the work and also for analysis.

2. Corrosion m nitoring and control :

In paper plants there are key areas which require attention pertaining to corrosion prevention.

a) Material selection for fabrication of equipments to withstand operating condition.

b) Application of preventive methods for water side corrosion.

c) Control methods for mitigating environmental attack by adopting suitable paint coating system.

3. Triboligical cansideration. :

This basically relates to interacting behaviour of friction, wear and lubrication phenomena of rotating and sliding surface. The key of successful operation depends on selection of right lubrication and frequency of lubrication.

4 Insite repair teachnique :

The repair at workshop involves dismantling of equipments losing considerable amount of time. To prevent costly machine down time the following repair system may be adopted in emergencies for specific jobs

— on lines leak scaling, using cold welding compound.

— Usage of cold welding compounds for reconditioning of bearing journals of shafts at side.

— On site machining such as key way cutting, which does not need the equipment to be dismantled.

5. Instrumentation and control :

Instrumentation methods are useful for safeguarding the operation of equipment. By setting and tripping in case of severity, the damage to the equipment could be prevented. Introduction of flow monitoring systems to individual bearing points helps in prevention of bearing failure due to lack of lubrication. This benefits the maintenance by reducation by reducing excessive fault occurring to plant and machineries.

Now a days computor aided maintenance systems are being introduced in a few paper industries.

The main objectives of computer aided maintenance systems are :

a. Single source of information :

b. Improved decision making :

c. Better resources utilisation :

d. Reduction of unwanted paper work :

The reduction of clarical efforts and availability of reliable and timely information would allow increase opportunity for improved analysis, decition making and resource utilisation.

Prerequisites for computerised maintenance system :

a. Codification of machine, spare parts, preventive maintenance activities of different sections.

b. Standardising gang size for checking preventive maintenance activity and their required time.

c. Identification and codification various reasons for delay of nonexecution and noncompletion of jobs.

CORRECTIVE MAINTENANCE SYSTEM :

With conditions based maintenance procedure it is possible to take the repair jobs on a planned way. Normally preparation for any repair work takes 70% of the total downtime and only 30% is utilised in actual repair job. Hence by taking condition based corrective maintenance procedure, atleast 50% of the total down time canbe reduced.

Even with regular preventive maintenance practices and condition based maintenance practices, some times due to reasons of fatigue, break down could not be totally avoided. Only a very efficient maintenance system will reduce this unexpected failures.

UNPLANNED CORRECTIVE MAINTENANCE :

In emergency corrective maintenance the skill of crew is very important for the maintenance aspect. The necessity of doing the job in a limited time because of urgency and any long down time of the machine will result in production loss makes the job still difficult. Hence, a correct and accurate diagonisis of the problem will help in faster execution of thc job by mobilising crew and spare parts in time.

Planned corrective maintenance :

This maintenance procedure is very relevant for high speen machines. The eurrent practice in Mysore Paper Mills is to have a shut of 3 to 4 days for every four months of the year so that the equipmeet is maintained throughout in good condition. This is in contrast to the procedures normally adopted in slow speed machines i-e., having a down time of 15 days in a year at a stretch.

Before these staggered shut downs are taken up, the maintenance planning wing of the mills prepares the list of necessary materials required during the shut-down. This is normally done during pre shut period of three months in close laison with the concerned departments and the wing arranges for the availability of these materials well in time during the shut down period.

Also a PERT/CPM chart is prepared for every work being taken up during shut down. Using these charts, the progress of the Works are closely monitored, This is to ensure that the machines start as planned. Skilled manpower available else where in the country is also utilised so that the maintenance does not suffer on this account.

Spare parts management system :

The cost of spare parts alone works out to be above 50/60% of total maintenance cost. Hence it is very essential to have proper control over consumption and stocking of different spares. Main features of this sub-system are.

a. spares procurement control and follow up system.

b. Spares information system.

c. Spares stock control system.

This system needs the following information which on processing, required out put reports can be generated.

i) Material transaction slip (both issue & receipts)

ii) List of released purchase orders.

iii) List of purchase requisitions.

iv) Material despatch details.

Maintenance cost control system :

This module utilises the data available from preventive maintenance module to get following reports for a specified period.

a. Department wise costing reports

b. Disciplinwise costing reports

c. Total costing reports.

Two typical case studies with regard to preventive maintenance approach are Worth considering.

1. Press felt roll journal repair :

For this job insite repair technique had been adopted. The journal had wornout to the order of 5mm on a 90mm shaft basic diameter.

Repair work : The bearing sealing had been roughed with cutter and two layers of rapid durometal compound had been applied, with two layers of re nforcement tapes. Finally after hardening the outer surface uneveness had been filled out. The total time involved was of the order of 6 hrs. The reduction in total down time had been to the order of 24 hours. The life of the repair was 10 months.

2. Dryer gear case idler gear bearing failure :

The above failure had been detected by continuous monitoring through vibration readings The idler had been running at rpm of 250. The vibration velocity had been 24 mtr/sec. with an increasing tendency every day and vibration displacement from 50 to 60 micron. The early detection of this variation avoided the gear failure and a major break down.

IMPORT SUBSTITUTION ITEMS IN PAPER MILLS :

Due to high exchange rate and to save precious foreign exchange, lot of efforts are being made in this regard. In many areas import substitution items are successfully operating in plant.

In this attempt drawings of many critical items have been made and vendors are developed to manufacture such items. To quote a few items where MPM has succeeded in import substitution : replacements for refiner disc segments for Bauer refiners, screening bars and screws for pressafiners, centri cleaners of deculator unit, Pallman chipper knives doctor blades, Siemens vacuum pumps spares etc.

It is hoped that modern maintenance practices will catchup momentum with the necessities of the occasion and will be a very valuable tool in future for achieving high levels of production out of the machine. Also it is desired that all efforts will be directed at further import substitution to conserve foreign exchange. In this aspect it is necessary that the co-operation of all and the Government is important.