

# Plant Maintenance Strategy

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## INTRODUCTION

The advent of automation has increased production levels as well as rigid production schedules. The high cost of capital equipment & increased machine utilization have highlighted the fact that, maintenance can no longer be considered simply as an adjunct to the production process, but must be regarded as an integral part of it. It is therefore logical that as much forethought & planning should be devoted to the maintenance aspect as to any of the other engineering activity.

We have tried to emphasize on the subject on the basis of our visits to various paper mills, sharing of experience/views with qualified & experienced engineers & reading through some literature. We are presenting here in brief, how a fabric manufacturer would think about plant maintenance. We will confine our selves to wet end section only. We are dividing maintenance in two parts.

1. Planned / shut down maintenance
2. Preventive maintenance.

Break down maintenance has been purposely avoided as we believe prevention is a better cure & will ultimately avoid the need of break down maintenance.

## PLANNED MAINTENANCE

- (a) Cheaper items can be replaced keeping their life into account because the repair cost can be high if it leads to a breakdown.
- (b) In expensive equipment, basic maintenance is carried out (e.g. lubrication, servicing and adjustment) to keep it in good condition. It is then replaced before it loses its operational efficiency when break down or failures may be expected.
- (c) Due to technological advancement or needs,

new equipment is installed as a replacement. Planned maintenance seems expensive but is always cost effective. Planning must be made prior to stopping the production. During a shut down following needs to be thoroughly checked.

Following are the factors aggravated by unplanned maintenance of wet end, which ultimately lead to loss of productivity, quality and higher cost of production.

1. Uneven wear.
2. Fast wear out
3. Ridging.
4. Guiding.
5. Interlocking failure
6. Clogging of fabric.

Following symptoms generally warn of a need to pay attention to the possible problem area related to these symptoms.

## UNEVEN WEAR

The uneven wear of fabric leads to less life, slower drainage and uneven paper profile.

Points to check-

- i. Check wire returns roll, couch roll & breast roll for surface discrepancy.
- ii. Leveling of forming board/baggily box is not proper.

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<b>UNIT</b>	<b>CHECK</b>	<b>PROPOSED ACTION</b>
<b>1. Rolls</b>		
A. Breast roll	Bearing/surface Discrepancy	Bearing change/surface grinding dynamic balancing.
B. Table rolls	Bearings/deflection/surface discrepancy	Bearing change/surface grinding dynamic balancing
C. Suction couch roll	Shell holes/vacuum box & its sealing.	Chemical cleaning/Drilling/replacing strips.
D. Wire return rolls	Bearings/deflection surface discrepancy	Bearing change/surface grinding/dynamic balancing
<b>2. Stationary Elements</b>		
A. Forming board	Wearing/leveling	Regrinding/level
B. Foils	Angle	Regrind/replace.
C. Suction box tops	Thickness.surface finish	Regrind/replace.
<b>3. Stretcher Arrangement/ Guiding Mechanism</b>	Jamming/air bellow/air pipes.	Bearing/leakage check/pneumatic/hydraulic cylinder replacement/overhauling.
<b>5. Cleaning System</b>		
A. Showers	Nozzles jamming/nozzle diameter/oscillator	Cleaning/replacement/filter overhauling.
B. Doctors	Clearance/wearing	Proper setting/alignment/replacement.
<b>6. Table Alignment</b>	Roll to roll/croll alignment Table level.	Thorough checkup
<b>7. Controllers</b>	Calibration/air leakage	Recalibration
<b>8. Interlocking System</b>	Forward drive roll/pick up roll, Dandy/fabric. High-pressure needle jet shower pump/ fabric drive.	
<b>9. Civil Work</b>	Wire pit/couch pit/silo/ seal pit.	Cleaning/tiles.  Broken tiles to replace

iii Loop length on both sides.

performance

**FAST WEAR OUT**

Following points to be checked-

Fast wear out leads to tremendous drop in fabric

(a) Fabric tension/slippage

(b) Built in lubrication arrangement at edges of flat boxes.

