



**Verified Carbon
Standard**

Chemical Recovery project at Satia Industries Ltd. (SIL), formerly known as Satia Paper Mills Limited village Rupana, Punjab



**INFINITE
SOLUTIONS**

Document Prepared by Infinite Solutions

Project Title	Chemical Recovery project at Satia Industries Ltd. (SIL), formerly known as Satia Paper Mills Limited village Rupana, Punjab
Version	03
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Monitoring Period	01/09/2010 to 27/03/2016 (Inclusive of both the dates)
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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

Satia Industries Ltd. (SIL) previously known as Satia Paper Mills Ltd. (SPML) is one of the leading integrated paper manufacturing unit in Punjab. SIL, being an environmentally concerned entity has always worked for protecting the environment from degradation. Thus, the proponent had commissioned a chemical recovery plant in SIL's plant premises at Muktsar, Punjab with the ultimate objective to reduce the Green House Gases emissions in the atmosphere.

The purpose of the project activity is to recover the caustic soda from waste liquor generated at the pulping stage of the paper manufacturing process. Since the electricity consumption for the process of recovery of 1 tonne of soda is much lesser than that consumed in the production of fresh stock, the project activity helps in curbing the greenhouse gases emissions into the atmosphere. The electricity consumed at project activity is generated inhouse from biomass-based power project.

Therefore, an energy equivalent of approximately 301.1 million kWh for a period of 10 years would be saved by the project activity with CO₂ emission reduction of 219,020 tonnes over a 10-year crediting period.

The total GHG emission reductions or removals generated in this monitoring period, i.e., 01/09/2010 to 27/03/2016 (inclusive both days) is 117,415 tCO₂e.

1.2 Sectoral Scope and Project Type

The project activity falls under the following Sectoral scope and Project Type:

Sectoral Scope: 05

Project Type : Chemical Industries

Methodology : AMS III.M., Version 02 EB-33 – “Reduction in Consumption of Electricity by Recovering Soda from Paper Manufacturing Process”

The project is not a grouped project activity.

1.3 Project Proponent

Organization name	Satia Industries Limited
Contact person	R. K. Bhandari

Title	Director
Address	Village: Rupana, Muktsar-Malout road, Muktsar, Punjab – 152206, India
Telephone	+91-163-3262215,262001,
Email	satiapaper@gmail.com

1.4 Other Entities Involved in the Project

Organization name	Infinite Solutions
Role in the Project	Carbon Consultant
Contact person	Jimmy Sah
Title	Head - Sustainability
Address	611, Chetak Centre Main, 12/2, Rabindranath Tagore Marg, South Tukoganj, Tukoganj, Indore, Madhya Pradesh 452001
Telephone	+91-731-4050174
Email	jimmy@infisolutions.org

1.5 Project Start Date

Project Start Date: 02-Mar-2006¹;

The project start date has been taken as the actual commissioning date of the chemical recovery plant when it first started operations.

1.6 Project Crediting Period

Crediting Period Start date: 28-Mar-2006

Crediting Period End date: 27-Mar-2016

Project crediting period: 10 years (Fixed)

¹ Date of Commercial operation.

1.7 Project Location

The project activity is located within premises of paper manufacturing unit of SIL at Rupana village in Muktsar district in Punjab. The nearest railway station is located at Muktsar which is around 8 km from the plant site. Following map shows the exact location of project plant in state map

	CRP Site location
LATITUDE (N)	30°28'43" North
LONGITUDE (E)	74°31'22" East



Figure 1: Location of the project activity

1.8 Title and Reference of Methodology

Methodology:

Title: "Reduction in Consumption of Electricity by Recovering Soda from Paper Manufacturing Process"

Reference: Approved Small-Scale methodology AMS III.M., Version 02 EB-33,

Sectoral Scope: 05 – Chemical Industry

The emission factor for the project activity has been estimated on the basis of the small-scale methodology AMS.I.D (Version 13.0) titled 'Grid connected renewable electricity generation'.

1.9 Participation under other GHG Programs

The Project has not participated in any other GHG programs.

1.10 Other Forms of Credit

- Emission Trading Programs and Other Binding Limits: The project proponent is not part of any emission trading program. SIL also does not have any binding GHG emission limits. The net GHG emission reductions from the project will not be used for compliance with emission trading programs or to meet binding limits on GHG emissions.
- Other Forms of Environmental Credit: The project proponent hereby confirms that the credits from VCS mechanism would be claimed in either of the mechanism for a given monitoring period.

