

# Best Maintenance Practices In Pulp And Paper Mills To Improve Profitability

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## ABSTRACT

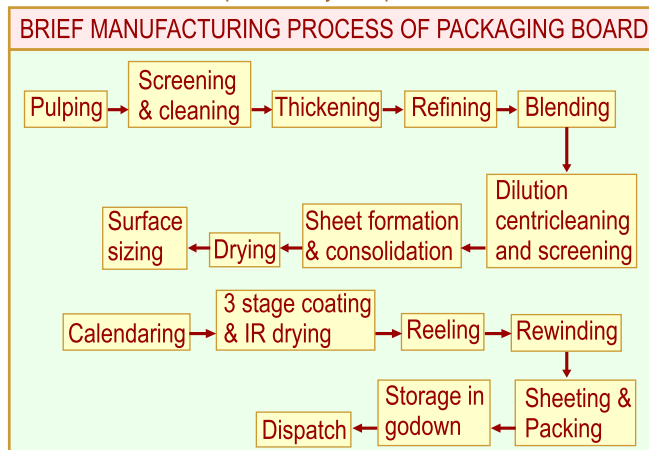
India is a fast developing nation. To accelerate Economic Growth, Indian Business community has to invest into manufacturing sector, produce Qualitative as well as Quantitative products as per International standard at lowest possible manufacturing cost. Best Maintenance of heavy machinery is a major share in manufacturing cost. Best Maintenance Practices include powerful techniques to maximize uptime of machinery at lowest maintenance cost. This leads to profitability. In this competitive world, cost competitiveness is must for survival of every Industry. The tailor-made Maintenance Practice / motive or task, cost competitiveness in one or other form, is an essential component to be adopted by Pulp and Paper industry. There are several maintenance practices and techniques established through scientific methodology and research, which are integrated to improve profitability.

## Introduction

JK Paper Unit; CPM is committed to maintain ZERO BREAKDOWNS and ZERO REPETITIVE FAILURE through:

- ❖ Deployment of combination of Time Based Maintenance (TBM) and Condition Based Maintenance (CBM).
- ❖ Optimization of Processes, Plant and equipment efficiency.
- ❖ Identify and evolve Best maintenance solutions through Preventive Maintenance (PM), Maintenance Prevention (MP) and Maintainability Improvement (MI) to suit individual Equipment.
- ❖ Establishment of effective training mechanism and motivational policies to engage maintenance crew to achieve common Goal Trouble free Production.
- ❖ Identifying and eliminating non-value adding processes and production bottlenecks.

Overview Board Plant - J.K. Paper, CPM unit  
Good maintenance practice is one of the keys to increasing productivity and profits



JK PM, Unit: CPM, For Songadh, Dist Tapi (Gujarat)

- ❖ Cost reduction through innovative Cost Compression Schemes.
- ❖ Equipment protection, security and safety with environmental and other applicable statutory compliances.
- ❖ Nurturing Team work and Development of Individual skill at all levels.
- ❖ Creating lively, energetic, healthy and safe work environment.

## Profitability

Profitability of production unit increase through

- ❖ Practicing innovative Total Productive Maintenance Technique to improve Overall Equipment Efficiency (OEE).
- ❖ Modifications to suit effective use of Resources to Optimize Product Quality.
- ❖ Studying Bottlenecks in system and elimination plans for improvements in Production
- ❖ Crabbing Resource wastages.
- ❖ Incorporating new Technology for improvement in Production facilities.

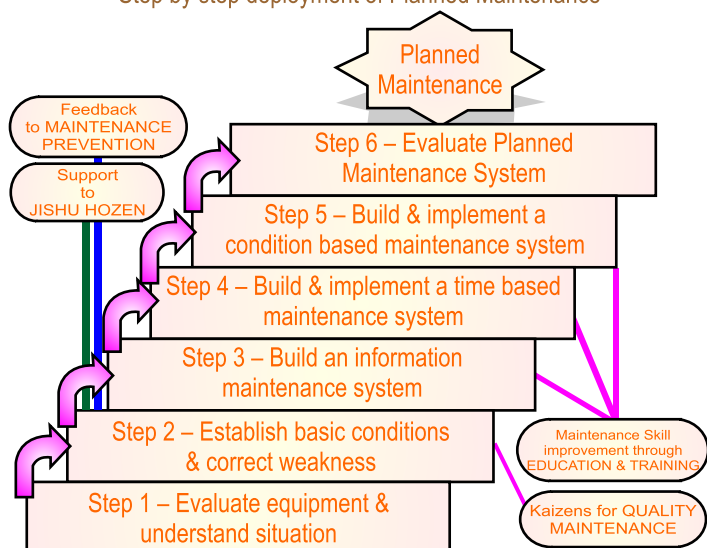
## Maintenance Practice Followed At Board Plant

Keeping emphasis on Company's Policy regarding Equipment Maintenance, JK Paper Unit: CPM started implementing Total Productive Maintenance practice in February, 2002. TPM Concept focuses on I Operate, I fix the fault and its aim is Zero Breakdown, Zero Losses, Zero Defects and Zero Accident.

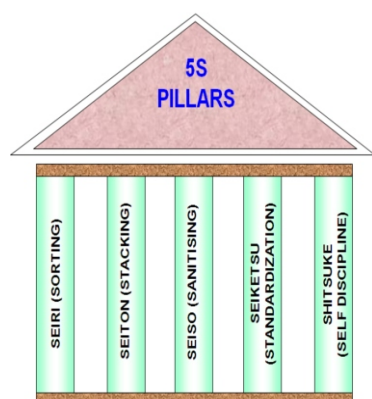
## Equipment Category

According to Equipment contribution in Production, equipment categorized in ABC Critical groups.

## Step by step deployment of Planned Maintenance



Basic of all maintenance activity is 5S Practice.



