

# New Approaches to Technology Development and Trouble Shooting



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## ABSTRACT

The technology of pulp and paper production has advanced considerably since the discovery of paper in AD 105. The improvements in technology have also increased the environmental impact of the processes through air and water pollution. Efforts are being made to reduce the environmental impact of the processes through development of substitute raw materials. The increasing pulping of non-wood raw materials, development of pulping methods, total chlorine free bleaching and introduction of nanotechnology in pulp and paper production aim at addressing these problems.

## 1.0 Introduction

Despite the development of information and communication technology, paper production still remain one of the industrial activities regarded as a pointer to industrialization and educational development worldwide, and, without doubt, pulp and paper production capacity is increasing. It is one of the high demand sectors in the world of industrial production. In the light this, and, in view of the increasing protectionism of the environment, research and development in the sector have concentrated on overcoming environmental problems associated with pulp and paper manufacturing activities globally.

## INCORPORATION OF NEW TECHNOLOGIES

- Always we cannot afford to New Development Technology completely at a time
- Instead they apt for continual improvements with Small Upgradation in plant and Machineries.



## EXPERIMENTS

1. Raw material up-gradation
2. Resource conservation
3. Product quality
4. Process improvement
5. Energy conservation
6. Environmental compliance
7. Research & Development for adoption of technologies.

## 1. RAW MATERIAL UPGRADATION

- Waste land development
- Rural employment
- Environmental Protection
- Up-liftment of rural economy
- Availability of raw material to industry

## 1. A. Improvement in chipping

- Grab feed instead of manual feed to chippers - Manpower reduction
- Drum chipper to cut smaller diameter logs
- Chips screening - Kone screen instead of Oscillating screen to improve production and chips quality



## 2. RESOURCE CONSERVATION

### 2. a. Improvement in cooking

Chips packing in digesters is improved by having

- Air evacuation system (for evacuating vapours in digesters)
- Steam packing system (For charging of chips evenly inside digester)
- Rapid displacement of heat by way of tank form (Accumulators)
- Effective way of heat recovery
- This is highly energy conserving method of cooking when compared with continuous digesters



**3. PRODUCT QUALITY**

**3. A.Improvement in pulping:**

Drum Washer to Press Washer:

- Drum filters with vacuum system is replaced with Natural vacuum drum filters and later with Twin roll press (For reduction of soda loss & less chemical consumption)
- Better screening system (from bump rotor to step rotor)
- Shell and heat ex-changer for black liquor / white liquor application replaced with spiral heat ex -changer to avoid scaling effect.



**3.b. Black Liquor - White Liquor Spiral Heat Exchanger**

Trigger for this project

- White liquor temperature could not be maintained in RDH station with the conventional shell and tube heat ex-changer.
- This had necessitated to look into alternate advanced heat ex-changer with state of the art technology.

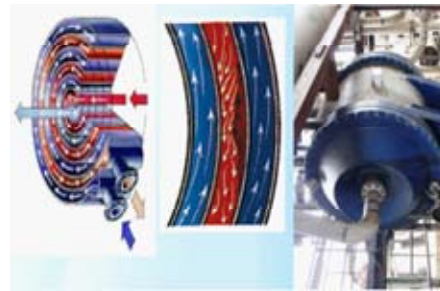
**Why it is innovative**

- Spiral Heat Ex-changer (SHE) with single flow channel and 100% pure counter current flow heat exchange concept, produces flow path with high shear rate and turbulence resulting in high heat transfer co-efficient and low fouling tendency.

Parameter	Present	Earlier
Heat Ex changer	Spiral Heat Ex changer	Shell & Tube
White liquor outlet temperature	100 - 120 °C	85 - 100 °C
WBL supply temperature to Chemical recovery Complex	82 °C	90 °C

**Advantages of SHE:**

- The continuous curving flow channel produced, results in intense scrubbing effect that prevents fouling of deposits formation.
- The resultant overall heat exchange can be anywhere from 30 to 50% higher than in conventional shell and tube heat exchanger.
- Eliminates leakages – Intra, external & bypassing – Unlike S & T heat exchanger.
- Compact unit –low footprint.

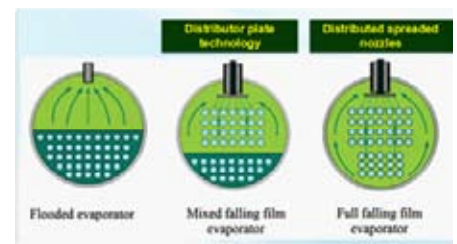


**Benefits:**

Steam saving	25TPD
Annual steam saving	9215 Tonnes
Cost saving	45.62 Lakhs
Annual GHG Emission reduction	2646 tCO2e

