

## **Andhra Pradesh Paper Mills Ltd Rajahmundry**

### **Brief description of the paper manufacturing process**

APPM has adopted down flow low solids continuous system for cooking the raw materials. At first, the raw materials are chipped and screened to the average size of 1" chips. The chips are pre-steamed in diamond back chip bin.

These pre-steamed chips are fed to continuous digester each and cooking chemical known as white liquor is added with WBL to the chips. Cooking temperature is maintained at 155°C – 160 °C. The cooked material is fed to 2 stage DD washer, wash on current Brown stock washing. The washed pulp is then processed through 2 stage oxygen delignification (ODL), screened and stored in UB pulp storage tower.

The washed liquor from 1<sup>st</sup> stage, known as weak black liquor is sent to the chemical recovery section. The weak black liquor containing dissolved organic & inorganic is concentrated in multiple effect evaporators, before firing in the recovery boiler. The inorganic coming in the form smelt is dissolved in the weak white liquor, known as green liquor. This green liquor is treated with lime at causticising plant for making white liquor, a cooking chemical to use in digester house.

The washed ODL treated pulp is screened and stored in high density tower from where the pulp is supplied to paper machines for making unbleached varieties of paper and is supplied to bleach plants for whitening it. APPM is having bleach plant with bleaching sequence of D<sub>O</sub>-E<sub>OP</sub>-D<sub>1</sub>. Single stage DD washers are provided to wash the pulp between stage to stage. After D<sub>O</sub> the pulp is treated with dilute caustic and hydrogen peroxide and oxygen in Eop stage.

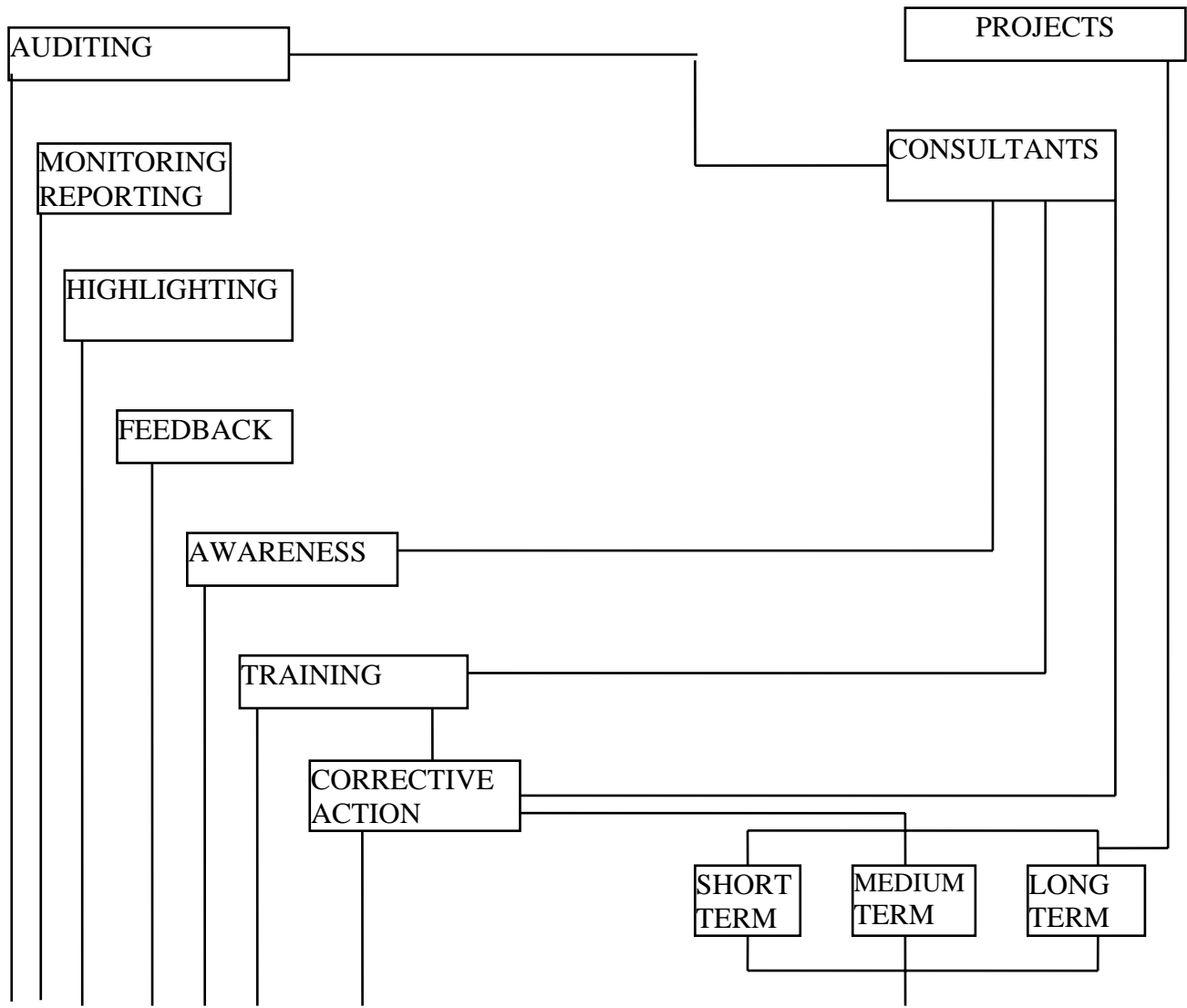
After Eop extraction, the pulp is treated with chlorine dioxide in i.e. D<sub>1</sub> stage. This helps to obtain high brightness with better strength to produce quality papers. The finally washed pulp is stored in storage tower to supply pulp to paper M/Cs for making bleached variety of papers.