### Objectives:

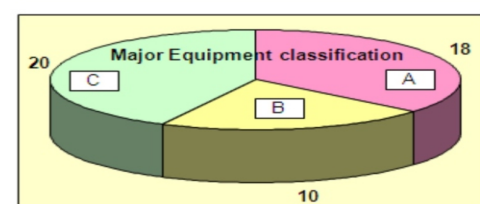
- Creating a neat and clean workplace
- Systematize day to day working
- Improving work efficiency
- Standardize work practices
- Improve work discipline

**A-** Very Critical Equipment

**B-** Critical Equipment

**C-** Non critical Equipment

Evaluation Element	A Rank	B Rank	C Rank
<b>S</b> Safety and Environmental pollution	Failure would cause serious safety and environmental problems in surrounding area.	Failure would cause some safety and environmental problems in surrounding area.	Failure would cause some safety and environmental problems in surrounding area.
<b>Q</b> Quality and yield	Failure would cause defective products to be produced or seriously affect yield.	Failure would cause quality variation or affect yield moderately.	Failure would affect quality or yield slightly.
<b>W</b> Working (Operating Status)	24-hour operation	7-to 14 - hours operation	Intermittent Operation only
<b>D</b> Downtime Ratio (approx. number of days)	Failure would shut down entire plant.	Failure would shut down relevant system only.	Standby unit available to work for failure and then repair.
<b>P</b> Period (Failure interval)	Frequent stops (every 1 month or more)	Occasional stops (approximately once a year)	Failure only stops (less than once a year)
<b>M</b> Maintainability	Repair time: 4 Hours or more	Repair time: 1 to 4 Hours or more	Repair time: less than 4 hours



Board Machine equipments are categorized in ABC groups according to their criticalness for safety, quality, working hours etc. For each and every equipment, prepare Data sheet, Standard Overhauling procedure, Critical path method, Failure analysis and Kaizens for improvement. Also on daily basis, Data collection is done related to Condition indicating parameters of equipments categorized in A, B, and C groups. Followed by analysis of data, corrective action plan and its implementation. Maintenance practice sheet and Maintenance Time schedule was prepared for every equipment according to its category.

### a. Time Based Maintenance

### b. Condition Based Maintenance.

Lubrication Schedule of each equipment was prepared & implemented. Equipment Lubrication failure analysis and wastage report prepared. Based on reports, formulate action plans and implement them in phased manner. Record in detail, Lubrication Procurement, Storage, recovered lubrication collection and disposal.

Repetitive Failures and Breakdown analysis report prepared. Based on finding, suitable action plan and implementation carried out in phased manner. Also for better maintenance following activities were implemented.

1. Observations were recorded & maintained as data in history register for future reference.
2. Proper monitoring & trending of consumables like Pulp, Water, Power, Steam, Compressed Air etc. has been done on regular basis to reduce consumptions.
3. Continuous improvement in quality parameter of product, operational ease & maintenance has been done through technological up gradation of equipment.

4. All engineering parameters are studied on regular interval by external agencies to enhance equipment reliability such as Vibration, Thermography, Oil analysis etc

### Equipment History Register

Maintaining History Register in Soft format helps retrieving information related to equipment. So Area-wise Equipment listed in Excel sheet with asset number. Each equipment Hyperlinked with

1. History of Job carried out.
2. Specification with Drawing details
3. Spare List, with ERP code
4. SOP ( Standard Overhauling Procedure)
5. Modifications done if any

### Equipment Data Sheet

Equipment data sheet contains information regarding Specification, MOC, Drawing Details, Lubrication details & Spares details

**APPROACH TO REWINDER**

Sl.No.	Area
1	Approach Flow
2	Wire Part
3	Binip Press
4	Jumbo Press
5	Nipco Press
6	Pre Dryers
7	MG
8	Post Dryers
9	Size Press
10	Pre Coater
11	Back Coater
12	Top Coater
13	HNC
14	SNC
15	Pope Reel
16	Broke Handling System
17	Vaccum System
18	Steam & Condensate
19	Rewinder
20	PV & Exhaust System
21	Drive arrangement

**Master File for SNC**

Sl.No.	Equipment Name
1	Rolls
2	Accessories
3	T F Heater
4	T F H Accessories

**History Sheet of SNC Rolls**

Sl.No.	Date	Job description
12	25/3/2011	Bow roll belt changed as got damaged (B - 53)
13	7/5/2011	SNC top & bottom rolls were changed as per shedule
14	11/11/2011	SNC top & bottom rolls were changed as per shedule
15	15/3/2012	Bow roll belt change (B - 52)
16	9/5/2012	SNC top & bottom rolls were changed as per shedule
17	4/11/2012	SNC top & bottom roll change due to dought of torque decrease after roll loading (New roll top 579 dia, old 579, Bottom roll new - 417 dia, old - 422 dia)
18	21/11/2012	Bow roll belt change (B - 52)
19	6/9/2013	Bottom roll Fs bearing hosing oil leakage attended.
20	26/9/2013	SNC top & bottom roll change.
21	24/5/2014	Bottom roll gearbox change.

**History Sheet of SNC Accessories**

Sl.No.	Date	Job description
25	4/11/2012	SNC bottom roll drive timer pulleychange
26	4/11/2012	SNC top & bottom rolls gearbox change. Due to of torque variation
27	29/3/2013	SNC bow roll V Belt change.
28	27/7/2013	SNC top roll doctor blade change.
29	7/9/2013	SNC bottom rolls F S oil leakage attend
30	8/9/2013	SNC bottom roll timer belt change
31	4/2/2014	SNC top & bottom roll doctor blade change.
32	13/4/2014	Bow roll v belt change
33	22/4/2014	SNC Bottom roll timer belt change
34	24/5/2014	SNC Top roll doctor blabe change
35	24/5/2014	SNC bottom roll (DP - 104) gearbox change
36	2/6/2014	Dam roo pulley change & carden shaft check

EQUIPMENT DATA SHEET						
EQUIPMENT NAME		BOTTOM LAYER RICH WATER PUMP - ABS SCAN - NL 80-160				
LOCATION		APPROCH PROCESS WHITE WATER TANK				
EQUIPMENT CATEGORY		B				