**4. PROCESS IMPROVEMENT**

**TECHNOLOGY DEVELOPMENT IN EVAPORATOR**



**Issues in Increasing The Black Liquor Feed Rate in Evaporator**

Sl.no	Cause	Action Taken	Results
A	Low vacuum in surface condenser	Surface condenser water box leakage arrested  Post condenser changed over from PHE to S & T condenser  Foul condensate vapour re-circulation improved by introducing POT.  Orifice size for all NCG were modified	Evaporation feed Rate increased from 185 m <sup>3</sup> /hr to 190 m <sup>3</sup> /hr  Evaporation feed rate increase from 190 m <sup>3</sup> /hr to 200 m <sup>3</sup> /hr  Evaporation feed rate increase to 210 m <sup>3</sup> /h  Evaporation feed rate increase to 203 m <sup>3</sup> /hr
B	Cooling water flow problem	Fan less mist cooling introduced	For sustainability spare O & M Provided

**EVAPORATOR PERFORMANCE IMPROVEMENT**



**5. UTILIZATION OF RENEWABLE ENERGY SOURCES**



Recognizing the importance of Solar Energy, SPB is exploiting the Solar Energy in following ways:



**Renewable Energy Sources Related Projects - 2020-21:**

Through Mill Development Plan, we are stepping up Pulp Production, thereby increasing

- BLS generation 128 TPD of dry solids
- Green Power generation 48,000 units / Day
- Green Steam generation 350 Tons / Day

**6. ENVIRONMENTAL COMPLIANCE**

- Our “Unique way of handling foul condensate” and fire as partial fuel replacement in Lime kiln.
- It was developed with the help of In-house team and utilising the existing facilities.
- Care being taken for mitigating H2S by addition of Ferric chloride.
- Lower Investment.
- By this, we have reduced 20% load to ETP, and furnace oil reduction of about 3 to 3.5 KL / Day

**Bio-gas firing in Rotary Lime Kiln:**

Foul Condensate generated from Evaporators contain reduced Sulphur gas, Methanol, Turpentine etc

- Foul Condensate Generation:8000 Kg / Hour
- Methanol :7.5 Kg / Tonne of Pulp
- Turpentine: 0.50 Kg / Tonne of Pulp
- TRS:1.20 Kg / Tonne of Pulp
- Negative impact to the Environment via VOC and Odour
- Untreated Foul Condensate is let out to the sewer creating huge impact to the Environment by means of high BOD.

**Steam stripping vs. Lagoon**

Parameters	Conventional Steam Stripping	Uniqueness Treatment in Anaerobic Lagoon
Methodology	To install an Expensive Stripper Column in Black Liquor Evaporation plant	The Treatment of foul condensate along with Bagasse effluent biologically for generation of bio gas
Motive Energy	Consumes energy to generate energy	Uses natural phenomena
Initial cost	High	Moderate
O & M cost	High	Low
Recovery of water	Yes	No
Foot Print	Minimum	High



**Scheme Details**

- An anaerobic lagoon was installed early in 1984 to treat the High BOD effluent from Bagasse plant.
- The biogas generated was let to the atmosphere without any collection device.
- In 2013, a suitable supplier was identified to make a balloon cover above the anaerobic lagoon to collect the bio gas and was pumped by a blower to the power boilers to a tune of 2000 Nm3/day.

**Results:**

Description	UOM	QTY
Furnace oil reduction	KL / day	3 – 3.5
Savings	Rs in Crores / Annum	3.6
GHG Emission avoidance	tCO2e	42439
COD load to ETP reduction	%	20

**7. RESEARCH & DEVELOPMENT FOR ADOPTION OF TECHNOLOGIES.**

**Dissolver agitator in CRB**

**Problem**

- Settling rate is very high in dissolver tank and need recovery boiler stoppage once in 3 months for cleaning.
- Pump maintenance frequency is less for cleaning of scales.

**Root cause**

- Agitation is poor despite increasing the RPM with the permissible motor load

**Solution**

- Similar agitator functioning with good agitation with same motor power was

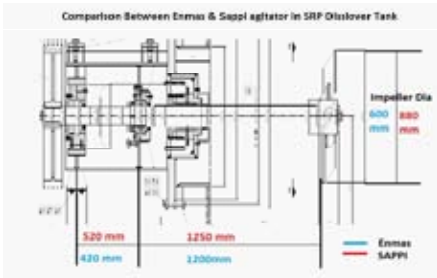
compared. Agitator design verified and was having similarity.

**Action plan**

- Propose to increase the impeller diameter from 600 mm to 880 mm to have a demo run with liquid with the beside spare tank for the sustained run ability covering all aspects.
- On confirmation dissolver agitator was modified accordingly.







