PRE-FEASIBILITY REPORT

for

Mill Growth Plan (MGP)

November,2015

Submitted to

ITC LIMITED
PAPERBOARDS & SPECIALITY PAPERS DIVISION
UNIT: BHADRACHALAM

SPB PROJECTS AND CONSULTANCY LIMITED
Chennai - India

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1 EXECUTIVE SUMMARY

1.1 Profile of Mill Growth Plan (MGP)

ITC Limited has its Paperboards & Specialty Papers Division (PSPD) headquartered at Secunderabad, Andhra Pradesh and one of its manufacturing units located at village Sarapaka, near Bhadrachalam, district of Khammam, Andhra Pradesh. ITC Limited-PSPD, Unit: Bhadrachalam was established in the year 1978 with a wide range of product mix including surface sized printing & writing papers, non-surface sized printing and writing papers, paperboards and coated boards. The unit has obtained ISO 9001, ISO 14001 and OHSAS 18001 certifications.

The mill gradually expanded its capacity and the present capacity of paper and paper board is 740,000 tpa (2,176 tpd), bleached pulp 350,000 tpa (1,000 tpd) and Co-generation power capacity of 114.5 MW. The consent for establishment was received during July, 2011.

ITC – PSPD now proposes to install a Mill Growth Plan (MGP) in order to

- The objectives of the proposed expansion are
- To meet the growing demand for paper in the country
- To facilitate the manufacturing of more grades of environmentally friendly paper/products.
- To adopt energy efficient process and plant and machinery

Mill Growth Plan (MGP) comprising installation of

- Paper and paperboard machines – 500,000 tpa (from 7,40,000 tpa to 12,40,000 tpa)
- Bleached chemical Hard Wood Pulp (HWP) – 500,000 BD tpa (from 3,50,000 BD tpa to 8,50,000 BD tpa)
- Bleached Chemi Thermo Mechanical Pulp (BCTMP) – 150,000 BD tpa
- Cogeneration Power Plant (CPP) - 190 MW for captive consumption (power generation from 114.5 to 304.5 MW)
- Supporting section consisting of chemical recovery, water intake, water treatment and effluent treatment to match the above capacities.

The summary of the existing and post MGP capacities and proposal are as below.

Sl. No	Section	Unit	Capacity		Incre-mental
			Existing	Post MGP	
1	Paper machine (PM# 8 &9)	tpd	2176	3676	1500
2	Wood pulping capacity (FL#3)	BD tpd	1000	2500	1500
3	Chemi Thermo Mechanical pulp	BD tpd		450	450
4	Chlorine dioxide	tpd	10	25	15
5	Ozone plant	tpd	5	15	10
6	Evaporation plant	tph	450	1500	1050
7	Recovery boiler	tpd	2200	5800	3600
8	Recausticising Plant	tpd	450	1250	800
9	Lime kiln	tpd	450	1210	760
10	Multifuel boiler	tph	530	1230	700
11	Turbo Generator	MW	114.5	304.5	190
12	Net Water drawal	m^3/day	80,000	1,80,000	100,000
13	Effluent treatment plant capacity	m^3/day	80,000	1,80,000	100,000
14	Final effluent discharge	m^3/day	68,800	1,53,800	85,000

From the inception, ITC-PSPD has always been a responsible player in the paper industry by

- Adopting environment – friendly processes as far as practicable
- Being quality conscious – in products, processes service and people
- Continuously enhancing the value for all stake holders and
- Upholding societal values and expectations

The project envisages resource optimization or recycling and reuse of water and various chemicals measures and some of the important proposals are as under;

S.No	Description	Recycling / Optimisation
1	Chemicals in effluent	Chemicals recovered from effluent by recovery boiler
2	Black liquor solids	fired in recovery boiler to generate steam and power
3	Water recycling	condensate from evaporator and boilers are reused
4	ETP water recycling	Treated effluent water reused for pulp washing, cleaning, ash quenching, dust suppression, etc.
5	BCTMP Evaporator	Recovering 1.5% black liquor by evaporation
6	Bark and Dust from chipper	Fired in biomass boiler
7	Clarified water from Paper machine	Used for floor cleaning and wood washing
8	High pressure boilers	To conserve coal by generating higher power per tonne of coal fired.

S.No	Description	Recycling / Optimisation
9	Vacuum system in paper machines	Replaced with "Turbo Air" which occupies less space and consume less energy
10	Continuous Cooking	Steam consumption is reduced comparing to batch cooking
11	DD Washer & press	Reduces steam consumption by increasing black liquor concentration from 13-15% to 17-18%
12	Non Condensable Gas	Recovered from different points and fired in boilers or lime kiln.
13	Producer gas	Coal based producer gas is used in place of furnace oil

The capitalized cost of the MGP is Rs 5,800 crores and about Rs 664 Crores is allocated towards pollution control equipment and implementation of environmental pollution control measures.

1.2 Environmental Impact Assessment:

Construction Phase

The construction activities of new installation will not necessitate any displacement of people, as the construction will be carried out in forest land. This phase does not involve major changes in the terrain.

Air Environment

The major pollutants from the mill after MGP are particulate matter (PM) and sulphur dioxide (SO2) from the coal fired boiler. High efficiency ESP will be installed to reduce the particulate matter and the chimney will designed suitably to reduce the effect of SO2 emission and the resultant concentration of PM and SO2 will be kept below the standards prescribed.

In addition non condensable gases (NCG) generated in kraft pulping are poisonous and create characteristic smell in the premises. The gases, from different points of generation are collected and fired in boilers or lime kilns.

Wastewater Characteristics and Disposal

The waste water is generated from the process are treated and then discharged. The characteristics of treated wastewater from the WWTP outlet after MGP shall confirm the norms specified by APPCB.

WASTEWATER INFLUENT CHARACTERISTICS

Description	Unit	Fibreline (including pulp mill, chemical recovery & power plant)	Paper machines, SFT and others
Flow	m^3/day	70,000	30,000
pH		6.5-8.0	6.7-8.1
Total suspended solids	ppm	250-500	600-1000
BOD	ppm	250-400	250-300
COD	ppm	1000-1900	800-1400

TREATED WASTEWATER CHARACTERISTICS

S No	Parameters	Unit	Characteristics
1	pH	--	6.5 – 8.5
2	Oil and Grease	mg/l	<10
3	Total Suspended Solids	mg/l	<100
4	Total Dissolved Solids	mg/l	<2100
5	BOD (3 Days at 27^0C)	mg/l	<30
6	COD	mg/l	<250
7	AOX	kg/t of product	<1.0
8	Sulphates	mg/l	<1000

The treated wastewater will be discharged through closed pipeline to river bank. Presently, most of the discharged water from the pipeline is tapped and used by the locals for irrigation purpose. Additional land area is proposed to be brought under irrigation scheme with the help of Rotary International and through farmers' co-operation, with a view to use additional treated wastewater for crop irrigation. The balance water shall finally meet the river Godavari.

Solid Waste Generation and Disposal

The solid wastes generated in pulp mill are non-hazardous in nature. The solid waste generation expected from the proposed expansion project will be chipper dust and boiler ash. In addition to this, there will be fibre sludge generation from the wastewater treatment plant. The details of solid waste generation and quantities with disposal methods are given below.

NON-HAZARDOUS WASTE

S No	Name of the Waste	Quantity (tpd) Yearly Average	Method of disposal
1	Fly ash	1700	The fly ash will be used for construction activity brick manufacturing and disposed to cement mill
2	Chipper dust	550	Used as fuel in biomass boilers / vermin composing
3	Effluent treatment plant sludge (dry basis)	90	ETP sludge will be disposed to APPCB authorised agencies for making sundry hand made secondary/inferior grade boards.
4	Lime sludge (Dry basis)	1100	Out of 1100 tpd generation 850 tpd is reused/recycled in lime kiln to produce lime for internal consumption and rest 250 tpd will be disposed to cement mills.

Noise environment:

- The noise level of the all the equipment will be kept within the CPCB standard in and around the work zone.

Socio – Economics:

- Forest land is proposed for the project. There will not be any resettlement and rehabilitation. Thus, there will not be any adverse socio economic implications.
- The economic status of the area is likely to improve, as there will be direct /indirect employment generation during construction and operational phase.

Risk Assessment & DMP

- No major hazards with potential for any emergency situation exist in the process plants. On site and off site emergency measures shall mitigate the effect on any risk.

1.3 Corporate Social Responsibility

ITC - PSPD is committed to corporate social responsibility (CSR) in helping the inhabitants of the surrounding villages by taking part in

- Social farm forestry
- Watershed development
- Agricultural productivity

- Livestock development
- Primary education
- Woman empowerment
- E-choupal for farmers

This has paved the way for establishing a harmonious relationship in the area.

Under social farm forestry, ITC – PSPD has promoted farm forestry in 120,000 hectares till now with 508 million saplings. The employment generation is about 54 million man days.

Watershed development carried out covering about 74,000 hectares with 3400 harvesting structure, benefiting about 711 groups of farmers.

Agricultural productivity is increased training the farmers and about 473 irrigation wells and 740 sprinkler units were installed. About 5800 demonstration plots were created to educate the farmers. Also 13,800 vermicompost & NADEP units were installed for the benefit of farmers to manufacture organic manure.

ITC-PSPD has created 260 cattle development centres for the benefit of about 187,000 farmers.

In the field of woman empowerment, ITC has created 8,800 micro credit groups of woman to benefit 39,000 woman entrepreneurs.

ITC – PSPD has taken up about 700 government school and extended infrastructure support and also opened 2,500 supplementary learning centres to provide coaching in the evening.

ITC – PSPD has set up E-choupal at various places and trained the farmers to browse the internet for e-trading to avoid middlemen and to access various information including commodity price to enable them to get more prices for their products.

CSR is a continuing activity for all progressive organisations and ITC-PSPD understands and appreciates that as the company progress, expectation levels of neighbourhood population increases.

ITC has received many awards and some of the awards in the corporate responsibility and environmental excellence are as under;

- ITC won the Asian CSR Award for Environmental Excellence, given by the Asian Institute of Management (2007).

- ITC Limited has won the top honours at the TERI Corporate Award for Social Responsibility 2008 in recognition of its exemplary initiatives in implementing integrated watershed development programmes across 7 states, providing precious water resources for agriculture, rural communities and livestock.

- ITC was conferred the Corporate Social Responsibility Crown Award for Water Practices from UNESCO and Water Digest (2008).

- ITC Limited was presented the FICCI Award for Outstanding Achievement in Rural and Community Development by the Finance Minister, Shri Pranab Mukherjee (2010).

- ITC became the first Indian Company to gain Membership with WWF-GFTN for Responsible Forestry (2010).