BEARING HOUSING

STUFFING BOX

SHAFT COUPLING

ROTATING SHAFT

IMPELLER

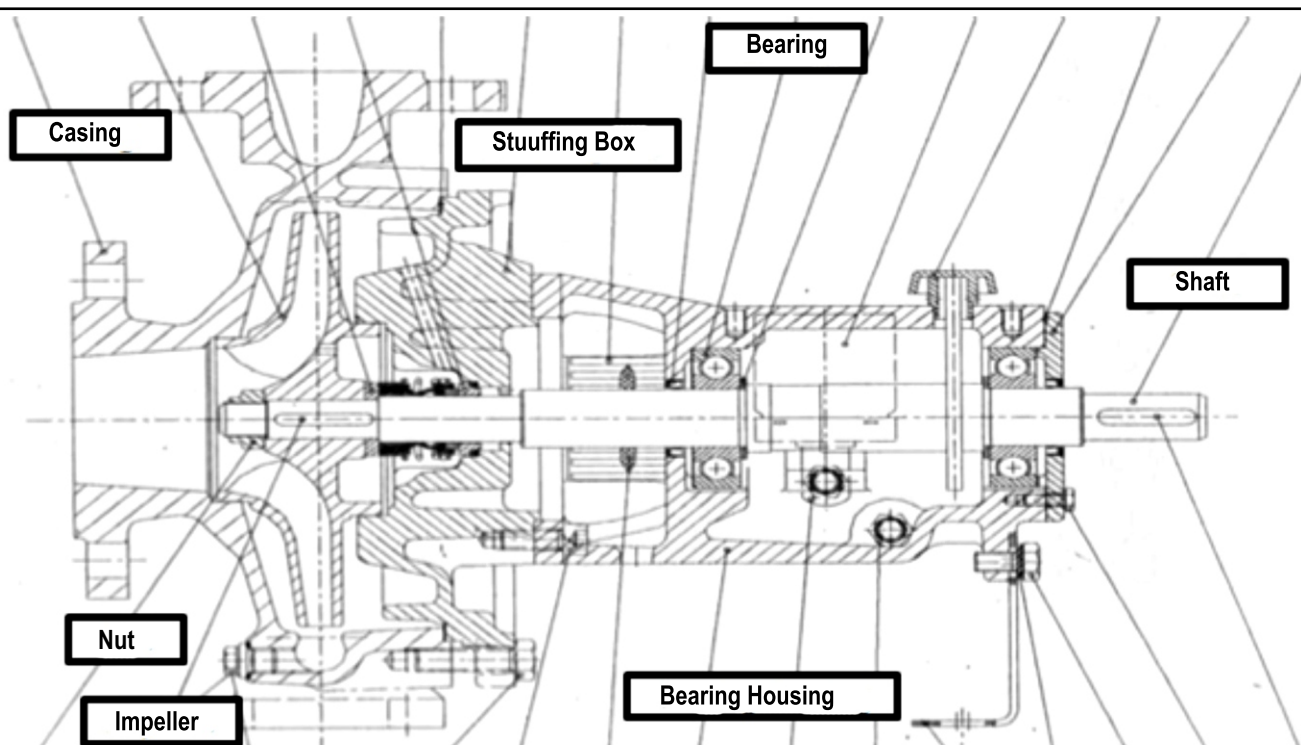
MECHANICAL SEAL

SPECIFICATION OF PUMP		MAKE	ABS SCAN				
		MODEL	NL 80-160				
		DISCHARGE	165 m <sup>3</sup> /hr				
		HEAD	31 mtrs				
PRIME MOVER		MOTOR	KW 22	Amp 37.7	rpm 2900	frame 180M	Foot mounted
SPARE DETAILS							
Sr No.	Description	Location	Qty	ERP code			
1	Input shaft	Pump	1	7010050643			
2	Mech Seal	Shaft	1	7010050530			
3	Bearing 6306 ZZ	Shaft	2	1122063063			
4	V Ring	Shaft	2	7015140060			
5	Coupling F-70	Shaft	1	1930450069			
6	Coupling Tyre F-70	Shaft	1	1930050700			
7							
Lubrication							
Type	Lithium Soap Bearing Grease						
Grade	Shell Alvania Water repellent - 2						
Qty	200gms						
Relubrication Interval	Every 2500 hrs opration						
Relubrication Qty	30 gms						

Pump shaft

Motor shaft

STANDARD OVERHAULING PROCEDURE	
EQUIPMENT NAME	BOTTOM LAYER RICH WATER PUMP - ABS SCAN - NL 80160
LOCATION	APPROACH PROCESS WHITE WATER TANK
EQUIPMENT CATEGORY	B



Dismantling Procedure	Assembling Procedure
1. Drain Lubrication oil in container	1. Bearing Inner race pre-heated in induction heater & Fitted on shaft
2. Remove coupling by Puller	2. Assembled shaft fitted in Bearing Housing
3. Remove Stuffing Box bolt & Part off Casing Bearing housing	3. New Oil seal fitted in cover & bolt up on Bearing Housing
4. Remove Impeller lock nut, Impeller & Mechanical Seal unit	4. Stuffing box boltup to Bearing housing
5. Remove Bearing Housing & Stuffing Box connecting bolt	5. Mechanical Seal fit on shaft.
6. Remove both end cover of bearing housing	6. Impeller & Impeller Nut fitted on shaft. Maintain clearance in between Impeller & Stuffing box face.
7. Remove Shaft with bearing. Bearing r	7. Assembled Bearing Housing boltup to Pump casing & check for free rotation
8. Clean all dismentle parts	8. Coupling fitted on shaft
Check up	PPE use
1. Bearing check for damage, Clearance &	1. Cut & heat resistance hand gloves
2. Check shaft for worm out, Specially Bearing sit	2. Googles for Eye
3. Check Bearing housing for worn out.	
4. Check Mechanical Seal parts for worn out	
5. Check Impeller & Stuffing box eor worn out	


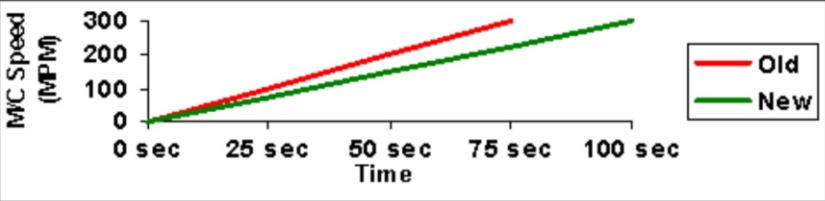
### Standard Overhauling Procdure ( SOP)

SOP sheet contains details like Dismantling and Assembling Procedures with check points, Tools uses

### Breakdown Maintenance

Basically it is activity of restoring equipment to make available for production. To avoid such unplanned failures following steps have been taken.