(c) Vacuum regulator of flat boxes (vacuum fluctuation)

(d) Boxes tops are badly worn out.

## RIDGING

Ridging of fabric will lead to marking in paper causing loss of productivity & tends to fabric unserviceable.

Points to check-

i. In case of sectional drives, load sharing of couch & wire turning roll or FDR.

ii. Free movement of rolls (Specially wash rolls)

iii. Doctor blade alignment & wear profile/deflection.

## GUIDING PROBLEM

This problem leads to damage of fabric due to creasing and over-running of the fabric. On high-speed machines it is very difficult to adjust on run. Paper makers are forced to slow down or stop the machine to adjust it.

Check points for this are:

i. Loop length at both sides of table.

ii. Roll to roll cross alignment.

iii. Guiding device (pneumatic cylinders, air bellows functioning).

iv. Air pressure or air supplies traps filled up. (pressure alarm & air drying system to be checked)

v. Alignment of table rolls.

vi. Rolls bearings to be checked for any malfunctioning.

vii. Free movement of rolls.

viii. Drive synchronization in case of sectional drive.

## INTERLOCKING FAILURE

Interlocking arrangements are introduced to

strengthen/safeguard the working system. Its failure leads to heavy losses to the machinery. Following inter locking should be regularly checked at appropriate opportunity.

(a) Wire/dandy speed mismatch.

(d) Pick up roll/turning roll (F.D.R.) speed mismatch.

(e) Wire drive/H.P. osc. shower oscillator & pump drive.

(f) Wire part/Fan pump drives inter locking.

Wire/dandy roll speed mismatch interlocking helps to avoid any damage to the running fabric on the m/c. In case of any speed variation (beyond specified limit) dandy roll is lifted automatically.

Pick up roll/turning roll speed interlocking also helps same way. In case of any speed variation, turning roll moves away thus avoiding any risk of fabric damage.

High-pressure osc. Shower booster pump & its oscillator should be inter locked with wire part drive to avoid damage to the fabric in case of failure. If wire part trips due to some electrical problem, needle jet at 30-40 kg/cm<sup>2</sup> or above pressure range will damage the fabric. We should ensure/recheck during every wire change that inter locking device is functioning in proper manner.

Wire part/Fan pump drive interlocking also helps in same way. It also saves good quantity of stock going into drain.

## CLOGGING OF FABRIC

Clogging of fabric affects fabric life as well as paper quality & at times paper production also. Following points need proper attention.

1. Fabric tensioning system.

2. High-pressure osc. Needle shower pump/pressure.

3. Nozzles tips condition.

4. Doctor blades lifting/lowering mechanism.

5. Proper functioning/closing of fresh water shower valve.

Based on our mill experiences, following are some of the case studies, which show how planned jobs can lead to increase in machine efficiency & enhance productivity, which in turn reduces the cost of production.

1. In one paper mill frequent couch roll jamming was the problem leading to cleaning of the couch shell in between and during every wire change resulting into high down time of machine. The reason was absence of effective H.P. shower to flush the holes at regular intervals. When maintenance crew identified the problem, the drilling frequency of couch roll was reduced from 4-5 times a year to just 2 times a year & fabric life was also escalated.
2. In one paper mill just after starting fabric, the movement of fabric was erratic even reducing the speed and adjustment of fabric tensions was of no help. Finally machine was shut and observed that stretcher backside cylinder movement is not free and displacement at front side and backside are different. If they had been over hauled and checked during wire change, the stoppage and loss of production could have been avoided.
3. In one paper mill frequently dryer screens and fabric got damaged/burst. The fabric used to play forward and backward and as speed increases the movement becomes faster causing overrun/bursting. It was found that roll to roll alignment was not okay and the T-bolts were not properly secured in the sole plate causing bolts getting loose due to vibration. After setting it right with proper stoppers the problem was solved.