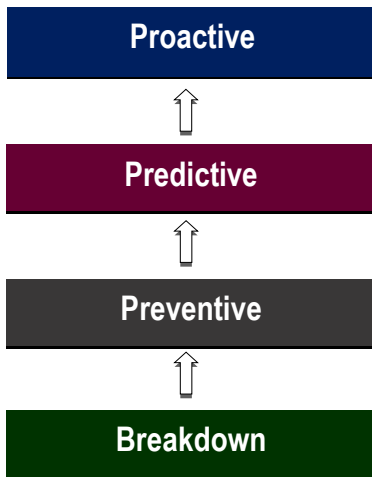
**Results:**

Before shut	Top sample	Bottom sample
	102.3	125.2
	100.4	122.1
	105.4	133.3
	115.9	108.5
After shut	105.4	102.3
	111.6	114.1
	116.6	120.9
	115.9	119.7

**Benefits:**

- Uniform concentration of green liquor.
- Agitation improved (Verified after three months of running)
- Huge saving in investment cost

**DEVELOPMENT IN MAINTENANCE STRATEGY**



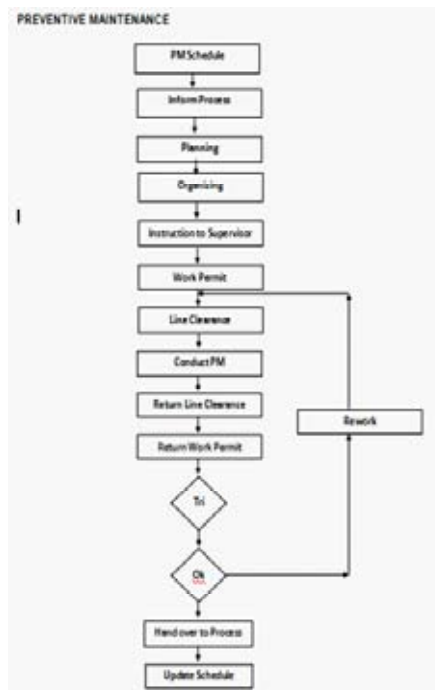
**Preventive Maintenance:**

- Preventive maintenance is a daily maintenance
- Cleaning, Inspection, Oiling and Re-tightening
- Design to retain the healthy condition of equipment
- Prevent failure through deterioration, periodic inspection or equipment condition diagnosis.

- Just like human life is extended by preventive medicine, the equipment service life can be prolonged by doing preventive maintenance

**Preventive maintenance activity includes,**

- Visual inspection
- Abnormal sound recognition
- Frequent parts change
- This maintenance practice is purely random.
- Preventive maintenance is also known as time based maintenance.
- Considered to be costlier maintenance when compared to predictive maintenance.



**Predictive Maintenance**

- Service life of equipment is predicted based on inspection or diagnosis, in order to use the equipment to the limit of their service life.
- Compared to periodic maintenance, predictive maintenance is otherwise known as condition based maintenance.
- Manages trend values, by measuring and analysing data about deterioration
- Employs a surveillance system, designed to monitor conditions through an on-line system.

**Predictive maintenance technique includes,**

- Vibration Monitoring
- Thermography inspection
- Oil analysis
- Ultrasonic testing
- Time and frequency analysis

**Proactive Maintenance**

- It is a preventive maintenance strategy to maintain the reliability of machine or equipment.
- The purpose of proactive Maintenance is to view machine failure and similar problems that can be anticipated and dealt with repeated problems.
- All predictive maintenance observations should be assessed and cause of concern should be eliminated in proactive maintenance.
- Proactive maintenance failures primarily determine the root cause of machine failure and dealing with those issues before problems recurrence.

**CONDITIONED BASED MAINTENANCE**

**Condition Monitoring**

- It is the process of monitoring a parameter of condition in machinery, such that a significant change is indicative of a developing failure.
- It is a major component of predictive maintenance.
- The main value of Predictive Maintenance is to allow convenient scheduling of planned corrective maintenance at opportunity and to prevent unexpected equipment failures.
- Maintenance work can be better planned.

**TROUBLESHOOTING**

**Case Study 1**

**Problem**

New pulp mill (RDH) fibre line, BSW 1 & 2 Repulper journals were of straight bore bearing shafts in which case bearing seating area damage due to some reason invites entire Repulper change.

### Solution

This shaft has been suitably modified with higher diameter to have adapter sleeve mounting bearing without compromising dynamic load capacity of the new bearings.

### Benefits

- Wear on bearing shaft journals avoided totally.
- Uptime of Re-Pulper – Single Street increased to +98% availability.

### Case Study 2

Pickup roll with drives removed and scrapper system introduced in BSW washer 2 with all clamping arrangements.



### Benefits

- Productivity improved by about 140 tons per month
- Nil Down time from the earlier 7 hrs./ month
- Inventory in procuring pickup roll bearings eliminated.
- Safety and good house keeping
- Earlier day's power transmission was done through chain drive.
- Recently it has been changed to timing belt drive to overcome the drawbacks from the above drives with recent developed technology.
- Downtime with respect to chain drive is eliminated
- Environment improved by avoiding lubrication on chain drives.

### CONCLUSION

- Focussed on prioritisation of Safety / Quality in production and environment, Healthiness with respect to performance
- Organisation has a strong belief, more the number of Kaizens, more employee involvements in its functional objective.
- Functional managers to promote Kaizens.
- To optimise the equipment's in service to run in its ideal condition by continuous monitoring
- To take care of employee welfare on different grounds by CREP activities, Housing, Schooling at affordable cost and other social activities in and around mill premises.

