Date: 24.09.2012

The Environmental Officer
Karnataka State Pollution Control Board,
'C' Block, Plot No. 501, Near Income Tax Office,
Devraj Urs Layout
Davangere – 577 006

Dear Sir,

Sub: Submission of Environmental Statement for the year ending March 2012

Please find enclosed the Environmental Statement (Form V) for the financial year ending 31st March 2012.

Hope you find the same in order.

Thanking you,

Yours faithfully,
For **HARIHAR POLYFIBERS**

UMESH DUGGANI
VICE PRESIDENT (TECHNICAL)

Encl.: a.a.

Cc: The Member Secretary
Karnataka State Pollution Control Board,
No. 49, Parisara Bhavan,
4th & 5th Floors, Church Street,
BANGALORE – 560 001

FORM – V

(See Rule 14)

Environmental Statement for the Financial Year ending the 31st March 2012

PART – A

i) Name and address of the owner / occupier: of the industry, operation or process

Rajendra Jain
Executive President
Harihar Polyfibers
Kumarapatnam – 581 123
Dist: Haveri

ii) Industry category Primary (STC code) : -
Secondary (SIC code) : -

iii) Production capacity : 6800 Tons/Month (Installed Capacity)

iv)Year of Establishment : 1972

v) Date of the last environmental statement submitted : 27.09.2011

PART – B

Water and Raw Materials Consumption:

1. Water Consumption:

Process : 33000 m^3 / day
Cooling : 300 m^3 / day
Domestic: 900 m^3 / day

Name of products	Process water consumption per unit of product output (m^3/ton)	
	During the previous financial year 2010 – 2011	During the current financial year 2011-2012
Rayon Grade Pulp	173.0	172.0

2. Raw Material Consumption

Name of Raw Materials	Name of Products	Consumption of Raw Material per unit of output kg / t	
		During the Previous Financial year (2010 - 2011)	During the current Financial year (2011-2012)
Wood	Rayon Grade Pulp	3050	3050
Caustic Soda	"	32.0	32.0
Sodium Sulphate	"	24.0	25.0
Chlorine	"	27.0	27.0
Sulphuric Acid	"	19.0	19.0
Sodium chlorate	"	6.0	6.0
Sea Shell	"	39.0	39.0
Oil	"	79.0	74.0
Oxygen	"	8.0	8.0

PART C

Pollution Discharged to Environment / Unit of output

(Parameters as specified in the consent issued)

(a) Water

Pollutants	Unit	Tolerance limit specified by KSPCB (Mass/Vol)	Concentrations of pollutants in mixed discharges (Mass/Vol)	Quantity of pollutants discharged (T/day) [Mass/day]	Percentage of variation from prescribed standards with reasons
1. Colour & Odour	--	*	**	**	↑
2. Suspended Solids	mg/l Max	100	71	2.82	
3. Dissolved Solids (Inorganic)	mg/l Max	2100	1843	73.32	
4. Temperature	Deg. C	***	31	-	
5. pH	--	6.0 – 8.5	7.6	-	
6. Oils & Grease	mg/l Max	10	0.13	0.005	
7. Total residual Chlorine	"	1.0	ND	ND	
8. Ammonical Nitrogen (as N)	"	50	1.75	0.069	
9. Total Kjeldhal Nitrogen (as N)	"	100	2.68	0.106	
10. Free Ammonia (as NH_3)	"	5.0	ND	ND	
11. Biochemical Oxygen Demand (3 days at 27 Deg.C)	"	30	18	0.72	All the parameters are maintained within the prescribed standards
12. Chemical Oxygen Demand	"	250	204	8.11	
13. Arsenic (as As)	"	0.2	ND	ND	
14. Mercury (as Hg)	"	0.01	ND	ND	
15. Hexavalent Chromium (as Cr^{+6})	"	0.1	ND	ND	
16. Total Chromium (as Cr)	"	2.0	ND	ND	
17. Boron (as B)	"	2.0	ND	ND	
18. Chloride (as Cl)	"	1000	283	11.26	
19. Flouride (as F)	"	2.0	ND	ND	
20. Dissolved Phosphates (as P)	"	5.0	1.72	0.068	
21. Sulphate (as SO_4)	"	1000	817	32.50	
22. Sulphide (as S)	"	2.0	0.29	0.011	
23. Phenolic Compounds (as C_6H_5OH)	"	1.0	ND	ND	
24. Bioassay – as per IS-6582: 1971	% survival	Not less than 90% of test animals shall survive in 96 hours	100	-	↓
25. Total Volume	m^3 / day Max	42000	39788		