The pulp thus received from pulp mill is not suitable for making paper straight away. Pulp is subjected to refining. In the refining process, the cutting and fibrillation takes place. In addition to this the stock is made by adding dyes and wet end additives suitable for making required quality papers.

The pulp at very low consistencies is formed into sheet on an endless wire mesh made of synthetic wire. This wet paper sheet is fed to press part where the water is removed and finally dried in dryers. The dried paper is calendered to impart smooth finish on both sides of paper. Finally the paper is reeled or cut into sheets depending on the requirement of the customers. The average production per day is 280-300 Tons and the quality of products are made as per the product mix available / requirement from the market.

**ENERGY CONSERVATION**

**ENERGY MANAGEMENT**



**S U C C E S S   O F   E N E R G Y   C O N S E R V A T I O N**

## Brief description of the Mill and energy conservation at APPM:

### **1. Unit Profile:**

M/S. THE ANDHRA PRADESH PAPER MILLS LTD. located at Rajahmundry, in the state of Andhra Pradesh was established in 1920'2 with an initial installed capacity of 10 TPD. It was taken over by present management in the year 1964. The mill has grown in stages from 10 TPD to 300 TPD production of different grades of papers, such as printing & writing grades, packing etc. and 550 tpd bleached pulp production. The mill has not only taken; up the expansion but also modernization, value addition and up gradation of old inefficient equipment and systems to produce good quality paper with optimum energy efficiency from time to time.

### **II. Energy Conservation – Concern, Commitment and Set up:**

APPM has always been concerned and committed to improve the mill energy performance levels continuously. Basically because it realizes that natural energy resources available are finite with no way of replenishing the quantum consumed and also heavy investments are required for energy sector for meeting the demands and these resources are to be consumed with prudence to conserve the energy. For APPM, conservation of energy has become a way of life. It reflects and manifests itself in all the endeavors. APPM realizes that this not only is a means to improve competitiveness, enhance profitability but also is a source of moral responsibility.

To achieve the above objectives of energy performance, APPM has constituted an independent Energy Conservation Department and engaged reputed proven “Energy Consultants” M/s. MK Raju Consultants Ltd., Chennai, as early as in 1987 for energy audit, 1990-91, 1996-97, 2001-02 for detailed energy audit with mass; and energy balance and in 2006 for energy audit. These studies are conducted for identification and implementation of energy saving proposals, reduction in energy cost and wastage with improved housekeeping and monitoring practices. The department is bestowed with the functions of bringing awareness of; importance of energy to the employees by conducting in house training programs, by organizing energy conservation week celebrations, Energy Conferences, etc.