Breakdown Attended by		Ramlal		BREAKDOWN ANALYSIS FORMAT				Record No.		M-07/07/02																						
Planned Maint.		✓						Date		07/08/2007																						
Jishu Hozen								Section Chief		Subsection Chief																						
Plant		Board m/c No:-4						S Bhalla		Sandesh Joshi																						
Equipment								Vinayak Shanbagh		Sandesh Joshi																						
Rank		A		B		C																										
Date & Time Occurred		6/7/2007 at 6:30AM		Date & Time Repaired		6/7/2007 at 15:00PM																										
Production		01 Production Stop		✓		02 Production Non-stop																										
Production Stoppage Time																																
Total time to repair		8.30Hrs		Manpower arrangement time		0.45Hrs		Tools arrangement time		0.15Hrs																						
				Actual repair time		5.45Hrs		Spares arrangement time		0.45Hrs																						
								Start up time		1.0Hrs																						
Phenomenon/ Condition (Description of Breakdown)		(Where and what condition ? Illustrate if possible)						<div style="border: 1px solid black; padding: 2px; color: red; font-weight: bold;">Damaged Gears</div>																								
		(How repaired, why it occurred? Describe as much as possible) 1. Internal gears replaced with spare gears 2. Gear box lubrication oil replaced by high viscosity index oil 3. For details please refer why-why analysis sheet																														
Failure Cause/ Analysis		<table border="1"> <thead> <tr> <th>Properties</th> <th>Mineral Oil (Servomesh SP 460)</th> <th>Synthetic Oil (Viscotherm S 140)</th> </tr> <tr> <th></th> <th>Old</th> <th>New</th> </tr> </thead> <tbody> <tr> <td>Viscosity Index (VI)</td> <td>90</td> <td>124</td> </tr> <tr> <td>Flash Point °C</td> <td>232</td> <td>280</td> </tr> <tr> <td>Four Ball Wear mm 40 kg 1200 Rpm, 75° C (hr)</td> <td>0.26</td> <td>0.34</td> </tr> <tr> <td>Gear Test FZG SPUR Stage pass</td> <td>8+</td> <td>12+</td> </tr> <tr> <td>Timken OK Load kg</td> <td>20</td> <td>45</td> </tr> </tbody> </table>										Properties	Mineral Oil (Servomesh SP 460)	Synthetic Oil (Viscotherm S 140)		Old	New	Viscosity Index (VI)	90	124	Flash Point °C	232	280	Four Ball Wear mm 40 kg 1200 Rpm, 75° C (hr)	0.26	0.34	Gear Test FZG SPUR Stage pass	8+	12+	Timken OK Load kg	20	45
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		(What to be done in future?) 1. Speed up ramp increased from 75 to 100 sec to reduce load on gears during startup																														
Action/ Counter measure																																
		2. Actual load coming on gear box was 32.2 kw but the gear box fixed is designed for 17.2 kw So gear box is of higher load carrying capacity i.e. 34 kw fixed																														
Maintenance Cost	Replacement Part Cost	Rs. 122000/-		In- house Man Day	8		Subcontractor Cost	----																								
Contribution Cost	Rs.7046/-		Total Cost	Rs.129046/-																												
Time to repair	8.30 Hrs																															
Permanent Counter measure	Plan Date	30/11/2007		Maintenance Technical Information	Date Issued		07/09/2007																									
	Comple- tion Date	26/11/2007			Issued By																											
Needed/ Not Needed	KAIZEN Sheet No.	M-K 05		Needed/ Not Needed	Maint Prev. Sheet No.		BP-M-04																									
Action to Prevent Similar Failures																																
Plant	Equipment	Date		Plant	Equipment	Date																										
		Action Planned	Action Completed			Action Planned	Action Completed																									
Board M/c	13th group drive	12/01/2007	01/12/2008																													

1. Prepare detailed analysis using 7QC tools
2. Collect details of incurred losses and Cost - Direct and Indirect
3. Record finding and Kaizen Plans for its implementation

### Breakdown analysis Format

Repetitive Failure analysis helps

- ❖ Find out Root cause of Failure
- ❖ Formulating Action Plan and Its implementation to improve OEE

### Case Study # 1

#### Problem Faced:

Frequent Failure of drive motors bearings.

#### Description:

There are 108 drives installed to run the board machine. There were several incidents of premature failure of drive motor bearings. JK Paper Unit: CPM consults with bearing manufacture for such premature failure of bearings. They gave feedback that leakage current is passing through bearing which leads to bearing failure.

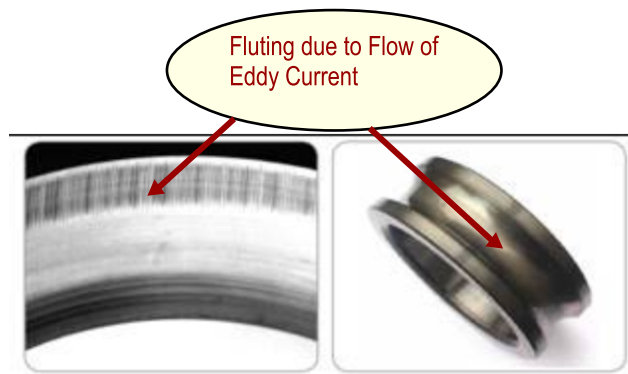
The leakage Eddy currents when flow through the rotor bearing, give rise to the failure of the Bearings of the motor.

So they suggested remedy for the failure to use Insocoat bearing in motor.

The Bearing problem is shown in the figure below.

As per recommendation, maintenance team tried using Insocoat Bearing for the drive motors, but the cost of Insocoat Bearing is very high as compared to normal bearing (Cost is 7-8 Time high), so it will be a very costly affair to replace all Drive motors normal bearing with Insocoat Bearing.