* All efforts should be made to remove colour & unpleasant odour as far as possible.
** All efforts are made to remove colour & odour at source as far as possible.
*** Shall not exceed 5°C above the receiving water temperature
ND- Not Detectable

Portion of the treated effluent was also used for greenery development in the non-monsoon period on company's own land. Totally 341250 m^3 of treated effluent has been used for greenery development in the year 2011-12.

(b) AIR

Pollutants	Tolerance Limit Specified by KSPCB (Max)		Concentrations of pollutants in discharges		Quantity of pollutants discharged (ton/day)	Percentage of variation from prescribed standards with reasons
	Vol (Nm3/Hr)	SPM (mg/Nm3)	Volume (Nm^3/Hr)	SPM (mg / Nm^3)		
Particulates						
(a) Chimney attached to Recovery Boiler	106000	150	104430	123.0	0.31	Discharge level Maintained within prescribed standards
(b) Chimney attached to Lime Kiln	18000	150	16102	91.0	0.04	
(c) Common Chimney attached to IJT Boiler No. 1	88300 (For IJT No. 1)	150	72598 (For IJT-1)	135.0	0.23 (For IJT-1)	

PART - D

HAZARDOUS WASTE

(as specified under Hazardous Wastes Management and Handling Rules 1989)

Hazardous Waste		Total Quantity (kg)	
		During the Previous financial Year 2010-11	During the Current financial Year 2011 – 2012
(a) From Process	Used oil generated from industrial operations using lubricants	2700	3600
(b) From pollution control facility			

PART - E

SOLID WASTE

Source		Total Quantity (Tons)		Quantity sold / recycled / reutilized within the unit
		During the Previous financial Year 2010-11	During the Current financial Year 2011 – 2012	
a) From Process	1. Pulp from Centri-Cleaner Rejects (ADT)	199.0	197.0	Sold to Card-board Manufacturers
	2. Lime Sludge from Causticising (as such)	46500	48422	100% recycled within the unit
b) From pollution control facility	Pulp from Primary Clarifier underflow (ADT)	186.0	168.0	Sold to Card-board Manufacturers
	Fly ash (as such)	11665*	11500*	Made available for use like brick, tiles, etc for surrounding manufacturers

*Includes bottom ash as per Fly Ash Notification S. O. 2804 (E) dated 03.11.09

PART - F

Characteristics (in terms of composition & quantum) of hazardous as well as solid wastes, disposal practice.

1. Hazardous Wastes :

Source	Composition	Quantity kg / day	Disposal Practice
Used oil generated from industrial operations using oil as lubricants in hydraulic systems or other applications	Lubricating oil	8.0 – 10.0	Sold to Authorized recycler (M/s Special Oils, S. No. 202 / 2, Kalghatgi, Dharwad)

2. Solid Wastes :

Source	Composition	Quantity (Tons / day)	Disposal Practice
(a) Pulp from Centricleaner rejects (AD tons)	Cellulose Fibers	0.55 – 0.60	Sold to Cardboard Manufacturers
(b) Pulp from primary clarifier underflow (Ad tons)	Cellulose Fibers	0.50 – 0.55	- do -
(c) Fly ash from Power Plant (as such)	Ash	32.0 - 33.0* (as such)	Made available for use like brick, tiles, etc for surrounding manufacturers

*Includes bottom ash as per Fly Ash Notification S. O. 2804 (E) dated 03.11.09

PART - G

Impact of the pollution abatement measures taken on conservation of natural resources and on the cost of production:

Refer Annexure – I

PART – H

Additional measures/investments proposals for environmental protection including abatement of pollution, prevention of pollution:

Refer Annexure – II

PART – I

Other Particulars for improving the quality of environment

Refer Annexure – III

OTHER INFORMATION

Refer Annexure – IV

Annexure –I
(Refer Part G)

IMPACTS OF POLLUTION ABATEMENT MEASURES TAKEN ON CONSERVATION OF NATURAL RESOURCES AND ON THE COST OF PRODUCTION

Harihar Polyfibers, a unit of Grasim Industries Limited is engaged in the production of Rayon Grade Pulp from wood. Ever since its inception the unit is upgrading its production processes and effluent treatment facilities in order to protect the environment and cut down the cost of production. It is evident from the unit's experience that conservation of resources and pollution control go hand in hand. With a clear emphasis on control of pollution at source, Harihar Polyfibers has been proactive in its approach towards implementation of several in-plant measures on pollution abatement. Identification of opportunities for improvements is done by providing various platforms to exploit the innovative abilities of the human resource thus ensuring involvement of entire workforce in the improvement of environmental and in turn business performances. Innovations and continuous improvements (*KAIZEN)* are encouraged through recognition and rewards. The projects thus identified are implemented after assessing their technical as well as economic feasibility. Table – 1 gives some of such projects implemented.

The continuation of implementation of these systematically engineered projects as 'ongoing exercise' has resulted in considerable reduction in the requirement of input chemicals and energy on one hand and corresponding reduction in influent load on the other, making effluent treatment economic and effective.

The abundance of greenery and paves in and around the plant and of fish in treated effluent today stand testimony to this effort and achievement.

Graphs – 1 and 2 describe the above achievement. Graph – 1 shows the progressive reduction in influent load. Graph – 2 shows the progressive reduction in the consumption of 'Chemical' and 'Energy' per ton of pulp production. The final effluent BOD load today is well within specified limits and mere 4% of what it was earlier.

The treated effluent quality as against the stipulated limits by KSPCB is given in Table - 2. The treated effluents meet all the parameters. In addition, the treated effluents have more than 4.0 mg/l DO and the industry successfully conducts continuous on-line bio monitoring.

Annexure –I
(Refer Part G)

Table-1

List of Cleaner Technologies Implemented

- Modernisation of chip-mill with state-of-the-art technology resulting in lesser generation of dust and reduced power consumption. The dust is efficiently burnt in a fluidised bed boiler which is first of its kind for saw dust application and the steam generated is used in process.

- Closed compact pressure knotter in brown stock washing improved washing efficiency and reduced alkali carry over. In addition there has been total elimination of black liquor spillage and odour improving the work environment.

- The industry is the first pulp mill to introduce oxygen bleaching in its conventional bleaching sequence. This has reduced chlorine consumption, pollution load on the effluent treatment plant and treated effluent colour. Further the industry introduced two-stage oxygen bleaching to reduce effluent colour and chlorine.

- Lime sludge generated is fully recycled with modified two-stage lime mud washing system in causticizing, thus eliminating solid waste.

- First mill to automate batch digester, washing and bleaching process reducing steam and chemical consumption.

- First mill to introduce high dry solids firing system and crystallizer technology reducing sulphurous emissions and improving thermal efficiency of evaporator and recovery boilers cutting down make up chemicals and energy requirement.

- Introduced for the first time slow motion slaker in causticizing reducing the grits generation, soil pollution, dust carry over, steam, and furnace oil and sodium sulphate consumption.

- Electro static precipitators with microprocessor based control system to collect sodium salt/dust from flue gases and recycling of the same to the process in both recovery boilers and limekiln.

- Advanced process controls incorporated for chemical recovery boilers. This has optimized the recovery boiler operation through reliable & precise controls and reduced purchase coal steam.

- Medium consistency pumping system with inline mixer installed for hypo stage reduced hypo consumption.

- New blow tank with modified heat recovery system installed. This has improved the process efficiency and environment.

- Incorporation of Energy efficient devices & drives for fans, pumps, air compressors, vacuum filters & screw press and energy efficient motors & pumps has reduced the energy consumption and conserved natural resource coal.