The Energy Conservation department prepares and monitors daily energy performance of the mills through computerized daily energy performance reporting system. APPM has installed energy meters and measurement devices for all energy inputs like power, water, steam, fuels, compressed air and condensate return. The energy performance report indicates the figures of today and till date against best achieved norms for immediate comparison and for identification of variances on total and specific energy consumption figures of various sections of the mill for all the above energy inputs.

These daily reports are put for specific discussions on energy performance in daily production meetings, for taking effective corrective actions. The detailed monthly energy performance reports are also presented in monthly executive performance review meetings for identifying areas of improvement and for making; necessary exclusive decisions.

### **III. Energy Consumption:**

The Andhra Pradesh Paper Mills Ltd. Unit:APPM, being an integrated pulp and paper mill, consumes steam and power for the production. Steam is generated not only for the process, but also captive power generation. The fuel for steam generation is coal. In addition, the solid waste, wood/bamboo dust generated in the process is also used as fuel.

The fuel oil, LSHS/furnace oil is used as a fuel in the like kiln for lime mud re-burning. It is also used in chemical recovery boiler as supporting fuel as and when required.

The Mills has operating TG sets for co-generation, Double-Extraction-Condensing type of 34 MW and 12 MW capacity and fully condensing set of 5 MW capacity. The 34 MW and 12 MW steam turbo generator sets are operated continuously.

In the year 2006-2007 the coal consumed in the boilers for process steam requirements and the power generation is a total of 208421 Tons out of which 117716 tons is used for process steam 90705 tons for power generation. The consumption of LSHS oil is 13888 KL out of which 7273.5 KL is used for process.

The mill also imports power from State electricity Board grid and the consumed grid power is 357.67 lakh KWH in addition to total co-generation/captive power utilized is 1326.9 lakh KWH.

The mills have implemented energy conservation schemes and details of investment and savings are given in the annexure. Energy cost as % of manufacturing cost during 2004-2005, 2005-2006 and 2006-2007; is 13.04, 13.49 and 15.7% respectively. The increase in energy cost in 2006-07 is due to commissioning / commissioning trials in progress for implementation of mill development plan under which energy efficient equipment are being installed.

Energy Conservation is an ongoing process. Realizing the need for energy conservation, APPM puts its efforts for improving the energy performance on continuous basis.

## Description of the energy conservation schemes implemented in 2006-07:

### ➤ Installation of energy efficient continuous lo solids cooking system

The Mill follows kraft pulping process and has 13 numbers of very and less efficient batch digesters. Pulp is produced in batches. The cooked pulp is blown and has blow heat recovery system to recover and reutilize the heat. The system requires high quantity of specific steam for producing the pulp.

These thirteen numbers of digesters were replaced with a single large digester of continuous lo solids cooking system. In the system cooking of pulp is done is carried out continuously. Blowing of pulp at high pressure and temperature is not required. On line equipment are provided for cooking, cooling and one stage of washing in one digester which resulted in reduction of specific steam consumption.



### ➤ Installation of energy efficient TG set:

The mill has boilers and TG sets operating at 32 kg/cm<sup>2</sup> (g) pressure and 420<sup>0</sup> C. Specific power generation from the double extraction cum condensing TG set was 90 kwh/T.

The mill has installed chemical recovery boiler which generates steam at 64 kg/cm<sup>2</sup>(g) pressure and 460<sup>0</sup> C. A new 34 MW installed for this steam conditions generates specific power of 130 kwh/T. This resulted in increased power generation and reduction in grid power drawl.



## **SAFETY & ACCIDENT PREVENTION**

1. The Safety and Accident Prevention activities at APPM are monitored by a participative safety committee with equal number of members from Management and Workmen. This committee is in existence since 1976.

There are 17 department level safety sub-committees, which look in to local level safety and accident prevention activities in collaboration with the Safety Committee and Safety Department.

The Safety Department is manned by qualified safety officers and other administrative assistance.

2. Accident Reporting and Investigation

All the accidents and near miss accidents are reported and investigated and reviewed by the Safety Committee.

The accident data is analyzed and Safety Performance is measured monthly, quarterly and yearly and communicated to concerned depts. and higher authorities.

3. Identification of Hazards

Frequent inspections are being carried out by using checklists.