To overcome the problem our maintenance team thought of



*Fig: Bearing Outer and Inner Race Fluting.*

maintaining proper earthing of multidrive system. Team separated the earthing electrodes only for the drive section and that also connected in parallel, ultimately proper earthing was provided for our multidrive system which is having less resistance and proper conductivity and also connected double sided earthing to drive motors. Due to above modification, Actual life of bearing is achieved and avoid the premature failure of bearings which lead to unplanned shut of machine and loss of manpower that was incurred for replacement of motor or bearing.

#### Results:

In this way this system helped us to save our downtime and increase in Machine availability which further improves our OEE.

#### Time Based Maintenance

For Critical Category "A" equipment such as Screens, Wire, Press, MG, Calender, Coater rolls, Time Based Maintenance strategy followed. Time Based maintenance jobs are planned in advance in detail. Spare sub-assemblies are kept ready to minimise Replacement time. Maintain minimum stock of Standard spares Bearing with accessories, Belt, Coupling etc.



## Condition Based Maintenance

Condition based maintenance practice is carried out by monitoring the various parameters like Temperature, Vibration, Load, Noise level etc. There are various measuring equipments used for monitoring these parameters. By continuous monitoring these parameters trends are plotted & according to Deviation of measured value with standard, Condition Based Maintenance jobs are scheduled.

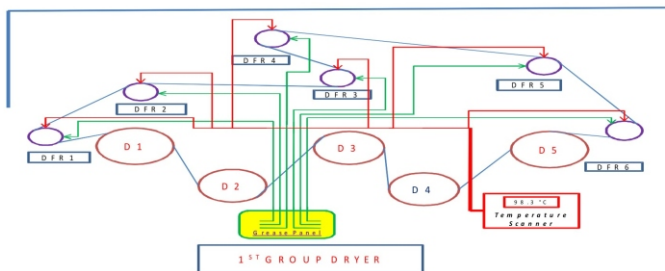
### Case Study #2

**Problem Faced** Unaccessible Dryer fabric roll Bearing failures .

#### Description:

There are some locations at dryer section fabric rolls bearing in closed hood, which are difficult to access due to high temperature in running condition of machine. To monitor such locations RTD was installed on the roll bearing housing and taken the signal to the group supervisory unit which gives alarm to DCS if the temperature of the bearing rises above the desired level for the appropriate action. This is one of the unique cross functional initiatives for measuring the temperature of the running roll bearing.

#### DFR Temperature Sensor Layout



## Result:

This has resulted in reduction in unplanned stoppage which influenced the reduction in downtime by approx. 1%, and the saving achieved is approx. Rs 98 lacs per annum.

## Corrective Maintenance

Suitable modification in existing conditions, system, control or equipment always beneficiary in terms of improvement in Equipment reliability, Operation efficiency, Cost reduction.

### Case Study #3

#### Problem Faced:

Higher vibration level at coater area frames.

#### Description:

At higher Machine speed, Board machine Coater area, Machine structure rattle with high vibration. Vibration of structure found 6mm/s Paper roll and Dryer fabric roll bearing failure is high. On vibration analysis figure out protruded Brackets at height rattle with vibration. Increased Vibration level in equipment means abnormalities induced in Equipment. Periodically conducting Equipment vibration measurement and analysis is very essential for healthy maintenance practice. Fabricated tie rod installed on M/c cross section to strengthen structure.

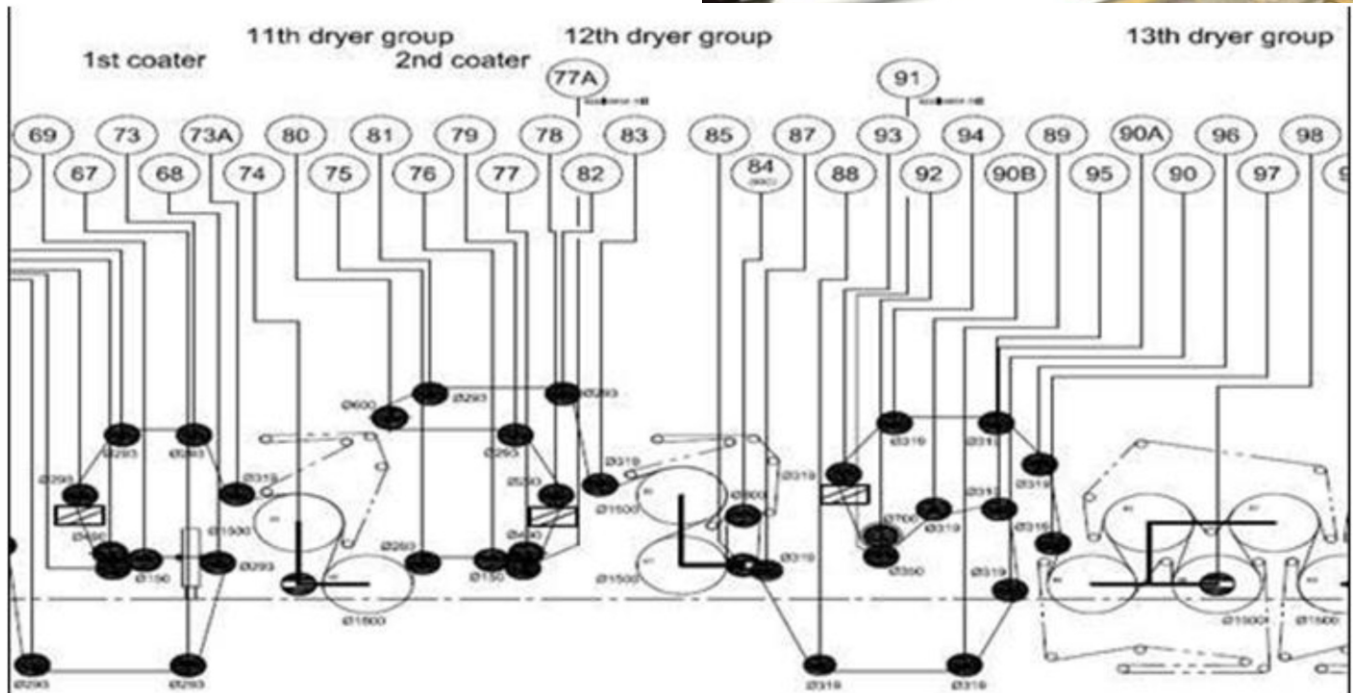
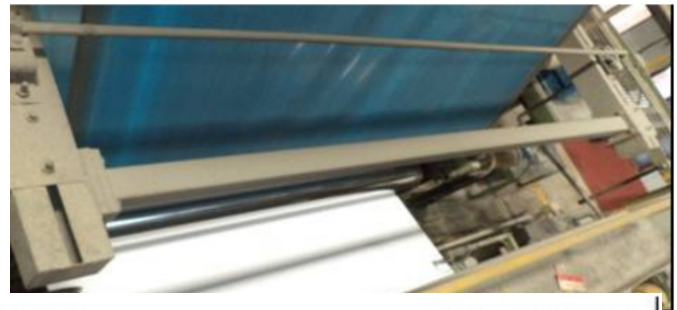