- Steam & Power conservation in evaporator by effective utilization of flash vapour and modifying the condensate pumping system.

- Conservation of treatment chemicals by optimization of water quality, installation of pH analyzer in alkali bleaching stage, installation of mass flow meter for sulphuric acid and chlorate flow in ClO2 plant and installation of online turbidity meter for river water.

- Electrical energy conservation by fixing variable frequency drives for induced and forced draft fan in fluidized bed boiler and degasser pumps at DM water plant, separate lighting transformer to optimize the lighting voltage at 380 – 390 volts and energy efficient fluorescent lamps in place of conventional plants

- Biogas plant operations improved by installing the 3rd reactor of higher capacity to treat more volume of PH liquor.

- Process improvement to reduce environmental impact through installation of mass flow meter in evaporator plant, control valve for hot water line causticizing plant and installation of temperature transmitter & control valves in evaporator section.

Annexure –I

(Refer Part G)

TABLE –2

TREATED EFFLUENT QUALITY *VIS-À-VIS* KSPCB LIMITS

Sl. No.	Parameters	Units	Standards set by KSPCB	Achieved
1	Colour & Odour	--	*	**
2	TSS	mg/l (max)	100	71
3	TDS	,,	2100	1843
4	Temperature	Deg. C	***	31
5	pH	--	6.0 – 8.5	7.6
6	Oils & Grease	mg/l (max)	10	0.13
7	Res. Chlorine	,,	1.0	ND
8	Amm. Nitrogen	,,	50	1.75
9	Kjeldhal Nitrogen	,,	100	2.68
10	Free Ammonia	,,	5.0	ND
11	BOD_3 at 27 Deg. C	,,	30	18
12	COD	,,	250	204
13	Arsenic	,,	0.2	ND
14	Mercury	,,	0.01	ND
15	Hexa. Chromium (as Cr+6)	,,	0.1	ND
16	Total Chromium (Cr)	,,	2.0	ND
17	Boron (as B)	,,	2.0	ND
18	Chloride (as Cl)	,,	1000	283
19	Fluoride	,,	2.0	ND
20	Dissolved Phosphate	,,	5.0	1.72
21	Sulphate (as SO4)	,,	1000	817
22	Sulphide (as S)	,,	2.0	0.29
23	Phenolic Compound (C6H5OH)	,,	1.0	ND
24	Bioassay	% Survival	Not less than 90% of test animals shall survive in 96 hours	100

* All efforts should be made to remove colour & unpleasant odour as far as possible.

* * All possible efforts are made to remove colour & odour at source.

*** Shall not exceed 5^{o}C above the receiving water temperature.

ND – Not Detectable

Strategies & techniques applied for continuous monitoring of environment and feedback mechanism for correcting / preventing any run-away operations for achieving stable operations.

Effluent from pulping section consists of wood matter & residual chemicals from washing & bleaching stages. It is subjected to primary clarification in two primary clarifiers and the overflow is mixed with bleach drain. The effluent from recovery plant is also subjected to primary clarification in settling pond, overflow of which joins the combined effluent of primary clarifier overflow and bleach drain. The entire mill effluents are then treated in anaerobic digester. The overflow is subjected to aerobic treatment in biological reactor. Biological reactor is designed on the basis of Extended Aeration Activated Sludge Process and consists of 17 Nos. surface aerators of 40 HP each.

The effluent is finally clarified in two secondary clarifiers. The treated effluent is discharged to the river meeting all the stipulated standards.

The treated effluents are passed through an aquarium containing fish obtained from the receiving water body i.e. the river. The property of aquatic life to be highly sensitive to the surrounding environment is made use of as an early warning signal to notice any variation in the quality of effluents. Fish behavior is monitored round the clock and it serves as feedback mechanism to initiate corrective action much before the operations reach run-away stage. This is an unique approach addressing all the control parameters of significance.