1.4 Socio Economic Benefit of MGP:

- The project will create direct employment to about 1500 persons and indirect employment of 20,000 persons

- The project creates additional livelihood to farmers, casual workers and transporters in near by region. In farm forestry operations, about 100,000 families will be benefited and earn a revenue of Rs 600 Crores per annum. Casual labours earn a revenue of Rs. 100 Crores by way harvesting, debarking etc and transporter earns a revenue of Rs. 100 Crores for the transportation of wood.

- About 200,000 hectares of land shall be brought in to farm forestry in a span of 5 to 7 years. This will increase the forest cover of Andhra by about 2%.

- The project is likely to generate income to the state by way of sales tax to the tune of 60 Crores and by way of excise duty to the tune of 175 Crores.

- The implementation of the project will undoubtedly provide stimulation for added growth to a number of other industries some of which are given below

    - Trucking industry which will load and haul wood, coal, lime and supplies to the mill and also mill outputs. The haulage requirement for the project would be around 5 million tonnes per annum comprising both inputs and outputs.

- Establishment of ancillary industries such as burnt lime, core for paper reels, core plugs, machining and welding units, etc.
- Indigenous machinery suppliers / manufacturers.
- Establishment of indirect industries and shops near the project site such as small scale work shops, hardware shops, small scale restaurants, petty civil and electrical contractors, grocery and provision shops, etc.

➢ Construction industry during erection and construction period.

2 INTRODUCTION TO PROJECT

2.1 Back drop

ITC Limited has its Paperboards & Specialty Papers Division (PSPD) headquartered at Secunderabad, Andhra Pradesh and one of its manufacturing units located at village Sarapaka, near Bhadrachalam, district of Khammam, Andhra Pradesh. ITC -PSPD comprises four (4) units viz. Bhadrachalam, Tribeni, Kovai and Bollaram. ITC Limited-PSPD, Unit: Bhadrachalam was established in the year 1978 with a wide range of product mix including surface sized printing & writing papers, non-surface sized printing and writing papers, paperboards and coated boards. The unit has obtained ISO 9001, ISO 14001 and OHSAS 18001 certifications.

ITC Limited-PSPD, Unit: Bhadrachalam has employed cleaner technology in pulp bleaching operation. The mill has also implemented the state-of-the-art technologies in pulping and recovery operations by successfully commissioning the Elemental Chlorine Free (ECF) pulp mill for the first time in the country. ITC has also first time in the country installed Ozone Based Pulp Mill.

The mill gradually expanded its capacity and the present approved capacity of the mill is paper and paper board 740,000 tpa, bleached pulp 350,000 tpa and Co-Generation Power Plant 114.5 MW.

From the inception, ITC-PSPD has always been a responsible player in the paper industry by

- Adopting environment – friendly processes as far as practicable
- Being quality conscious – in products, processes service and people
- Continuously enhancing the value for all stake holders and
- Upholding societal values and expectations

2.2 Nature of the Project

ITC-PSPD proposes to further expand by way of “Mill Growth Plan (MGP) the operation of the unit located at Sarapaka Bhadrachalam, with a view to improve technology, energy efficiency, marketability and long term environmental compliance.

Mill Growth Plan (MGP) comprising installation of

- Paper and paperboard machines – 500,000 tpa (from 7,40,000 tpa to 12,40,000 tpa)
- Bleached chemical Hard Wood Pulp (HWP) – 500,000 BD tpa (from 3,50,000 BD tpa to 8,50,000 BD tpa)
- Bleached Chemi Thermo Mechanical Pulp (BCTMP) – 150,000 BD tpa
- Cogeneration Power Plant (CPP) - 190 MW for captive consumption (power generation from 114.5 to 304.5 MW)
- Supporting section consisting of chemical recovery, water intake, water treatment and effluent treatment to match the above capacities.

The driving force for the MGP is a combination of quest for improved environmental performance and market demand and to be leader in the paper industry.

2.3 Need for the Project and Its Importance to the Country and or Region

The objectives of the proposed expansion are

- To meet the growing demand for paper in the country
- To facilitate the manufacturing of mere grades of environmentally friendly paper/products.
- To adopt energy efficient process and plant and machinery

With steady increase in input costs and a continuous competition from the new units with better quality products apart from the threat of dumping from overseas manufacturers, the mill has to find ways and means to meet these challenges and for its continued economically viable operation for sustenance.

Further, as specified by the charter on Corporate Responsibility for Environmental Protection (CREP), it is necessary for the mill to comply with the latest environmental guidelines.

2.4 Paper and paperboard market – an Overview

The demand in Asia and Middle East region is expected to grow at CAGR of 5.5 percent over the next 5 years and driven by nearly 8 – 8.5 percent CAGR growth in China and India.

In India, the total paper and paper board consumption is around 10.2 million tonnes in 2010-11, are expected to grow to 15.2 million tonnes in 2015-16 with CAGR growth of 8.1 percent.

In India, the demand for the paper grows much faster than the growth in capacity addition and there is a shortfall in supply, which is to be met by the imports.

The demand and supply of paper and paperboard is project below;

(In million tonnes)

	2010-11E	2011-12P	2012-13P	2013-14P	2014-15P	2015-16P
Projected demand	10.28	11.07	12.05	12.91	13.98	15.16
Projected capacity	10.98	11.63	12.16	12.62	13.92	15.13

Even though the capacity and demand matches more or less, the actual production is likely to be in the range of 80-82 percent of capacity and hence there is likely to be shortage in supply. Hence there is likely shortage of paper and paper board to the tune of about 3.0 million tonnes per annum during the year 2015-16.

Paper exports, accounting for around 6-7 percent of domestic production, would increase around 11 percent CAGR from 0.55 million tonnes in 2009-10 to around 0.93 million tonnes in 2014-15.

The export in terms of quantity during the last 4 years of paper and paper board is as below;

(in lakh tonne)	2007-08	2008-09	2009-10	2010-11 P
Paper & Paperboard	4.5	5.0	5.5	6.5

Source: Ministry of commerce export data

The exports are steadily increasing in terms of quantity during the last few years from 450,000 tonnes in 2007-08 to 650,000 tonnes during 2010-11, indicating good prospects for export.

The domestic market for paper and paperboard is expected to grow around 8–8.5 percent and market for branded copier is expected grow around 15 percent during the next 5 years.

The exports are steadily increasing and the export is expected to grow around 15 percent during the next 5 years.

2.5 Employment Generation (Direct and Indirect) due to the Project

The direct manpower requirement for the performance of the mill's regular function will be around 1500 people. The project will provide scope for indirect employment of about 1500 people during construction stage and about 10,000 people during operation in the areas of material handling, transport and ancillary units.

MGP requires about 24 lakhs tpa of wood as raw material. About 20 – 22 lakhs tpa wood would be sourced from farm forestry sources. The above requires about 200,000 hectares of farm forestry land. MGP creates livelihood for about 100,000 families in farm forestry. Additionally creates about 15.0 lakh man days for felling and debarking of wood and 6 lakh man days for the transportation of wood to the plant.

3 PROJECT DESCRIPTION

3.1 Project Proposals

The proposals covered under the Mill Growth Plan (MGP) are as in the following paragraph.

3.1.1 Paper/Board Machines

Description	Unit	Capacity
PM #8 – Printing and writing (PWP)	tpd	750
PM #9 - Board machine (MLB)	tpd	750
Total Paper/board capacity	**tpd**	**1500**
	tpa	**500000**

3.1.2 Hard Woo Pulp (HWP)

Description	Unit	Capacity
Fibre line #3	BD tpd	1500
	tpa	5,00,000
Ozone generation plant	tpd	10
Chlorine dioxide plant	tpd	15

3.1.3 BCTMP

Description	Unit	Capacity
BCTMP	BD tpd	450
Evaporation Plant for wastewater from BCTMP	tph of water evaporation	250

3.1.4 Chemical Recovery System

Chemical recovery handles 3600 tpd of solids consisting of:

Description	Unit	Capacity
Black Liquor Evaporation Plants	tph of water evaporation	800
Chemical Recovery Boilers	tpd BL solids	3500
Recausticising plant	tpd	800
Lime kiln	tpd	750

3.1.5 Cogeneration Power Plants (CPP)

The mill is equipped with 100% captive power generation.

Description	Unit	Capacity
Multi fuel fired boiler	tph	630
Biomass fired boiler	tph	80
Turbo Generatord	MW	190
Cooling tower	m^3/h	27000
DM/RO Plant	m^3/h	780

3.1.6 Water intake Treatment Plant

The total water drawal from river Godavari for MGP is 1,00,000 m³/day.

3.1.7 Effluent Treatment Plant

Wastewater generation from pulping, paper machine and other sections will be 100,000 m^3/day (inlet to ETP Plant). and the final discharge from ETP will be 85,000 m^3/day. Around 15,000 m^3/day will be recycled from ETP.

3.1.8 Summary of capacities

The capacities of various sections of existing plant and the proposed during MGP and total capacities after MGP are presented below

Sl. No	Section	Unit	Capacity		Incre-mental
			Existing	Post MGP	
1	Paper machine (PM# 8 &9)	tpd	2176	3676	1500
2	Wood pulping capacity (FL#3)	BD tpd	1000	2500	1500
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13	Effluent treatment plant capacity	m^3/day	80,000	1,80,000	100,000
14	Final effluent discharge	m^3/day	68,800	1,53,800	85,000

3.1.9 Special Features of MGP

Some of the special features considered in the MGP are as below;

- State-of-the-art, low solids, low kappa, cooking to reduce Total Reduced Sulphur (TRS) Level
- Elemental Chlorine Free bleaching to reduce dioxin and colour & wastewater generation
- Collection and burning of Non-Condensible Gases (NCG) in cooking and washing and burning in lime reburning kiln/recovery boiler to reduce odour
- Use of producer gas as fuel in lime mud reburning kiln to reduce furnace oil consumption

- Falling film evaporator to concentrate black liquor to 70% and to dispense with direct contact evaporator (cascade evaporator) to reduce odour
- Circulating Fluidised Bed Combustion boilers for higher efficiency and low unburnt carbon in ash to be suitable for cement manufacturing
- Reuse of bleach plant filtrate water back in process and recycling the paper machine back water for water conservation
- Maximum recycling/reuse of treated wastewater for washing, floor cleaning, ash quenching, irrigation and non-other, non-critical process areas
- Turbo air in place of convention vacuum pumps for paper machine section
- CREP's guidelines
- Green cover/green belt to cover area of 33%