Fig: Paper Roll Overview



## Results:

Thus after installation of tie rods vibration level reduced to normal level.

### Case Study #4

#### Problem Faced:

Frequent Failure of paper roll drive gear motors

#### Description:

Previously the scenario was that Sixteen Nos. of Paper Roll Motors were divided into a group of motors connected to a single VFD. So there was total 4 VFDs for 16 Paper Roll Motors.

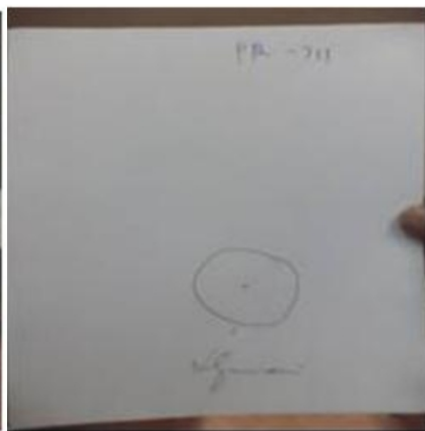
The arrangement was made up of following groups;

- 1) Group 1: DP 78 and 79
- 2) Group 2: DP 81 to 83
- 3) Group 3: DP 86 to 89 and DP 90A, 90B
- 4) Group 4: DP 93 to 97.

Other problems associated with this arrangement were:

1. Motors can't run on different speed as they were connected to one VFD only.
2. Load sharing was not adequate.
3. If one motor gets tripped, this results in tripping of VFD, thus all the 4 motors are stopped due to one motor.
4. The rating of Drive was much higher than the rating of motor, so the spare to be maintained was of higher rating, resulting into higher cost of spare.

#### Hole Detector Report and Trends in DCS



#### Samples of Blotch detected by Sensor



#### On line color marking system in running roll after detecting Blotch

5. Another important problem was regarding the scaling of the motors. When the roll changes, the scaling of the roll is to be set in the drive, but there is no any kind of multiple scaling setting present in the drive as the drive is made for supplying single motor only.
6. There are chances of getting friction marks on Board, if one of the roll stops.

These were few problems related to the previous system, due to which it was decided for separation of the drives.

## Results:

The successful completion of this installation of VFD following problems solved. All the paper roll motors in that area are now connected with the separate VFD, thus Each Paper Roll Motor can be operated on different speed according to the need. Fault in one

#### Hole Detector Installed before Master Reel.





## Ippta

motor drive or Roll bearing does not affect the performance of other motors. Load sharing is more effective in this arrangement, thus less time in paper passing and also reduces the No. of paper breaks in that area. The Gear box failure problem reduced and that saved not only man hours but also the cost. The proper rating of drive costs less than the larger rating drive which was feeding power to multiple numbers of motors previously.

### Quality Maintenance support:

1. Pursuing highest Customer delight through supplying defect free Quality product.
2. Establishing several stringent online and offline Quality inspection methods.

### Case Study #5

Online Quality inspection method

#### Problem Faced:

Physical defects like blotches and stamping are escaping to the customer.

#### Description:

In spite of all the physical and cognitive efforts by the team, some physical defects like blotches and stamping, which are predominant in board manufacturing process, are escaping to the customer. Due to this, customers have to incur loss as it damages the blankets of the printing machines which increase their down time. During our introspective brainstorming sessions it was felt to go for engineering solution for this problem. The solution for this in the market is "Web Inspection System" which inspects the physical defects of the paper board but it is an expensive system and it costs around \$200000. So it was thought to have some indigenously developed solutions to curb this holes problem in paper board. Our Instrumentation Department has developed sensor from Banner to detect small hole (>9mm) which works on it based on the principle of Triangulation. This system consists of laser beams and sensor fitted across the deckle of machine just after the Pope Reel Scanner. As soon as there is Hole in paper due to blotch the laser passes through the holes which is sensed by the sensor and the feedback is given to DCS system. In-house online blue (die) color marking system on the edge of web has been developed to remove defected material at Rewinder. Also on the outside of the Dry End control room there is an alarm is provided which is acknowledge from hooter, this system helps to machine floor operator for cleaning all coater blade, HNC and SNC blade to avoid further Stamping defect. In the DCS there is a separate page developed to understand exact location of blotch / defects.

#### Results:

After installation of in house hole detection system online quality checks are improved and customer satisfaction increased. The cost of this indigenously designed system is Rs 3,50,000/-.

### Safety

All necessary measures are taken for maintaining safety of occupants & Equipment. In the event of Fire, M/c is equipped with

General Fire fighting equipments. Further step taken to incorporate Autonomous mechanism to fight against fire.

### Case Study #6

#### Problem faced:

Fire occurs at IR dryer during power failure.

#### Description:

In our Board machine IR Dryers are used for Drying coating solution applied on board surface. Supplier has provided manual operated Fire extinguisher system (with steam and water) to rule out the ignition of paper residuals when a sheet break occurs. But during main power failure all drive stopped and web is in-front of IR Emitters and board start burning because of high temperature of Emitters. Speed of burning of board is faster than operator action to operate fire extinguisher push-button. This delay in operation results in damage of backing roll, coater screen and Broke conveyor screen.