In addition to the aforesaid foolproof arrangement the following in-plant measures help to control the operations for consistent quality of effluents and emissions -

1. Alternative power supply is provided to Effluent Treatment Plant (ETP) so that in case of failure of one supply the stand by resumes automatically for the ETP. A similar arrangement is provided for air pollution control equipments.

2. Sensitive effluent streams are monitored round the clock at influent stage itself by providing simple visual monitoring aids for easy and quick qualitative monitoring for taking timely corrective action.

3. Biogas plant efficiency has been improved by modifying the internals to treat higher quantity of PH liquor thereby reducing load on ETP.

4. Stand by arrangements have been provided for all critical air and water pollution control equipments.

5. All equipments critical to environment are identified & subjected to preventive maintenance and condition based monitoring as per a pre-drawn schedule to prevent unforeseen stoppages.

6. All process operating personnel have been trained to notice and inform any untoward incident that could lead to ‘out of control’ situation, to the operatives at the ETP so that the relevant stream can be diverted to a ‘guard pond’ which has a capacity to hold a day’s effluents.

7. All input chemicals and raw materials are carefully and closely monitored daily against preset norms per unit weight of product so that all wasteful practices that would result in emission to air or discharge to environment is eliminated.

Annexure-III
(Refer Part-I)

Other Particulars for Improving the Quality of Environment

1. The unit has aligned itself with Environmental Management Systems and Occupational Health and Safety Management System in accordance with ISO 14001 and OHSAS 18000 Standards respectively.
2. The unit is continuing adoption of cleaner technologies as an ongoing exercise with several projects under formulation and implementation to further enhance its environmental performance by avoiding human errors, improving work environment & controlling pollution at source.
3. World Class Manufacturing practices are being adopted and 6-Sigma quality concept is being propagated for better process control and better quality of environment.
4. As a step towards aforestation, green coverage is extended to degraded lands with free distribution of seedlings and post plantation services to ensure maximum survival rate.
5. Staff and workmen are exposed environmental awareness training by in-house faculty and external agencies. Three of our staff members have completed Post Graduate Diploma In Ecology & Environment course, from Indian Institute of Ecology & Environment, New Delhi, an internally recognized institute.
6. All activities in the mill, which have an interaction with the environment, have been identified. Aspects and impacts related to these activities are listed out. Based on this data environmental objectives and targets have been set against the significant environmental impacts. Aspects and impacts are being reviewed & updated periodically.
7. Industry has strengthened the guard pond, PH Liquor lagoon bunds as a part continuous upgradation of ETP facilities.
8. Methane capturing and replacement of fuel by methane is given more importance as a step towards reducing green house gases. The projects on methane capturing and fuel conservation are identified and being taken up to reduce carbon emissions under CDM concepts.
9. Following plantation activities have been taken up under 'Operation Green' campaign. This activity will be a continuous exercise to improve the greenery in and around the industry :

    - Industry has developed 180 acres of own land under "Operation Green Project" planting 130000 Nos. of different tree species.
    - This year around 2000 Nos. of tree species have been planted on around 5 acres of company's own vacant land using the treated effluent.
    - Treated effluent is used for land application to develop the plantation on company's own land during non-rainy season. On an average 1600 m3/d of treated effluent is used for greenery development during the said period.

10. Various varieties of birds and flower species in & around factory premises have been photographed to appreciate their presence, beauty and to protect these species as eco indicators. Lots of peacocks are found in the premises and special care is taken to protect them.