3.2 Project Location Aspects

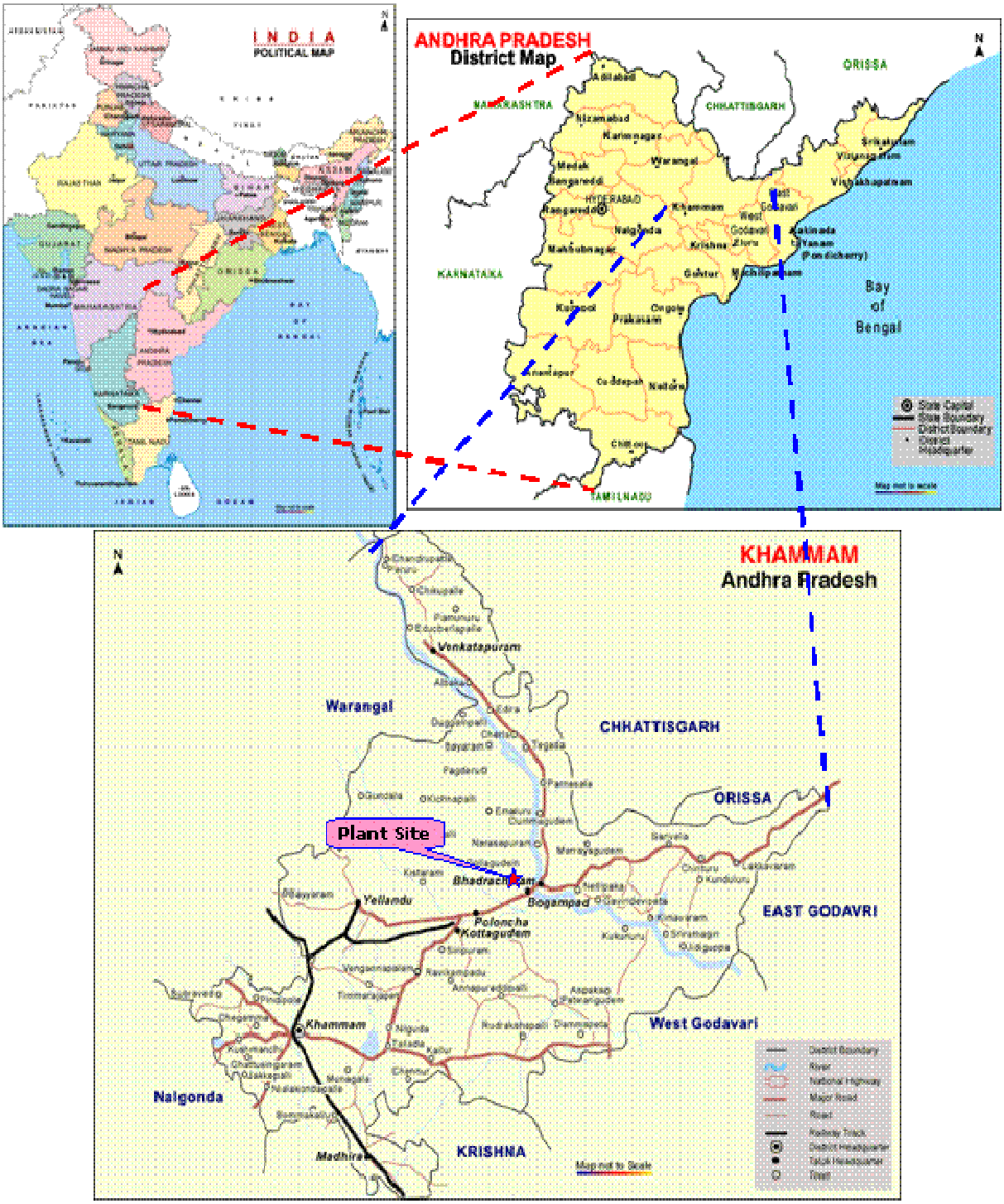
ITC Limited-PSPD, Unit: Bhadrachalam is located at Sarapaka village, Near Bhadrachalam. Khammam district, Andhra Pradesh, about 5 km from Bhadrachalam town in south central part of India.

Mill Growth Plan (MGP) project is proposed to be located adjacent to the existing paper mill.

The site is located at the intersection of longitude 80°52'05" E and latitude 17°41'19" N and falls under Survey of India Topo sheet No. 65C/13 and 65C/14.

The site is about 100 km (aerial) from Khammam, the district headquarters and it is on the State Highway No.9 and nearest airport is at Hyderabad.

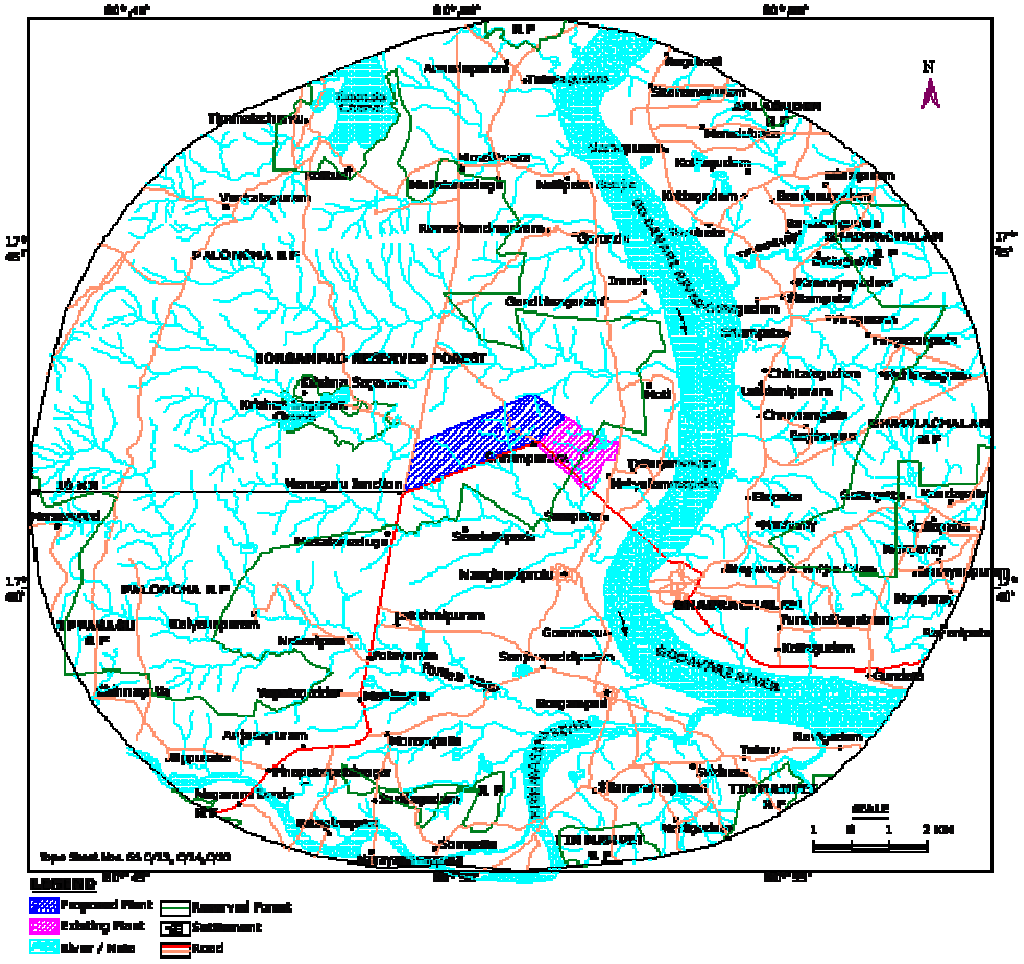
3.2.1 Location Map




Site for MGP
Existing Factory

3.2.2 Study Area

STUDY AREA – 10 KM AROUND THE PROPOSED PROJECT



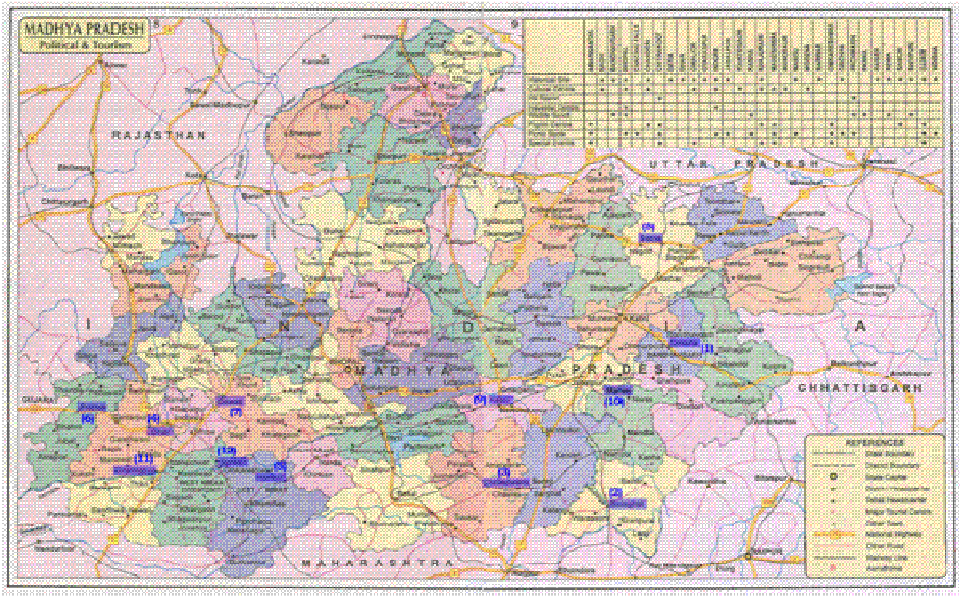
3.3 Site Selection

3.3.1 Short Listed Sites

The team consisting members from SPB Projects and Consultancy Limited (SPB-PC), Chennai and ITC Limited (ITC PSPD) carried out surveys to various states, for exploring the suitable sites for establishing the proposed Pulp and Paper Project

Considering the pre-requisites for the mill expansion project, the site selection team has conducted field survey and identified potential sites as below.

Site	Sites Identified	Sites Surveyed	Potential Sites
Madhya Pradesh	12	6	2
Gujarat	18	10	2
Maharashtra	5	4	Nil
Andhra Pradesh	4	4	2



3.3.2 Description of Short listed sites

The following sites are short listed sites for the mill expansion project from the potential sites:

- Padra in Gujarat
- Maneri in Madhya Pradesh
- Nellipaka in Andra Pradesh
- Sarapaka in Andra Pradesh

3.3.2.1 Site Description- Padra (Gujarat)

This site is located south-west to Vadodara (about 25 km) Which contiguous land is available, at this location (Amra Village). At present, land lives for cultivation like Dal, with low productivity as the crops are not remunerative. Owners of the land are proposing to dispose of the land. These are identified by GIDC for industrial development.

3.3.2.2 Site Description- Maneri (Madhyapradesh)

Maneri located South-east of Jabalpur, 20 km away from the outskirt of Jabalpur and 60 KMs from Mandla.

3.3.2.3 Site Description- Nellipaka Site, Andhra Pradesh

Nellipaka is located in Khammam district having water source as River Godavari. Its nearest Railway Station is Manuguru around 12 kms from the site.