**PREVENTIVE MAINTENANCE**

Preventive maintenance infact should be done on regular basis. Ideally maintenance audit should be done on a predetermined schedule & sequence by an audit team necessarily having one or two member other than from maintenance. Following points needs to be checked.

1. Foil/Forming board surface & angle - for thinning out/wear/chipping.
2. Table rolls bearing lubrication
3. Wire guide palm.
4. Guide roll pneumatic device.

5. Fabric cleaning before long shut down.
6. Breast roll lowering lifting device.
7. Breast roll & couch roll bearing lubrication.
8. Centri cleaners/screens/pumps clearance.
9. All instrument lines & equipments.
10. Vacuum gauges.
11. Steam and vacuum lines inspection.
12. Electronic devices.
13. Drive motors & cable joints.
14. Clutches/couplings.

Preventive maintenance is very effective, if it is followed religiously. It will avoid break down maintenance and in turn will lead to higher productivity. There are schedules for preventive maintenance plan as follows, and it could be displayed in machine house at suitable place.

**CHECK SCHEDULES**

- |                                 |           |
|---------------------------------|-----------|
| A) Daily/Weekly checks.         | - A Check |
| b) Weekly/Monthly checks        | - B Check |
| c) Quarterly/Half-yearly checks | - C Check |
| d) Annual checks                | - D Check |

Following items are suggested under each check

**A CHECK**

Lubrication, Vacuum & Pressure gauges, Process indicator, Vital equipment failure indicators, Cleaning showers, Flat belts/Vee belts. Bearings vibration.

**B CHECK**

Doctor blades, m/c Clothing, Foils & Forming Board Strips, Suction box Tops, Auto guide systems, Clothing Tension & Tensioning Systems, Cleaning Shower & Auxiliary System, Wet End System Boil Out.

**C CHECK**

Breast Roll/Wire Return Rolls/Table Rolls/F.D.R., & Calendar rolls/size press rolls Grinding, Suction

couch roll/suction pick up roll drilling.

## **D CHECK**

Suction Couch Roll/Suction Press roll surface grinding, Mount hope roll/wire or felts return rolls/breast roll & F.D.R. rerubberisation. Blind drill roll drilling, Uhle box tops.

Every plant must have a certain schedule for jobs, which are to be carried out as per the requirement.

The plant people in conjunction with production staff & the equipment supplier best decide the schedule & the items under the schedule.

The above schedule is an indication for ideal working of a paper m/c. However, it will vary from mill to mill & machine to machine depending upon, the furnish, m/c speed & Quality of paper produced.

Some additional tools for determining preventive maintenance schedule are:

## **WORK-STUDY**

Work study is the detailed examination & analysis of human efforts in order to determine the best way to achieve a defined objective. It is related with human activity. This is divided in two subgroups.

## **METHOD STUDY**

The systematic recording & critical examination of existing & proposed ways of doing the work, as means of developing & applying easier & more effective methods & reducing costs.

## **WORK MEASUREMENTS**

The application of techniques designed to establish the time for a qualified worker to carry out

a specified job at a designed level of performance.

The purpose of work-study is to determine a more efficient way of utilizing money, manpower, materials & machines.

## **INDUSTRIAL STETHOSCOPE & OTHER INSTRUMENTS**

A highly sensitive listening device, faint noises are highly amplified for easy location. This is helpful to maintenance crew by locating quickly & accurately wear & other defects in running machinery.

Chart & graphs also help in planned maintenance, which illustrate the relationship between various functions.

There are many other instruments which could also be of great help e.g. wall thickness gauge, bore viewer, tank viewer, inspection mirrors and endoscope etc.

## **CONCLUSION**

Forming fabrics being a tailor made & an expensive item, utmost care must be exercised in providing most favourable operation & maintenance conditions. It is a proven fact that meticulous working out in the maintenance strategy significantly contribute to the safe working & minimizing or eliminating break down. We have tried to share our knowledge gained from our customers during our visit to various paper mills.

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