Annexure – IV

OTHER INFORMATION

Awards & Certificates

Year	Award issued by	Achievement
1974	Indian Chemical Manufacturer's Association	The Sir.P.C.Ray Award for development of Indigenous technology for producing Rayon Grade Pulp from hybrid Eucalyptus.
1991	Indian Chemical Manufacturer's Association	Award for Environmental Control strategies and safety in chemical plants.
1994	Indian Merchants Chamber, Mumbai.	Award for outstanding contribution towards prompting savings, conferred on Grasim Social Service Society, Kumarapatnam.
1994	ISO 9002 : 1987 certificate conferred by RWTUV (Germany)	Certificate conferred on the unit for implementing the Quality system in accordance with ISO 9002 standards.
1995	ISO 9002 : 1994 certificate conferred by RWTUV (Germany)	Certificate conferred on the unit for implementing the Quality system in accordance with ISO 9002, Revised standards.
1995	Indian Merchants Chamber, Mumbai	Award for outstanding contribution in the field of Industrial & Labour relations.
1998	ISO 14001 : 1996 certificate conferred by RWTUV (Germany)	Certificate conferred on the unit for implementing Environmental Management System (EMS) in accordance with ISO 14001 standards.
2000	Chairman, Aditya Birla Group	Chairman's Award for Manufacturing Excellence - BRONZE AWARD
2001	ISO 9001 : 2000 certificate conferred by RWTUV (Germany)	Certificate conferred on the unit for implementing Quality Management system in accordance with ISO 9001 Revised standards.
2001	OHSAS 18001:1999 certificate conferred by RWTUV (Germany)	Certificate conferred on the unit for implementing Occupational Health & Safety Management system in accordance with OHSAS:1999 standards.
2001	Indian Chemical Manufacturer's Association	Certificate of Merit for Obtaining ISO 9001 certification
2002	TERI Corporate Environmental Awards 2001	Ranked II in category III (Companies with an annual Turnover of more than Rs.500 Crores) for adopting cleaner technology.
2002	Greentech Foundation New Delhi.	Greentech Industrial Safety Gold Award for the Year 2001-2002 for outstanding achievement in the field of Industrial Safety.
2003	TERI Corporate Environmental Award 2001 - 02	Ranked 1st in category III (companies with an annual turnover of more than Rs. 500 crore).for adopting cleaner technology.
2003	Institute of Directors & world Environmental Foundation, New Delhi	Winner Golden Peacock Environment Management Award – 2003

Awards:

- Unit has emerged as one of the Top Performers at the National Level getting an award of three leaves in the Green Rating Award by Centre, New Delhi for Science and Environment. Also the Unit is recognized with a special award for the best performance in fibre sourcing for striving towards raw material self-sufficiency by promoting farm and social forestry – Certificate enclosed.

- Unit's achievement of attaining the global distinction of high chemical recovery efficiency was appreciated and the technical paper presented in this regard during IPPTA Seminar was adjudged as the best and awarded the first prize.

- Unit was awarded 2nd prize amongst large industries in the State of Karnataka for Safety from Dept. of Factories & Boilers.

- Unit received "Unnatha Suraksha Puraskara" from the National Safety Council, for the year 2005, in recognition of outstanding safety performance and management system in paper and pulp category of industries during 2003 – 05.

- Technical paper titled "Two stage oxygen for Bleaching Dissolving Grade Pulp " presented during IPPTA Seminar was adjudged as one of the best Technical paper

- IMC Ramakrishna Bajaj National Quality Special Award for Performance Excellence – 2007 in the manufacturing category.

- Aditya Birla Group's Chairman's Platinum Award for Manufacturing Excellence in 2009.

- Harihar Polyfibers has received the Gold Award from Green Tech Foundation in 2010 for Outstanding Achievement in Environmental Performance.

- Harihar Polyfibers has won the **"Most Innovative Environmental Project"** award at the CII Environmental Best Practices Award 2011 organised by CII – Godrej Green Business Centre on 28 & 29 January 2011 at CII – Sohrabji Godrej Green Business Centre, Hyderabad.