3.3.2.4 Sarapaka, Andhrapradesh

Sarapaka is located about 5 km from Bhadrachalam town in Khammam Dist., Andhrapradesh with flat topography.

3.3.3 Selected Site

The short listed sites have been further analysed with various site selection parameters by assigning rating and score by weighted average method. Sarapaka emerged as the best site for MGP.

Considering the above, the Sarapaka site is given preference over Nellipaka site and selected for MGP.

3.3.4 Selected Site – Unique advantages over other sites

The other benefits and advantages of locating the Mill Growth Plan at Sarapakka are:

- Part of the existing infrastructure available at the present unit can be utilised. This will result in reduced area requirement for the project.
- Being adjacent to the existing plant, monitoring/control of all aspects of project easier and faster.
- Operations of both existing and new can be managed in a better and efficient way.
- Travel by the top level and admin/head office personnel will be minimised.
- Some of the storage spaces/ware houses out side the mill premises, being used at present can be closed by bringing them in side new premises for mill expansion project, thus reducing the haulage of the raw materials and finished products. As a result, movement of trucks on the roads will be less improving the environment.
- Reduction in manpower due to single location operations of storage of raw materials and products.
- Limitations/constraints/make shift arrangements in the existing storage areas/facilities can be overcome by providing these shortcomings in the mill expansion project site, which is not feasible if mill expansion project is located at a distance from the existing mill.
- Project can take off much earlier (at least 1 to 1-1/2 years compared to a green-field site)
- Perennial water source and only enhancement of available sanction for water is required.
- The project cost also may be less compared to green-field site due to shorter implementation period and less pre-operative expenses required for infrastructure development at site.

3.4 Project Description

3.4.1 Paper Machine Section

3.4.1.1 UWF – Printing and Writing Paper Machine (PM #8)

The paper machine section starts from stock preparation and continues upto rewinder with auxiliaries involving following processes.

The details are elaborated in subsequent sections appropriately.

The paper machine for uncoated wood free grades will be new and unused.

Machine will be capable of producing 2,50,000 tpa of saleable Wood Free Uncoated and Copier grades

Machine will have following features;

- Stock Preparation Section
- Chemical Additive Preparation and Coating color Kitchen (Common for Both UWF and CBD Machines)
- Approach flow Section
- Forming Section
- Press Section
- Pre Dryer Section
- Film Press
- Post Dryer
- Machine Calender
- Machine reel
- Paper machine auxiliaries consisting of Wet End Vacuum Section, Steam distribution and Condensate removal system, Hood and Ventilation System, Paper Machine Drive, Paper Machine Lubrication System, and Machine, Process and Quality Control System
- Conversion and Finishing
- Warehouse and despatch with automatic storage and retrieval system (ASRS)

3.4.1.2 Multilayer Board Machine (PM #9)

It is proposed to install a new state-of-art board machine for producing high value multi layer boards.

The selected new board machine shall have the following facilities

First floor, multi fourdrinier board machine with three (3) layers in the forming section for the production of Folding box board (FBB) and Solid bleached sulfate board

The board machine (PM #9) is capable of producing 250,000 tpa of saleable multi layer board.

Coated Board Substance to range from 170 to 400 GSM with 250 GSM considered as Anchor for design

Machine shall comprise the following sections

- Stock Preparation Section
- Chemical Additive Preparation and Coating color Kitchen (Common for Both UWF and CBD Machines)
- Approach flow Section
- Fibre recovery
- Forming Section
- Press Section
- Pre Dryer Section
- MG Dryer Section
- Surface Sizing
- Post Size Press Dryer Section
- pre Calender
- Coating sections
- Post calender
- Reel section

- Paper machine auxiliaries consisting of Vacuum Section, Dryer Steam supply and Condensate removal, Hood and Ventilation System, Paper Machine Drive, Paper Machine Lubrication System, and Machine, Process and Quality Control System

- Conversion and Finishing

- Warehouse and despatch with automatic storage and retrieval system (ASRS)

3.4.2 *Bleached Chemical Wood Pulp Mill (HWP)*

3.4.2.1 *Raw Material Receipt, Storage and Handling*

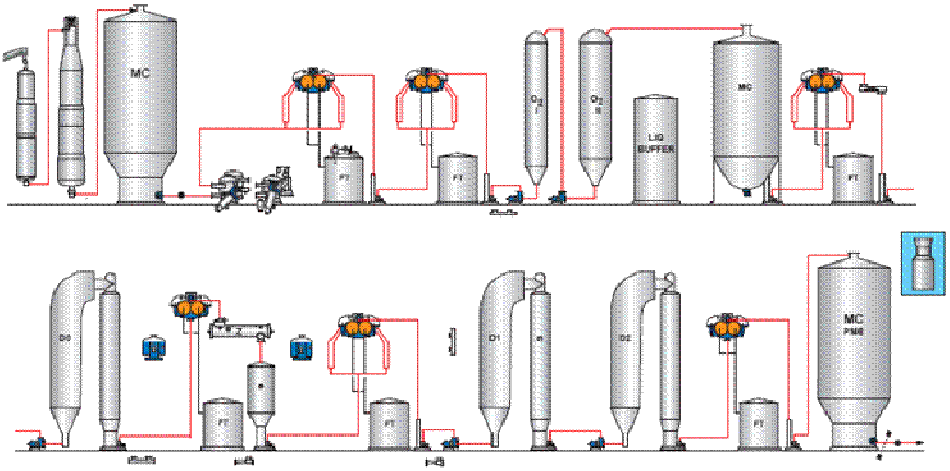
The raw material required by the mill, viz. hardwood/bamboo, will be received from Andhra Pradesh Forest Corporation/private plantations/ Assam. Stacking and unstacking will be manually/mechanically carried out.

3.4.2.2 *Raw Material Preparation*

Raw material received from the raw material yard will be fed to the chippers. The chips from the chippers will be screened on a multideck vibrating/oscillating screen for the separation of acceptable chips, oversize chips and fines. The accepted chips will be transported to the chips silo through a conveyor.

3.4.2.3 *Pulp Digestion*

Wood pulp will be prepared by the kraft process, employing cooking liquor with a sulphidity of at least 20%. The pulp digestion will be carried out in Continuous digesters.



3.4.2.4 Pulp Screening

A three-stage pressure screening system is adopted for screening of blown pulp.

3.4.2.5 Brown Stock Washing

The accepts from the pressure screen will be fed to the brown stock washing. The mill will go for the latest brown stock washing technology. The outlet pulp from the state -of – art brown stock washing system minimises the COD/BOD carryover to the subsequent pulping operations.

3.4.2.6 Oxygen Delignification

Oxygen delignification is performed with oxygen (O_2) and caustic (NaOH) serving as the active chemicals. The process is controlled by means of chemical charge, temperature and pressure.

Oxidised white liquor can be used instead of sodium hydroxide in the oxygen delignification. The oxygen should have a purity of over 93%.

The pulp from the final brown stock washer is discharged to a medium consistency pump. The medium consistency pump feeds the pulp to the oxygen reactor via static pulp heater and a high shear mixer in which the oxygen is charged.

The post oxygen washing consists of two washing stages.

The pulp from the blow tank is fed to the first post-oxygen washer, where it is washed. From washer, the pulp is transferred to a storage tower.

From the storage tower, the pulp is pumped to a post oxygen stage washer#2.

3.4.2.7 Bleach Plant

Pulp, after oxygen delignification, is led to a post oxygen washer and then bleached to a brightness level of minimum 88% ISO, by employing D_o-A Z_e - DP bleaching sequence, as described below.

From the second stage post-oxygen washer, pulp is discharged to the stand pipe of a MC Pump. The pulp is pumped into a chlorine dioxide (D_o) mixer, where chlorine dioxide solution is added to the pulp. The pulp is again passed through an upward flow Light D_o reaction tower. From the launder of the D_o reaction tower, the pulp is passed into a washer. After washing, the pulp is mixed with sulphuric acid and discharged into a stand pipe of a MC pump and then pumped to the Washer to increase the Pulp consistency to 35 - 40 %.

The outlet pulp enters the ozone reactor and discharged into a E-tower, maintaining the pH with help of sodium hydroxide. The pulp is then pumped to a second stage chlorine dioxide (D) mixer, where chlorine dioxide solution is added to the pulp. The pulp is passed through an upward flow D reaction tower. From the launder of the D reaction tower, the pulp overflows into a down flow P reaction tower. From the Peroxide reaction tower (P) , the pulp is washed in the washer discharged at about 10 to 12% consistency, into a Bleached Pulp High Density Storage Tower.

The bleached pulp is diluted at the bottom of the Bleached High Density Storage Tower, and pumped to stock preparation section of the paper machines.

3.4.2.8 Chlorine dioxide plant

The plant ClO_2 consists of the following major units :

- Sodium Chlorate Electrolysis
- ClO_2 Generation and Absorption Unit
- Waste Gas Dechlorination Unit

The chlorine dioxide generation system is provided with a safety interlocking system to prevent any dangerous operating conditions, which could give rise to damage of equipment and injury to operating personnel.

3.4.2.9 Oxygen Generation Plant

To meet the oxygen requirement for Fibreline, Ozone generation plant and White liquor oxidation plant, the mill plans to install an oxygen generation plant based on the VPSA system.

Two (2) molecular sieves vessels operate in a cycle. At a time, one vessel remains in oxygen production while second vessel remains under vacuum regeneration.

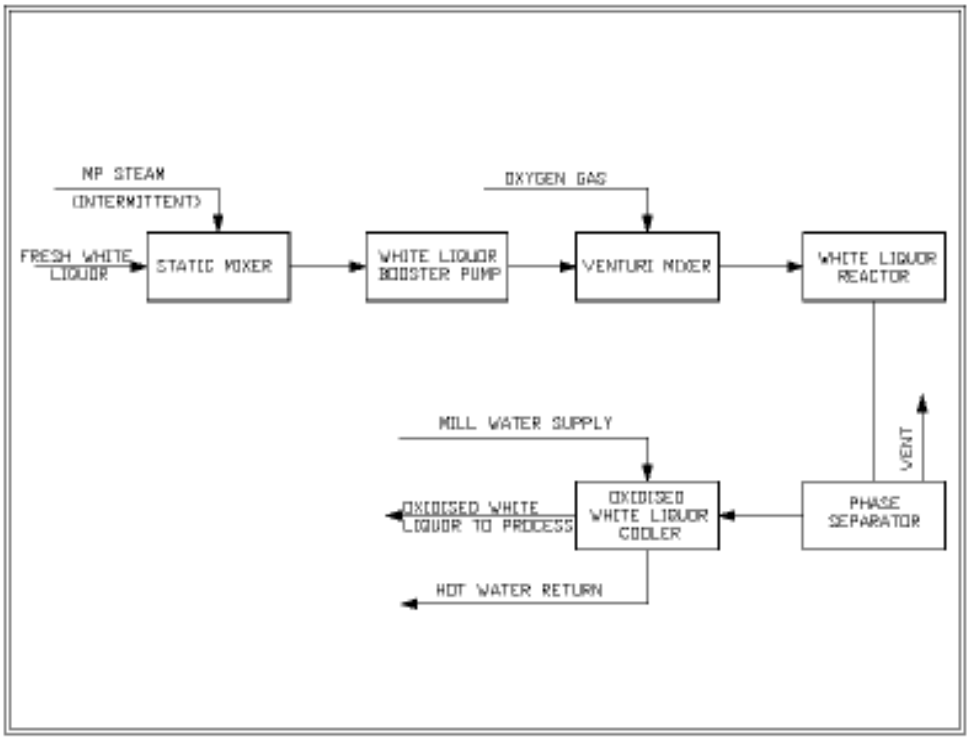
Feed air at around 30°C temperature from blower after cooler is taken to molecular sieves vessels. Oxygen is continuously produced and is collected in a surge vessel.