The Safety Committee and Sub-committees also inspect the plants regularly.

4. Safety Systems

Safety Work Permit System and Danger Tag System are in use for carrying out repair and maintenance works, hot works in fire prone areas, entry in to confined space, work on roof, excavation, etc.

5. Safety Training

General and need based training is given regularly to all employees including contract workmen

6. Motivation

National Safety Day is celebrated every year.

Many competitions like slogans, stories, posters, essays, etc. are organized on the occasion of National Safety Day Celebrations every year.

An accident reduction contest is organized.

7. Publicity

Posters, Slogans, Bulletins, etc. are displayed through out plant  
Safety Magazine is published

8. Personal Protective Equipment

Shoes are provided once in a year to all employees including contract workmen

Helmets are provided to all employees

All other Personal Protective Equipment is issued based on the need

Some equipment like Self Contained Breathing Apparatus; Canister Masks, PVC suits etc. are kept in the depts for use whenever and wherever those are needed

9. Emergency Planning & Preparedness & Response

Emergency Plan is made and copies distributed to all concerned personnel.

Periodic mock drills are being organized

Emergency control centers established.

Active role is being played in preparation of Off Site Emergency Plan being made by District Emergency Authority.

10. Occupational Health

Occupational Health Centre is established.

Two doctors and 5 nurses are working in Occupational Health Centre. It is operated round the clock

Periodical medical exams are being carried out for the identified personnel.

This includes X-rays, Clinical examination; Blood exam; Lung function test; audio metric, stool exam; eye exam as per the requirement under Factories Act 1948

## ENVIRONMENT CELL AT APPM

The Andhra Pradesh Paper Mills Ltd., Rajahmundry has established a separate, dedicated ENVIRONMENT CELL for Water and Air pollution abatement, which indicates the commitment of the Industry in controlling the pollution.

### ENVIRONMENT LABORATORY:

Environment Cell is having an exclusive Environment Laboratory equipped with modern monitoring/testing facilities costing about Rs.42 Lakhs.

#### Testing facilities available at Environment Laboratory.

- Water and Waste Water Testing
- AOX Testing
- Stack Monitoring Facilities
- Ambient Air Quality Monitoring
- Meteorological Station with automatic data logger

The Environmental issues are reviewed in the daily coordination meeting chaired by Vice President (Operations).

## WATER POLLUTANTS AND TREATMENT MEASURES

### WASTE WATER TREATMENT:

The main pollutants in the effluent discharged are Suspended Solids, B.O.D, and C.O.D etc. The wastewater from the mills is treated in Effluent Treatment Plant consisting of Primary Treatment to remove the suspended solids and Secondary Treatment (Activated Sludge Process) to remove B.O.D and C.O.D and then treated by Land Treatment process to remove even the Colour of the effluents. APPM is the only mill discharging effluents upstream and drawing water from down stream.

### PRIMARY TREATMENT:

Wastewater is passed through bar screens and perforated screens to remove any foreign material and pumped to primary clarifiers (2 Nos.) of each 7500 M<sup>3</sup>. The settleable solids are removed from the bottom and clarified effluent from the top of the clarifier is taken to Secondary Treatment.

### SECONDARY TREATMENT (ACTIVATED SLUDGE PROCESS):

The effluent from the Primary Treatment is taken to an aeration tank of 23000 M<sup>3</sup> volume. High efficiency diffused aeration system is installed with seven blowers, each of 75 HP. Cooling tower is provided to improve efficiency of the system. Nutrients like Urea and SSP (Single Super Phosphate), are dosed in to the aeration tank as food to the bacteria. From the aeration tank the effluent is taken to the secondary clarifiers (2 Nos.) of 6000 M<sup>3</sup> each. The effluent after Secondary Treatment is pumped to Land Treatment at Turupulanka.

## **LAND TREATMENT AT TURUPULANKA:**

It is a well recognized fact that top layer of the soil maintains a Micro Environment within which soil Flora and Fauna decompose varieties of organic matter. Thus, top layer of soil can be utilized for the treatment of Biodegradable Organic Waste water. Several conventional (natural, physical and biological) treatment processes occur in Land Treatment. Considering such capability of land for treating wastewater, land treatment is well recognized as Living Filter all over the World. As wastewater is discharged on land for treatment, part of it infiltrates down wards and part evaporates and part gets transpired by Plants. The remaining portion gets utilized under the influence of Land as Living Filter.