GRASIM

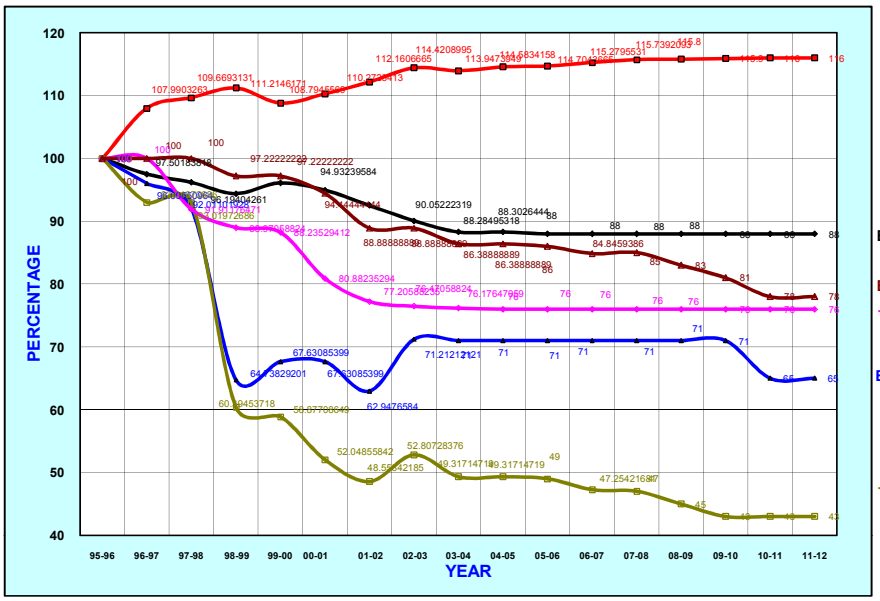
PULP DIVISION : HARIHAR

CLEANER TECHNOLOGIES IMPLEMENTED IN 2011-12

Sl.No	Project
1	Fume hood in Laboratory for improved work environment
2	Effluent Treatment PH lagoon bund strengthening phase IV project
3	Replacement of classifier grits collection & transportation trolley
4	Replacement of two screw conveyors with single drag chain conveyor in Lime Kiln
5	Replacement of MCS - HT Panel
6	Standby fire hydrant pump
7	Replacement of Laser Alignment instrument
8	Fulghum chipper feed hopper & infeed conveyor support structure repairs
9	Replacement of Fulghum chipper infeed conveyor drum assemblies
10	Digester health assessment - 2Nos. For safety & reliability of operation
11	Reconditiong of preheater bottom chest for improved operation and control pollution at source
12	Replacement of blow valve - 2 Nos for safety & reliable operation
13	Protective coating for pressure washer hoods & repulper troughs
14	Replacement of bleach hot water tank No.3
15	Replacement of vacuum filter repulper screw
16	Replacement of Hypo MC pump rotating assembly
17	Battery powered strapping tool
18	Protective coating for Vacuum filter No.3 fly rims & structure
19	Reconditioning of slow motion slaker screw
20	Replacement of Primary clarifier No.1&2 interconnection pipeline
21	Replacement of first alkali pipe line
22	TG3 cooling tower pump delivery line replacement
23	RB1 Primary air fan impeller, hub & shaft replacement
24	Replacement of air end assemblies
25	Replacement of MCC 54 & 55 in Pulp Mill
26	Replacement of VFDs in lime kiln
27	Replacement of ClO2 Ahlmixer delivery valve
28	Replacement of Lime kiln oil mass flow meter
29	Replacement of blow tank outlet stock flow meter
30	Replacement of bleach effluent line
31	Replacement of Hypo solution pump delivery lines
32	Replacement of Chlorate plant PVC lines & valves
33	Insulation repairs
34	TG-3 minor overhauling
35	Partial replacement of furnace oil in lime kiln using the biogas
36	Replacement of digester trays – 9 No.
37	Replacement of vacuum filter No 5 (N) circulation pump with higher efficiency pump
38	Replacement of old inefficient motors (40 Nos) with higher efficiency, IP 55 protection motors for electrical energy conservation
39	Centrifugal pumps for Lime Mud Washer No 2 underflow slurry
40	Introduction of valves in evaporator vapour lines
41	Replacement of Strong Base Anion exchanger units & introduction of Weak Base Anion units to conserve caustic

Projects are implemented to improve safety and reliability of operations, maintenance and testing to reduce or eliminate human errors thereby minimising the mistakes and impacts on environment

Graph - 1 : Reduction in Wastewater Generation & Pollution Load by Adoption of Cleaner Technologies of Production



Graph - 2 : Reduction in Makeup Chemicals & Energy Inputs by Adoption of Cleaner Technologies of Production