Oxygen gas is taken to oxygen compressor for increasing the pressure to 25 kg/cm^2 (g). Then the compressed gas is stored in storage tanks. After storage tank, gas pressure is reduced to 14 bar in pressure reducing station and from there, Oxygen gas will go to process.

3.4.2.10 White Liquor Oxidation Plant

White liquor from the chemical recovery section is fed to a reaction vessel. Oxygen from the oxygen generation plant is mixed with the white liquor through a sparger pipe. The reactor is equipped with a steam coil. Steam is needed only during stoppages and if the temperature in the reactor is low. The sodium sulphide in the white liquor after oxidation is converted to inactive sodium thiosulphate and sodium hydroxide and the resulting oxidised white liquor is pumped to the oxygen delignification plant.

Process Flow Diagram – White Liquor Oxidation Plant



3.4.2.11 Ozone generation plant

The ozone generation plant will consist of the following sections:

- Ozone generator
- Residual ozone off-gas destruct unit
- Measurement instruments for ozone generation system
- Control system

3.4.2.12 Chemical Preparation system

Sulphuric Acid dilution system

98% sulphuric acid has to be diluted to 4% for use in bleach plant. For this purpose 98% sulphuric acid storage tank and Dilution tank with accessories have to be provided.

Sulphur Dioxide solution Preparation

Sulphur dioxide gas from cylinder will be absorbed in water and sulphur dioxide solution will be produced. Necessary tanks, pumps etc have to be provided.

Caustic & Hydrogen Peroxide

Storage tanks and service tanks with required pumps will have to be provided.

3.4.3 Chemical Recovery System

The system will feature adoption of modern technology to reduce the operating cost, environmental compliance and to maintain uniform quality of outputs.

3.4.3.1 Evaporation Plant

The spent cooking liquor from the kraft pulp mill after washing the pulp in brown stock washing plant is pumped to the chemical recovery system and is stored in large storage tanks. This liquor will be at a concentration of about 16 % solids and has to be concentrated to about 75% which is mill specific.

3.4.3.2 Chemical Recovery Boiler

The concentrated black liquor from the evaporators is stored in storage tanks and fired in the chemical recovery boiler to recover the chemicals used for cooking. The organics in the liquor burns and the inorganics are taken out as molten smelt from the hearth of the boiler.

Black liquor is burned in the chemical recovery boiler at about 75% solids or more; Recovery boilers generate steam at 64 ata and 460 to 480^{o}C steam temperature.

3.4.3.3 Recausticising Plant

The preparation of digester cooking liquor, or white liquor, takes place in the recausticising plant. The smelt from the recovery furnace is dissolved and diluted in a dissolving tank with weak liquor. This solution known as unclarified

green liquor, is then sent to one or two large tanks in series for the purposes of removing recovery furnace impurities, called dregs, and to reduce variations in the liquor density and strength. The clarified green liquor is then mixed with lime in an agitated tank known as slaker. In addition to providing intimate mixing of the two reactants, green liquor and lime impurities, called grits are removed in this operation. The reaction is then completed in a series of agitated tanks, known as causticizers.

The unclarified white liquor contains a suspension of calcium carbonate, known as lime mud, formed during the causticising reaction.. The lime mud is separated from the white liquor in a low pressure filter Compact Disc filter (CD – Filter).

3.4.3.4 Lime Mud Reburning Kiln

Calcining, the conversion of lime mud to lime, is performed in a rotary kiln. The rotary kiln is the predominantly used equipment due to the thermal efficiency gains that have been accomplished. The lime mud fed to the lime kiln has to be as high as possible to reduce fuel oil consumption. Lime mud CD filters are in stalled for higher dryness instead of conventional drum type filters

Kilns are typically fuelled by low sulfur fuel oil. Due to high cost of fuel oil, coal based producer gas is also used to replace about 70% of the heat in put to the lime kiln.

The gases existing from the kiln must be treated to remove particulate matter before they enter the atmosphere. This is done with an electrostatic precipitator.

3.4.4 Bleaching Chemical Thermo Mechanical Pulping Line (BCTMP)

3.4.4.1 BCTMP Plant

BCTMP has higher bulk, higher pulp yield, higher opacity but has lower strength. The brightness of BCTMP pulp required is 70% for board manufacture and the bulk should be ± 3.0 cm3/g. The BCTMP pulp freeness should be 400 ± 50 ml CSF. The yield is expected to be 87% on BD chips

Along with the new BCTMP plant, a new evaporation plant will also be installed. The new chipper house and utility area will be suitably designed to cater to the requirement of BCTMP plant.

The process steps involved in BCTMP pulping are as follows:

- Chip washing system

- Impregnation system
- HC refining
- Washing
- LC refining
- Screening
- Reject refining
- Thickening & storage

3.4.4.2 BCTMP Plant Project Technical Details

Key machines:

- Plug screw
- High consistency RGP - refiner
- Low consistency refiner (optifiner)
- Optic screen
- Screw press

Flow diagram:

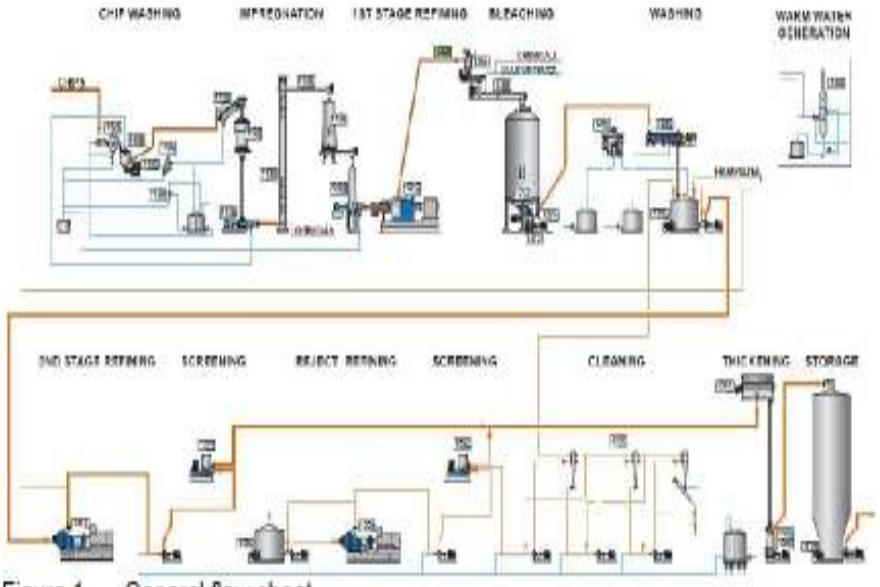


Figure 1 General flow sheet.

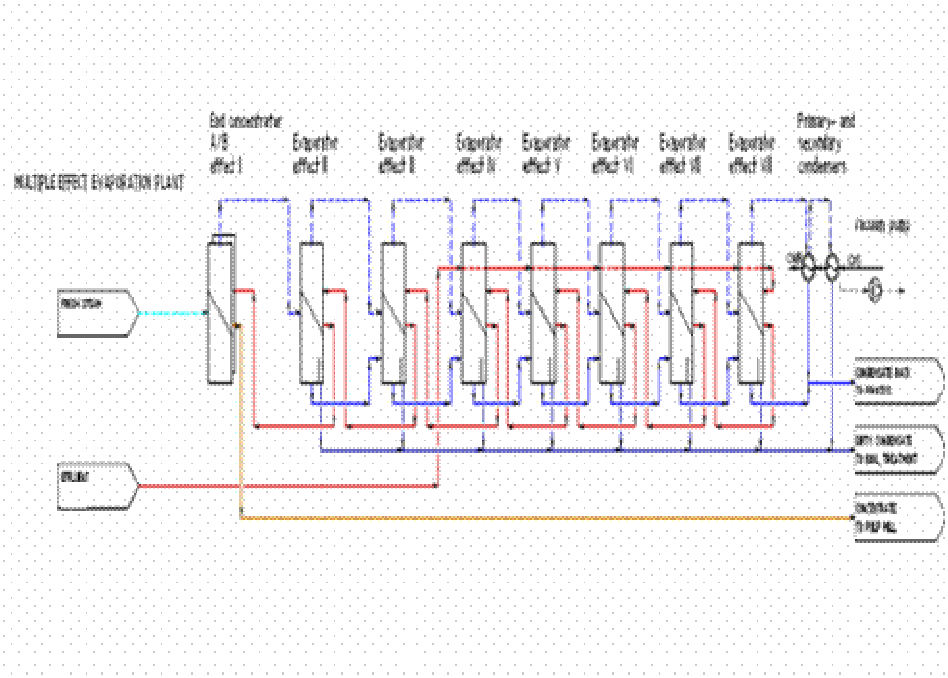
3.4.4.3 *Process Description for Multi Effect Evaporator*

Multi effect evaporator includes

- 2 vertical upflow concentrators
- 9 vertical tubular falling film evaporators (8 effects)
- primary condenser and secondary condenser
- pump tanks for primary condensate, process condensate, foul
- condensate, concentrate and wash liquid return
- vacuum pump

Flow diagram:

Multi Effect Evaporator for BCTMP Effluent



The effluent feed enters into multi effect evaporator. The evaporation takes place in vertical tubular falling film evaporators connected in series. Inlet concentration of the effluent is 1.5–1.6 % and evaporator outlet concentration will be 60%.

The secondary condensate to be returned to the pulping process is collected from the evaporator effects and from the primary condenser.

The foul condensate to be sent to the waste water treatment plant is collected from the vent steam cooling sections of the evaporator effects and from the secondary condenser.