To avoid this, Auto Fire extinguisher system has been provided. Whenever main power fails the auto fire extinguisher system operate with UPS & extinguishes fire.

#### Results:

Control over fire during any power failure is enhanced. Coater roll, screen and broke conveyor screen damages prevented.

#### Maintenance Prevention:

Maintenance Prevention refers to "design activities carried out during the planning and construction of new equipment, that impart to the equipment high degrees of reliability, maintainability, economy, operability, safety, and flexibility, while considering maintenance information and new technologies, and to thereby reduce maintenance expenses and deterioration losses. The classic objective of MP is to minimize the Life Cycle Cost (LCC) of equipment.

### Case Study #7

#### Problem Faced

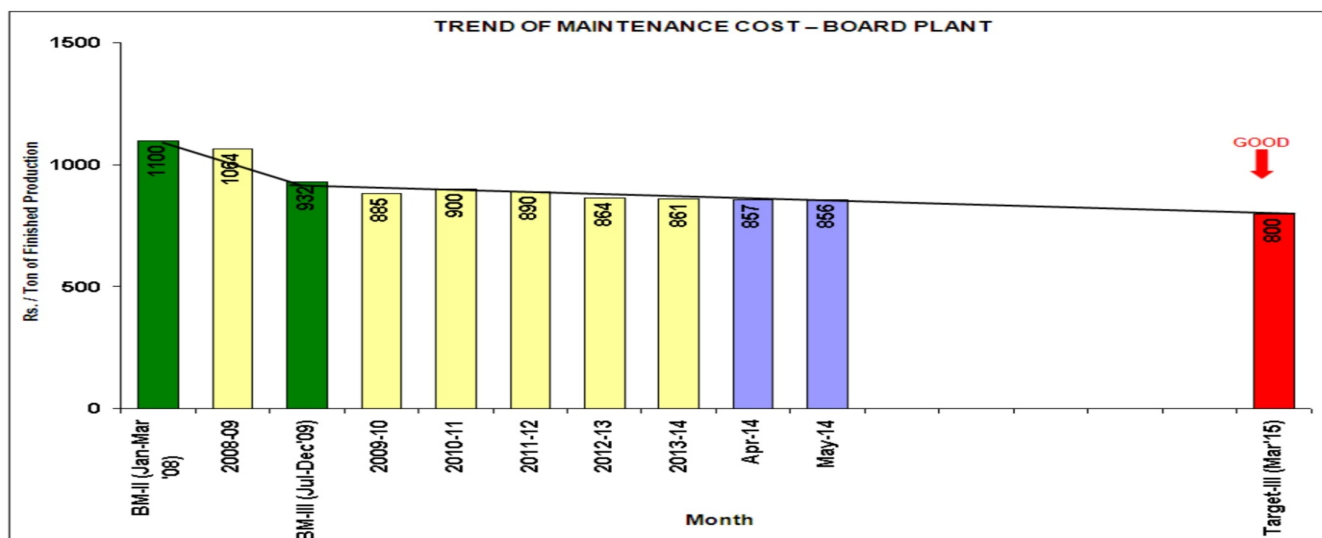
Highly corrosive chemical PAC carrying Metal pipe corroding heavily and waste chemical through leakage.

#### Description

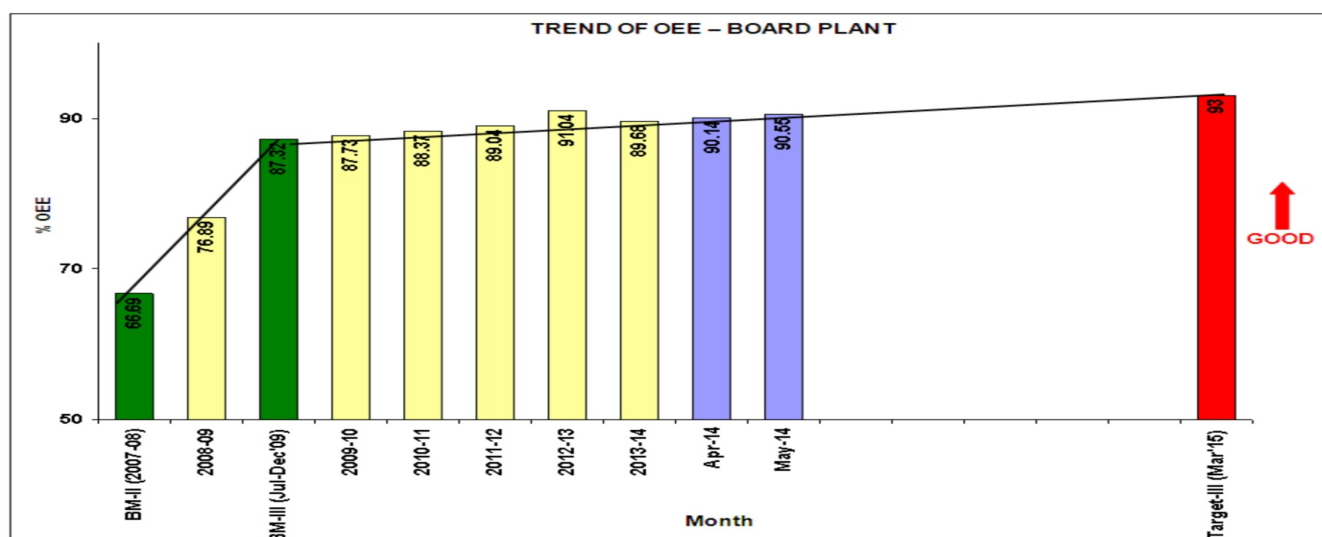
Earlier ETFE coated metal pipeline was used for PAC transport Pump suction. After certain time, coating starts deteriorating and PAC comes in contact with metal surface and pipe start corroding. Leakages attain job through corroded pipe line is tedious one. To eliminate root cause, decided to replace metal pipe line with Teflon coated 3 layer PVC grade pipe.