At APPM, the Rapid Infiltration (RI) system which is most beneficial system of Land Treatment is being implemented. In this system, the wastewater is applied through highly permeable soils such as Sands and Loamy Sands by spreading in Basins and is treated as it travels through the Soil Matrix.

The company has taken on lease about 612 Acres of land in Turupulanka, an Island in River Godavari. It is a unique treatment system adopted by APPM in the country. The expertise of NEERI has been used in designing the system. Water does not directly meet the river. Turupulanka is about 5 Kms up stream from the mills. It is unique in the sense that APPM draws water down stream while it discharges the treated effluents up stream.

The removal of constituents from wastewater by filtering and straining action of soil are excellent in this RI system. B.O.D, T.S.S & Faecal Coliform are almost completely removed. It is also observed that the effluents after percolation through land is void of colour. The soil seems to be working as colour removal media which is otherwise prohibitively expensive treatment. This is an additional benefit achieved through Land Treatment.

## **AIR POLLUTION CONTROL MEASURES IN A.P.P. MILLS**

In Paper Manufacturing Process steam is required at various stages. For generating the steam the Mills has installed five Coal Fired Boilers and three Recovery Boilers, where in the black liquor is fired in the furnace to recover and reuse the valuable chemical in the process. The Mill also installed one Rotary Lime Kilns where the lime sludge ( $\text{CaCO}_3$ ) is burnt to get burnt lime ( $\text{CaO}$ ) to reuse in the Causticizing Process.

## **ELECTROSTATIC PRECIPITATORS:**

The emissions from the boilers contain dust particles (Suspended Particulate Matter, SPM) and contain gases like Sulphur dioxide and Hydrogen sulphide etc.,. In order to control the dust particles and gases from the boilers the Mills has installed most modern sophisticated Electro Static Precipitators as Pollution Control Equipments to all the stacks.

## INCINERATION SYSTEM:

The Company has taken an altogether different approach to eliminate odour completely and installed “**Non-Condensable Gases Handling System**” consisting of Collection, Transportation and Incineration of NCG. The system is **first of its kind** in Pulp and Paper Industry in India to control Odour problem.

In this system, the non-condensable gases from Digester and Evaporation plants are collected and incinerated in the Rotary Lime Kilns. The system is designed and supplied by M/s.Andritz Ahlstrom Corporation, FINLAND having wide experience in design, manufacture and supply of such systems.

The system is installed **at a cost of Rs.5 Crores** and the recurring cost is **Rs.30 Lacs per Annum** for burning the gases in Lime Kiln and if the gases were burnt in Dedicated Boiler, the recurring cost would be **Rs.200 lakhs per Annum**. The system is provided with D.C.S, local instruments, alarms and necessary safety interlocks to ensure safe and trouble free operation.

Thus the Mills is fully conscious of its social obligations towards the abatement of air pollution and had spent quite a lot of money towards pollution control measures and striving hard and putting all its sincere efforts for minimizing the pollution from the mills.

## SOLID WASTE HANDLING

### REUSE OF LIME SLUDGE:

To minimise the solid waste disposal problem of lime sludge generated from the Mills, the company has installed a Rotary Lime Kiln (with a cost of about Rs.13 Crores) to reburn the entire lime sludge to produce high quality lime. The Kiln is equipped with a sophisticated high Efficiency Electrostatic Precipitator (ESP) with guaranteed dust emission of less than 110 mg/NM<sup>3</sup>. The new recovery boiler and lime kiln are provided with ESPs with guaranteed dust emission of 50 mg/NM<sup>3</sup>.

The operation of the Kiln enabled the company to effectively recycle the Solid Waste (Lime Sludge) generated in the Mills and solved the problem associated with lime sludge disposal besides helping in the preservation of depleting minerals -Lime Stone with its limited use.

### REUSE OF CHIP DUST:

Chip dust generated in raw material chipping is collected and is totally fired in our F.B.C Boilers as auxiliary fuel in place of coal, thereby conserving Coal.