3.4.5 Captive Power Plant (CPP)

The power plant will be consists of

- Multifuel fired boiler
- Biomass fired boiler
- Turbo alternators
- Cooling towers
- DM/RO plants
- Fuel handling system
- Ash handling system

3.4.5.1 Power Boiler

It is proposed to install high pressure multi fuel fired boiler(s) and biomass fired boiler (s) operating at a pressure of 105 kg/cm^2(g) and temperature of 490^{o}C and a biomass fired boiler operating at 65 ata and 465^{o}C. The high pressure steam generated is used for power generation and the steam is extracted from the turbine at 10.5 kg/cm² (g) and pressure of 4.5 kg/cm^2(g) for usage in process.

Considering the energy efficiency and the poor quality of local coal available with high ash content and low calorific value, it is proposed to adopt a Circulating Fluidised Bed Combustion (CFBC) system in the boiler.

The electrostatic precipitator will collect the particulate matter in the flue gas to limit the suspended particulate matter in the flue gas well within the norms prescribed by the authorities.

A suitable sized chimney of RCC construction will be included to disperse the dust effectively as per the standard. The concentration of dust in the flue gas coming out of chimney will meet the standards prescribed by the Pollution Control Board.

3.4.5.2 Turbo Alternator

To make the mill self-reliant in the power front, it is proposed to install a power plant with double extraction condensing turbo alternator(s). One of them using steam from biomass fired boiler and recovery boiler to generate power.. Other turbo alternator(s) will be using steam from Multifuel Fired Boiler(s) to generate power.

3.4.6 Water Treatment Plant

The mill has water intake well situated at the bank of the River Godavari. The water will be pumped to the water treatment plant at the mill site through under ground pipelines.

The total raw water consumption for MGP is about 1,00,000 m³/day including supplies for domestic purpose. The water from the intake well will be pumped through a combination of mixer and clariflocculators. The clarified water from the clariflocculator will be pumped to a storage reservoir. The process water will be passed through pressure sand filters and stored in an overhead tank. The filter water from the overhead tank will be used for drinking and other domestic purpose.

The flow diagram of water treatment plant is enclosed as *Annex 1*.

3.4.6.1 Flash Mixer

Raw water from the river shall be pumped to a flash mixer, whereas the velocity head shall be dissipated and the required coagulant and MOL are dosed and mixed. The treated raw water shall gravitate to a clariflucculator. The flash mixer tank shall be of reinforced concrete construction. This shall include the complete agitator mechanism unit with drive system including the support structure and drive motor.

3.4.6.2 Clariflocculator

The treated raw water shall enter into the clariflocculation chamber, from where the flocculated water shall enter the clarifier chamber. Clarified water shall overflow from launder located on the periphery of the clarifloculator and shall flow to rapid gravity sand filter. The clariflocculator tank will be of reinforced concrete construction.

This shall include center mechanism, flocculation drive, traction drive, rotating cage, flocculator arms and paddles, rake arms with blades, bridge spanning the tank upto the center, telescopic sludge discharge arrangement etc. Clarifier traction drive shall be of modular type with chain drive. Flocculator

paddle/agitator shall be driven by geared motor and to be included in the scope of supply.

3.4.6.3 Pressure Sand Filter

Pressure sand filter shall be used to reduce the turbidity of the clarified water to the required level. The clarified water is pumped to the pressure sand filter tank, made up of mild steel and shall be complete with necessary filtering medium. This shall consist of filtering medium of suitable depth. The filtered water shall be stored in the filter water storage tank and then pumped to paper machines, power boiler, BCTMP, and pulp mill.

3.4.7 Wastewater Treatment Plant

The wastewater treatment plant will be of capacity 1,00,000 m^3/day to treat the wastewater from the mill. The wastewater treatment plant shall consist of primary clarification, activated sludge process and secondary clarification. Appropriate tertiary treatment to improve the quality for final treated wastewater will be discharged.

The mill will also has de-watering system to dewater sludge from ETP. ETP Sludge shall be disposed to APPCB authorised agencies.

Part of the treated waste water will be used for irrigation to raise wood plantation development of green cover and excess into River Godavari.

The flow diagram of wastewater treatment plant is enclosed as *Annex 2*.

3.5 Materials Requirement

3.5.1 Raw Materials

The raw materials required for the expansion are tropical mixed pulpable hard wood. The average annual requirement of the raw materials is given below:

TABLE 1
RAW MATERIALS REQUIREMENT

Raw material	Unit	Existing	Post MGP	Incremental
Mixed hardwood	lakh tpa	8.2	32.2	24.0
Waste paper	lakh tpa	2.8	2.8	--
Purchased pulp	lakh tpa	1.7	--	--

3.5.2 Chemicals

The major process chemicals required to be used and procured for the production of pulp are given in the following table.

TABLE 2
CHEMICALS REQUIREMENT

Raw Material	Unit	Existing	Post MGP	Incremental
Hydrogen peroxide	tpa	2,270	17,170	14,900
Lime stone	tpa	42,000	95,000	53,000
Sodium sulphate	tpa	7,900	20,900	13,000
Sodium chlorate	tpa	4,200	4200	--
Ozone	tpa	2,100	5,100	3,000
Diethylene Triamine Penta acetic acid (DTPA)	tpa	Nil	825	825
Sulphuric acid	tpa	Nil	18,650	18,650
Sodium silicate	tpa	Nil	5,800	5,800
Sodium hydroxide	tpa	6,130	25,,330	19,200
Chlorine gas	tpa	Nil	3,200	3,200
Sulphur dioxide	tpa	Nil	1,000	1,000

3.5.3 Fuel

TABLE 3
FUELS REQUIREMENT

S. No	Name of the fuel	Nature and type	Unit	Average requirement		Incre-mental	Remarks
				Before expan-sion	After expan-sion		
1	Coal	Granules	lakh tpa	8.0	18.0	10.0	Purchased
2	Black liquor	Liquid	tpd of BL solids	2,200	5,800	3,600	Captive
3	Furnace oil	Liquid	kl/a	8,160	21.660	13,500	Purchased
4	LPG	Gas	tpa	1,000	3,500	2,500	Purchased
5	Biomass	Solid	lakh tpa	1.5	3.5	2.0	Captive

The steam and power balance for MGP is as below

Summary	Unit	Value
Total steam generation from Boilers	tph	961
Steam generated from Recovery boilers	tph	408
Total Steam generation from Power Boiler(s)	tph	553
External Fuel		
Coal for Circulating fludised bed boiler	lakh tpa	9.1
Coal for PG Plant	tpa	0.9
Power		
Power Requirement	MW	148.6
Captive generation	MW	148.1
Grid Power	MW	0.5

3.5.4 Sources of Material

3.5.4.1 Raw material

ITC PSPD has developed farm forestry in and around Bhadrachalam covering an area of about 120,000 hectares, which yield about 20 lakh t of wood every year. The present requirement is about 8 lakh t of wood and project will meet about 65% wood of the wood required for the mill including the mill expansion project. ITC PSPD is continuing its effect in the farm forestry and would develop additional forestry to cover the entire raw material requirement by the time the project comes in to operation

3.5.4.2 Chemicals

All the chemicals are locally available and shall be procured from local market

3.5.4.3 Fuel

The main fuel used is the coal, which shall be procured from Singereni coal fields. The other fuels are furnace and gas, which shall be procured from oil companies

The mass and energy balance is enclosed *Annex 3*.

3.6 Resource Optimisation

The following recycling or resource optimization are envisaged in MGP

S.No	Description	Recycling / Optimisation
1	Chemicals in effluent	Chemicals recovered from effluent by recovery boiler
2	Black liquor solids	fired in recovery boiler to generate steam and power
3	Water recycling	condensate from evaporator and boilers are reused
4	ETP water recycling	Treated effluent water reused for pulp washing, cleaning, ash quenching, dust suppression, etc.
5	BCTMP Evaporator	Recovering 1.5% black liquor by evaporation
6	Bark and Dust from chipper	Fired in biomass boiler
7	Clarified water from Paper machine	Used for floor cleaning and wood washing
8	High pressure boilers	To conserve coal by generating higher power per tonne of coal fired.
9	Vacuum system in paper machines	Replaced with "Turbo Air" which occupies less space and consume less energy
10	Continuous Cooking	Steam consumption is reduced comparing to batch cooking
11	DD Washer & press	Reduces steam consumption by increasing black liquor concentration from 13-15% to 17-18%
12	Non Condensable Gas	Recovered from different points and fired in boilers or lime kiln.
13	Producer gas	Coal based producer gas is used to replace part of furnace oil

3.7 Water Availability with Source

The total water requirement for the expansion is proposed to be drawn from river Godavari by installing intake well and pump house on the banks of River.

The water requirement is as given below.

Total water drawal is 115,000 m^3/day. Wastewater generation from pulping, paper machine and other sections will be 100,000 m^3/day (inlet to ETP Plant). and the final discharge from ETP will be 85,000 m^3/day.

Around 15,000 m^3/day will be recycled from ETP. Net water drawal from river Godavari from MGP is 100,000 m^3/day. The present drawal of water is around 79,000 m^3/day.

TABLE 4
WATER REQUIREMENT

Category	Description	MGP fresh water (m^3/day)
Cooling	DM Plant and boilers	7100
	Cooling water makeup	9400
	Gland cooling and boiler house	2500
	Sub-total (A)	**19000**
Domestic	Colony	2500
	Greenery	800
	Mill Domestic	900
	Plantation	1000
	Sub-total (B)	**5200**
Process	Fibre line #3	45000
	Pulp Sheeting	1500
	Paper machine #8 (PWP)	9000
	Paper machine #9 (MLB)	8000
	BCTMP	4500
	Soda recovery	21800
	Others	1000
	Sub-total (C)	**90800**
	Grand total (sub-total of A+B+C)	**115000**
	Less: Recycling of treated wastewater from paper machine wastewater clarifier	15000
	Net Fresh water	**100000**

3.8 Wastewater Treatment Plant

About 85% of the used water will be ultimately discharged from the mill as wastewater and the balance will be carried along with the products or lost into the atmosphere as evaporation or steam losses.

The wastewater discharge from MGP will be around 85,000 m^3/day and the details are as below:

Category	Description	MGP Waste water (m3/day)
Cooling	DM Plant and boilers	6500
	Cooling water makeup	8900
	Gland cooling and boiler house	2400
	Sub-total (A)	**17800**
Domestic	Colony	1500
	Greenery	0
	Mill Domestic	500
	Plantation	0
	Sub-total (B)	**2000**
Process	Fibre line #3	40500
	Pulp Sheeting	1400
	Paper machine #8 (PWP)	8100
	Paper machine #9 (MLB)	7200
	BCTMP	1400
	Soda recovery	20700
	Others	900
	Sub-total (C)	**80200**
	Grand total (sub-total of A+B+C) generation	**100000**
	Less: Recycling of treated wastewater from paper machine wastewater clarifier	15000
	Net wastewater discharge	**85000**

The existing discharge from the mill is around 68,800 m^3/day.