As PVC grade pipe line inert to chemical reaction, corrosion problem sorted out also chemical wastage avoided. On cost front, ETFE coated line costs Rs 90 Thousand / year. One time replacement with PVC grade pipeline cost is Rs 60 thousand. The

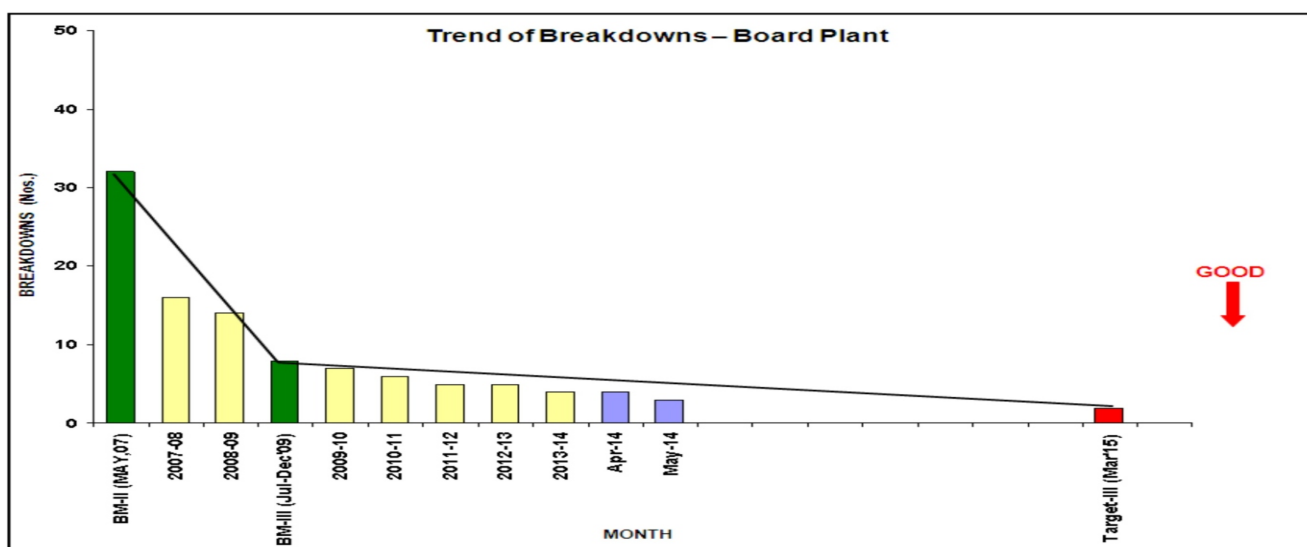
### Board Plant Maintenance Cost



### Overall Equipment Effectiveness (OEE)



### Nos of Breakdown



expected life span is more than 10 years.

## Result

Eliminated chemical wastage through leakage, reduction in maintenance expenses and deterioration losses.

## Import Substitution

Import substitution is an attempt to reduce foreign dependency for particular equipment and services.

In-house R & D facilities established by Indian Manufacturing sector, capable to deliver quality products and services equivalent to International standards.

Our company benefits by Import substitution activity in terms of,

1. Reduce Input and Inventory cost.
2. Shorten Lead-Time
3. Development of Domestic industry.
4. Support to Indian Self-reliant policy.

## Training

HR department have Training and Development initiative for our entire workforce. Frequently training programs are arranged for our employees on Business Priority and Individual/functional training needs.

1. Training imparted to Maintenance crew on Technical, Self Management and Safety.
2. Technical trainings are carried out On job and Off job (Classroom Training)
3. Classroom training conducted in Audio Visual method
4. Also Technical literature and Manual made available for study.
5. Encourage Crew member for sharing Knowledge in friendly environment.

## Increase in effectiveness of shut down Maintenance

Shut down maintenance effectiveness mainly depends upon reduction in number of shut down, reduction in shut down time & reduction in shut down cost.

Shut down nos can be reduced by enhancing equipment life & clubbing shut down jobs. Reduction in shut down time can be reduced by robust planning, Used of advanced Tools and Tackles & by applying Critical path methodology. Shut down cost can be reduced by spare part management & life enhancement with optimization of man power deployed.

## Final Results:

## Acknowledgment

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# Alpha Carbonless Paper Mfg. Co. Pvt. Ltd.

*Where Expectations Meet Excellence*

Established in 1991, we, "Alpha Carbonless Paper Mfg. Co. Pvt Ltd.", are an established manufacturer, Supplier and exporter of an optimum quality range of thermal, chrome, carbon-less and self-copy paper. We are committed to satisfy our customer by adhering to quality standards and service that we deliver. Our team of dedicated professionals work with passion to continuously improve the effectiveness of Quality Management System and endeavouring total customer satisfaction.

## Product List

- ✦ Thermal Paper Jumbo Roll
- ✦ Chromo Paper
- ✦ Carbonless Paper
- ✦ ATM Thermal Paper Receipt Roll
- ✦ Printed/Plain Thermal Paper POS Roll

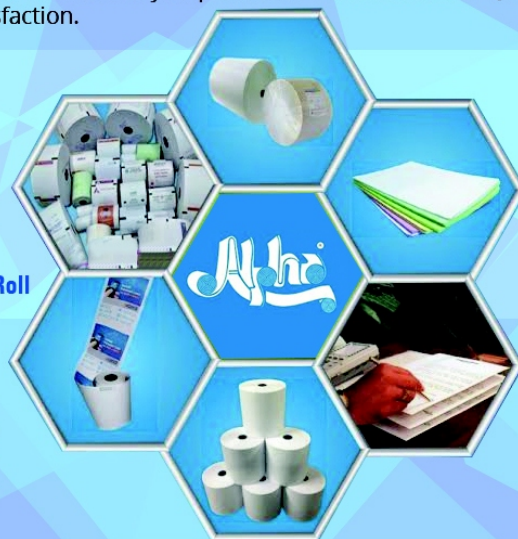
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Maharashtra, India



## Application

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- ✦ Bus Ticketing Rolls
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- ✦ Cash Receipt Rolls
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