Overall water balance is enclosed as *Annex 4.*

3.9 Power Requirement and Source

The mill at present is self-reliant on the power front, with its own captive power generation. However, to keep the system in operation, the mill has retained State Grid supply with minimum drawal.

The expansion requires additionally about 190 MW of power. It is proposed to install a 190 MW captive co-generation power plant.

3.10 Environmental Management

3.10.1 Construction Phase

The construction activities of new installation will not necessitate any displacement of people as the construction will be carried out in the forest land. This phase does not involve major changes in the terrain.

3.10.2 Air Environment

The major pollutants from the mill after MGP are particulate matter (PM) and sulphur dioxide (SO_2) from the coal fired boiler. High efficiency ESP will be installed to reduce the particulate matter and the chimney will designed suitably to reduce the effect of SO_2 emission and the resultant concentration of PM and SO_2 will be kept below the standards prescribed.

In addition non condensable gases (NCG) generated in kraft pulping are poisonous and create characteristic smell in the premises. The gases, from different points of generation are collected and fired in boilers or lime kilns.

3.11.3 Wastewater Characteristics and Disposal

The waste water is generated from the process are treated and then discharged. The characteristics of treated wastewater from the WWTP outlet after MGP shall confirm the norms specified by APPCB.

WASTEWATER INFLUENT CHARACTERISTICS

Description	Unit	Fibreline (including pulp mill, chemical recovery & power plant)	Paper machines, SFT and others
Flow	m^3/day	70,000	30,000
pH		6.5-8.0	6.7-8.1
Total suspended solids	ppm	250-500	600-1000
BOD	ppm	250-400	250-300
COD	ppm	1000-1900	800-1400

TREATED WASTEWATER CHARACTERISTICS

S No	Parameters	Unit	Characteristics
1	pH	--	6.5 – 8.5
2	Oil and Grease	mg/l	<10
3	Total Suspended Solids	mg/l	<100
4	Total Dissolved Solids	mg/l	<2100
5	BOD (3 Days at 27^0C)	mg/l	<30
6	COD	mg/l	<250
7	AOX	kg/t of product	<1.0
8	Sulphates	mg/l	<1000

The treated wastewater will be discharged through closed pipeline to river bank. Presently, most of the discharged water from the pipeline is tapped and used by the locals for irrigation purpose. Additional land area is proposed to be brought under irrigation scheme with the help of Rotary International and through farmers' co-operation, with a view to use additional treated wastewater for crop irrigation. The balance water shall finally meet the river Godavari.

3.10.4 Solid Waste Generation and Disposal

The solid wastes generated in pulp mill are non-hazardous in nature. The solid waste generation expected from the proposed expansion project will be chipper dust and boiler ash. In addition to this, there will be fibre sludge generation from the wastewater treatment plant. The details of solid waste generation and quantities with disposal methods are given below.

NON-HAZARDOUS WASTE

S No	Name of the Waste	Quantity (tpd) Yearly Average	Method of disposal
1	Fly ash	1700	The fly ash will be used for construction activity brick manufacturing and disposed to cement mill
2	Chipper dust	550	Used as fuel in biomass boilers / vermi composing
3	Effluent treatment plant sludge (dry basis)	90	ETP sludge will be disposed to APPCB authorised agencies for making sundry hand made secondary/inferior grade boards.
4	Lime sludge (Dry basis)	1100	Out of 1100 tpd generation 850 tpd is reused/recycled in lime kiln to produce lime for internal consumption and rest 250 tpd will be disposed to cement mills.

3.10.5 Noise Environment

- The noise level of the all the equipment will be kept within the CPCB standard in and around the work zone.

Socio – Economics:

- Land proposed for the project is forest land. There will not be any resettlement and rehabilitation. Thus, there will not be any adverse socio economic implications.

- The economic status of the area is likely to improve, as there will be direct /indirect employment generation during construction and operational phase.

Risk Assessment & DMP

- No major hazards with potential for any emergency situation exist in the process plants. On site and off site emergency measures shall mitigate the effect on any risk.

4 SITE ANALYSIS

4.1 Connectivity & transportation

Construction of paper machine building, co-generation plant, construction of other facilities involves movement of material of great magnitude. The material to be transported includes earthwork, concrete and other materials. Transport of construction material to the project site will result in increased traffic in the area, which shall certainly put additional load on the existing road infrastructure. ITC -PSPD, activity needs heavy-duty equipment and ITC -PSPD, shall strengthen the existing approach road to plant site to handle the additional heavy traffic on the existing moderate road. While strengthening the existing road, ITC-PSPD, will provide enough space to avoid any eventualities keeping in mind the low awareness levels of the local population regarding heavy-duty vehicles.

So, based on the above, it can be said that the proposed mill expansion project will result in improving the infrastructure facilities of the area.

Transportation for this project involves the following:

- Raw materials and finished products maximum extent will be transported through existing railway network
- Coal and Fuel oil is envisaged to be supplied from the nearest coal mine faces and terminals using high capacity trucks and takers to plant sire

However, for the road traffic is expected due to plant operations, ITC PSPD, shall provide necessary resting facilities for the truck drivers. Also, variety of business opportunities exists to the local population to start services such as rest rooms, food, and automobile repairing.

There will also be small increase in the vehicular traffic due to passenger transport. This increase in traffic will not be of any scale of consequence to warrant special mention. One should expect that the increased passenger load in the sector would prompt the state government to start new and frequent services to this area, bringing upliftment to the whole area.

4.2 Land Use, Land Form and Land Ownership

The site identified is forest land oned by Government.

The plant layout is enclosed as *Annex 5*.

4.3 Existing Infrastructure

The existing infrastructure of proposed site is as below

Water	From River Godavari, 3.1 km from the site and perennial water source
Coal	From near by Singereni Coal fields (about 150 km away)
Highways	State Highway (SH 9) connecting Bhadrachalam and Kothakudem is adjacent to the site
Electricity	Substation is available near by.

Existing factory of ITC is adjacent to the site. All managerial and other infrastructures required for the implementation of project is available. In addition to the above skilled labour is available in the existing factory to oversee implementation and commissioning of the project.

4.4 Soil Classification

The predominant soil classification of the proposed site is sandy loam

4.5 Climatic Data

The site specific climatic data are as below

Maximum Temperature	44.5^{o}C
Minimum Temperature	20.3^{o}C
Average annual rainfall	145,4 mm
Predominant Wind Direction	SE, SSE
Relative humidity	29.7% - 77.6%

4.6 Social Infrastructure

Considerable population (about half of the total population) in the 10 km radial study area belongs to socially weaker sections with majority under scheduled tribes.

The study area experiences a moderate literacy rate of 51.5% (2001). The distribution of literate and literacy rate in the study area is given below

The occupational structure of residents in the study area is studied with reference to main workers, marginal workers and non-workers. As per 2001 census records altogether the main workers works out to be 36.29% of the total population. The marginal workers and non-workers constitute to 8.53%

and 55.18% of the total population respectively. The distribution of workers by occupation indicates that the non-workers are the predominant population.

4.6.1 Places of Tourist and Archaeological Importance

Bhadrachalam Town

Bhadrachalam an important town of the district is located on the banks of the River Godavari, at a distance of 5.0 km towards SE of the proposed expansion site. The town is well known for the temple of Lord Sri Rama. It is considered holy spot since Lord Rama is supposed to have lived here for some time. The temple is said to have been constructed on the very spot where Rama crossed Godavari on his expedition to Lanka (Ceylon).

Ravigudem Village

This village situated on the right bank of river Godavari is noted for the temple of Kedareswara and Bhuvaneswara, the lingams (Phalic emblems) of which are believed to be consecrated by Sage Agastya. This is a noted pilgrim center and attracts a gathering of about one-lakh devotees during Mahasivaratri festival, which falls in the February- March. This is located at a distance of about 9.3 km towards SE from the proposed expansion site.

Yanambailu Village

This village lies at a distance of 11 km from Palwancha. The Kinnersani project at this place is designed mainly to supply water to Kothagudem Thermal Station and to irrigate about 4,047 ha of land. The natural environments in and around the Kinnersani project (which is a declared as wild life sanctuary also) present a beautiful scenary to attract tourists.

5 PLANNING BRIEF

5.1 Planning Concept

MGP is a pulp and paper industry and will be suitably well planned with all required infrastructure including township. The project site is located adjacent to Stat Highway (SH 9) connecting Bhadrachalam and kothakudem.

5.2 Population Projection

The proposed site is a degraded forest area and the population is negligible around the site. However the population is likely to go up by about 30,000 in the region due to direct and indirect employment with their family members.

5.3 Land Use Planning

About 300 ha of land has been identified adjacent to the existing mill.

The required land area will allocated as under with a provision for green cover to the extent of 33 percent.

5.4 Assessment of Infrastructure Demand (Physical, Social)

Infrastructure /amenities/facilities required for the proposed expansion project will be assessed based on the need based survey in the surrounding area. The infrastructure development will be taken-up under CSR activity.

6 PROPOSED INFRASTRUCTURE

6.1 Industrial Area (Processing Area)

This is being expansion project, most of the infrastructure like water in-take system, power in take, roads, railway siding for raw material/product transportation is available. The same will be augmented according to requirement.

6.2 Residential Area (Non Processing Area)

The new township will be suitably planned with required infrastructure such as educational institution, hospital, roads, shops, drain and sewerage system, to accommodate 800 families.

6.3 Green Cover

The mill has grown plantations around the mill area and is a pioneer in clonal plantations.

The mill encourages farm forestry and social forestry to meet the raw material requirements.

With a view to mitigate the adverse environmental effect on surroundings and to provide an environmental cover from emissions, green belts are developed in and around the mill.

Extensive plantation has been done under green cover development for the existing plant. Green cover has been developed and well maintained along the internal roads and mill area. The mill has made elaborate arrangement in developing green belt inside the mill.

Green belt will be developed along with plant boundary covering an area of 360 acres, which is around 33% of the totalplant area.

The plantation schedule is as below:

S. No	Year	Area	No. of Saplings
1	1st year	72	75,000
2	2nd year	72	75,000
3	3rd year	72	75,000
4	4th year	72	75,000
5	5th year	72	75,000

The species proposed will have broad leaves, trees will be selected based on the type of pollutants, then intensity, easy availability and suitability to the local climate.

The species will be selected based on:

- Wide adaptability to eco-physiological conditions
- Rapid growth
- Capacity to endure water and climate extremes
- Pleasing appearance and providing shade.

6.4 Drinking Water Management

Drinking water will be sourced from river Godavari. Water treatment will be installed at factory to the intake water and distributed to various section of the plant and residential area.

6.5 Drains and Sewerage System

Drains sewerage system will be designed according to needs of plant and residential area and shall be properly connected and linked.

6.6 Industrial Waste Management

6.6.1 Air Pollution Management

- Installation of ESPs of 99.9% efficiency to limit the SPM concentrations below 50 mg/Nm^3;
- Provision of adequate height stacks for wider dispersion of gaseous emissions;
- The NCG will be burnt in the boilers
- Dust extraction system will be provided at transfer points of conveyor system;
- Conveyor belt will be closed to prevent dust generation;
- Provision of water sprinkling system at material handling and storage yard;
- The ash will be transported by closed bulkers to potential users;
- Asphalting of the roads within the plant area; and

- Development of Green cover around the plant to arrest the fugitive emissions.

6.6.2 Water Pollution Management

- Recycling of wastewater generated in cooling tower into ash handling and disposal system;
- Provision of sewage treatment plant to treat domestic sewage from plant and township;
- Utilization of treated domestic wastewater for green cover development;
- Provision of separate storm water system to collect and store run-off water during rainy season and utilization of the same in the process to reduce the fresh water requirement; and

6.7 Solid Waste Management

The total ash expected from the proposed expansion project (Co-Generation Power Plants) will be about 1700 tonnes per day. This will be disposed for making fly ash bricks, surrounding fly ash brick manufacturing units (many units are operating and collecting ash from the existing operations) and partly to cement industries. The expected waste sludge will be about 90 tpd. The WWTP sludge (waste pulp) will be disposed to SPCB authorised agencies to manufacture secondary/inferior sundry handmade boards.

About 85% of lime sludge will be re-burnt in the lime kilns. The remaining 15% will be disposed to nearby cement industries. The chip dust/bark will be burnt in bio-mass boiler/multifuel boiler as fuel.

Used oil is the other hazardous waste will be disposed to CPCB/SPCB authorised agencies..

6.8 Social Infrastructure

ITC - PSPD is committed to corporate social responsibility (CSR) in helping the inhabitants of the surrounding villages by taking part in

- Social farm forestry
- Watershed development
- Agricultural productivity
- Livestock development

- Primary education
- Woman empowerment
- E-choupal for farmers

This has paved the way for establishing a harmonious relationship in the area.

Under social farm forestry, ITC – PSPD has promoted farm forestry in 120,000 hectares till now with 508 million saplings. The employment generation is about 54 million man days.

Watershed development carried out covering about 74,000 hectares with 3400 harvesting structure, benefiting about 711 groups of farmers.

Agricultural productivity is increased training the farmers and about 473 irrigation wells and 740 sprinkler units were installed. About 5800 demonstration plots were created to educate the farmers. Also 13,800 vermicompost & NADEP units were installed for the benefit of farmers to manufacture organic manure.

ITC-PSPD has created 260 cattle development centres for the benefit of about 187,000 farmers.

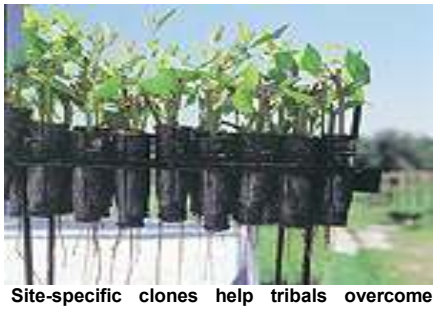
In the field of woman empowerment, ITC has created 8,800 micro credit groups of woman to benefit 39,000 woman entrepreneurs.

ITC–PSPD has taken up about 700 government school and extended infrastructure support and also opened 2,500 supplementary learning centres to provide coaching in the evening.

ITC–PSPD has set up E-choupal at various places and trained the farmers to browse the internet for e-trading to avoid middlemen and to access various information including commodity price to enable them to get more prices for their products.

Farm Forestry

Inter-cropping on plantations provides assured income to farmers during the period of these plantations



Site-specific clones help tribals overcome alkaline and saline soil problems to gestation convert wastelands into lush plantations

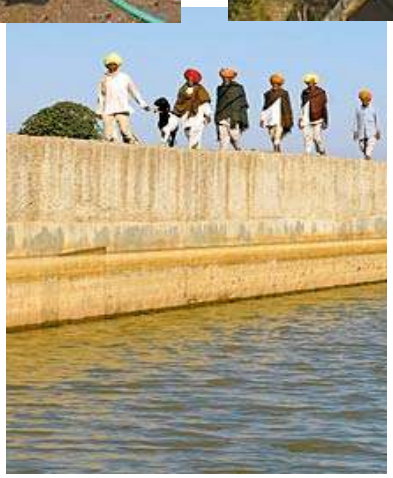
Mist chamber at ITC's pioneering R&D Centre in Bhadrachalam, Andhra Pradesh. productivity Bhadrachalam clones is 9 times higher than that of seedling plantations

ITC has created an attractive income opportunity for farmers to grow high- The of yielding, disease-resistant clonal saplings 6 to into plantations

The success of older plantations, seen in the background, is spawning a new generation of plantations, seen in the foreground

ITC has institutionalised its intervention by creating village-level natural resource management committees comprising local farmers.

Watershed Management



Agricultural productivity

Woman empowerment

Livestock Development

CSR is a continuing activity for all progressive organisations and ITC-PSPD understands and appreciates that as the company progress, expectation levels of neighbourhood population increases.

ITC has received many awards and some of the awards in the corporate responsibility and environmental excellence are as under;

ITC won the Asian CSR Award for Environmental Excellence, given by the Asian Institute of Management (2007).

ITC Limited has won the top honours at the TERI Corporate Award for Social Responsibility 2008 in recognition of its exemplary initiatives in implementing integrated watershed development programmes across 7 states, providing precious water resources for agriculture, rural communities and livestock.

ITC was conferred the Corporate Social Responsibility Crown Award for Water Practices from UNESCO and Water Digest (2008).

ITC Limited was presented the FICCI Award for Outstanding Achievement in Rural and Community Development by the Finance Minister, Shri Pranab Mukherjee (2010).

ITC became the first Indian Company to gain Membership with WWF-GFTN for Responsible Forestry (2010).

ITC- PSPD will continue to work for the social infrastructure development and requirements.

7 REHABILITATION AND RESETTLEMENT (R.R) PLAN

The land proposed for MGP expansion is forest land owned by the Government.

Hence the project will not involve rehabilitation and resettlement.

8 PROJECT SCHEDULE AND COST ESTIMATES

8.1 Implementation Schedule

The major activities are highlighted below and the completion time indicated are from the "zero date" which is the date of Environment Clearance(EC)

Start date	"Zero Date"
Ordering of long delivery plant and equipment	6^{th} – 12^{th} month
Commencement of Civil Construction	16^{th} month
Delivery of plant equipment	20^{th} to 30^{th} month
Erection of equipment	24^{th} to 45^{th} month
Commencement of start-up trial & commissioning	32^{nd} – 45^{th} month
Commencement of commercial production	48^{th} month

8.2 Project Cost

Total investment for the installation of MGP is Rs 5800 Crores as per broad break up given below:

TABLE 6
PROJECT COST

S. No	Description	Cost in Crores
1	Land and site development	70
1	Civil Works	500
2	Plant & Machinery Cost (including erection and engineering)	4800
3	Other Capitalisation Cost (pre operative expense, escalation and contingency, start up expenses and interest during construction)	430
	Total	**5800**

8.3 Environmental protection

As environmental protection will be monitored and implemented by a centralized environmental management cell. The fiscal estimate have been arrived for the proposed MGP are as below.

About Rs. 664 Crores is allocated towards pollution control equipment and implementation of environmental pollution control measures.

The details of investment for procuring the equipment for effluent control and monitoring of pollution are as below.

Section	After MGP Rs Crore
Power boiler - ESP and Chimney	20
Recovery boiler with ESP & chimney	300
Lime sludge (waste recycling) reburning kiln	130
BCTMP wastewater evaporation plant	70
Producer gas plant and NCG (Odour control system)	40
Wastewater treatment plant (WWTP)	60
Green Cover	6
Fly ash Brick manufacturing unit	4
Water conservation and recycling	20
Dust suppression system for coal handling area	4
Online Ambient Air Quality (AAQ) Monitoring Stations & Online Stack Monitoring and hooking the online data to PCB website and testing laboratory for environmental monitoring	10
Total	**664**

8.4 Economic Viability

The economic viability of proposed MGP is as below:

Description	Unit	Contribution
Production of P&W paper	tpa	2,50,000
	Rs Cr	250
Production of FBB	tpa	2,50,000
	Rs Cr	700
Production of SBS	tpa	1,00,000
	Rs Cr	225
Production of surplus HWP	tpa	1,78,000
	Rs Cr	215
Production of surplus BCTMP	tpa	75,000
	Rs Cr	60
Total inflow	Rs Cr	1450
Operating cost	Rs Cr	400
Net inflow	Rs Cr	1050
Investment	Rs Cr	5800
ROI	%	18%
Expected IRR	%	14%
Payback	Yrs Months	5Y 5 M

9 ANALYSIS OF PROPOSALS (FINAL RECOMMENDATIONS)

It would be some what difficult to quantify all the benefits of a project of this type and nature of state and national economy because there are too many "spin-off" indirect benefits in additions to direct benefits.

Some of the specific benefits are presented below:

- The project will create direct employment to about 1500 persons. In addition it would generate indirect employment to about 20000 persons in the industries and service organizations and material handling, etc., which will be supported by the operations of the mill.

- At optimum production level, the mill requires approximately 24 lakhs tones of pulp wood per annum and it is proposed to get around 20 – 22 lakh tonne of wood from the farm forestry. The above requirement will develop organized forestry plantation and requires about 200,000 hectares to get entire raw material. Assuming average land holding of about 2 hectare by farmers. About 100,000 families will be benefited. The approximate revenue earned by the farmers will be around Rs. 600 crores per annum. In addition to the above approximate revenue of Rs. 100 crores to causal labours by way harvesting, debarking etc and Rs. 100 crores by transport agencies for the transportation of wood to transport site. Thus the project creates additional livelihood to farmers, casual workers and transporters in near by region.

- About 200,000 hectares of land shall be brought in to farm forestry in a span of 5 to 7 years. This will increase the forest cover of Andhra by about 2%.

- The project is likely to generate income to the state by way of sales tax to the tune of 60 crores and by way of excise duty to the tune of 175 crores.

- The implementation of the project will undoubtedly provide stimulation for added growth to a number of other industries some of which are given below

    - Trucking industry which will load and haul wood, coal, lime and supplies to the mill and also mill outputs. The haulage requirement for the project would be around 5 million tonnes per annum comprising both inputs and outputs.

    - Establishment of ancillary industries such as burnt lime, core for paper reels, core plugs, machining and welding units, etc.

    - Indigenous machinery suppliers / manufacturers.

- Establishment of indirect industries and shops near the project site such as small scale work shops, hardware shops, small scale restaurants, petty civil and electrical contractors, grocery and provision shops, etc.

- Construction industry during erection and construction period.

In view of the foregoing, it is obvious that the potential contribution from this project to the State of Andhrapradesh and National economy would be significant, to say the least.