1.11 Sustainable Development

The sustainable development indicators stipulated by the Government of India in the interim approval guidelines for VCS projects are as follows^{2,3}:

- ✓ **Environmental well being**
- ✓ **Technological well being**
- ✓ **Economic well being**
- ✓ **Social well being**

The project activity proposed by SIL contributes to the above in following manner:

² http://envfor.nic.in:80/divisions/ccd/cdm_iac.html

³ http://envfor.nic.in/cdm/host_approval_criteria.htm

Environmental well-being:

Lesser amount of electricity is consumed in recycling the caustic soda than in manufacturing the fresh stock. Therefore, project helps in reducing GHG emissions.

Technological well-being:

The implementation of technology for soda recovery and recycling will provide a highly replicable model for other industries in this sector.

Economical well-being:

The project activity by providing employment opportunities to the local traders, labours, transporters would improve the living standards of the local people. The project would also create a business opportunity for local suppliers, manufacturers, contractors etc. during the various phases of the project construction, operation & maintenance.

Social well-being:

Installation of additional equipment in the plant will generate direct and indirect employment opportunities for skilled as well as unskilled labours. This will improve the local standard of living. Project activity will also facilitate capacity building amongst employees of the plant.

2 SAFEGUARDS

2.1 No Net Harm

There were no harm identified from the project and hence no mitigations measures are applicable.

2.2 Local Stakeholder Consultation

A stakeholder meeting was held on 06/10/2003 involving the local stakeholders at the project site. The meeting was attended by local Community, panchayat members and representatives of PPs.

The stakeholders were explained about the project activity and the various benefits arising out of the project activity. A discussion was held in which the views of the local stakeholders were addressed. No negative comments received.

Nevertheless, PP is open for the continuous stakeholder interaction and formed a grievance/suggestion register and a grievance box placed at the project site for the

comments at any point of time during the project crediting period. PP has explained this mechanism for on-going communication to the local stakeholders and transparently kept the notice mentioning the grievance register and box at the project site.

There are no negative comments received for the project. In line with VCS requirements all the processes have been implemented to receive comments from local stakeholders as well as communicate with them at periodic intervals.

However, no negative feedback received during the current monitoring period.

2.3 AFOLU-Specific Safeguards

Not Applicable

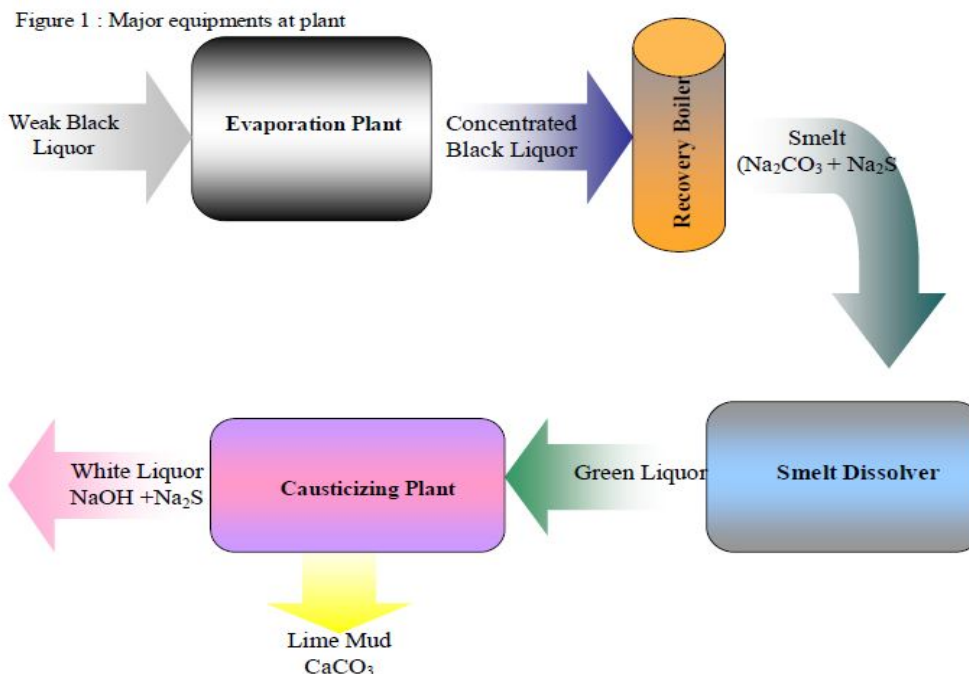
3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

This project category comprises of technology/measures for recovering caustic soda from waste black liquor generated in paper manufacturing as it involves commissioning of a chemical recovery plant wherein caustic soda will be recovered from waste liquor generated in paper manufacturing.

The conventional soda manufacturing process is highly energy intensive process, whereas energy requirement for per ton of soda recovered in the Chemical Recovery Process is lesser than the conventional plant. The electricity consumed at project is generated in house from biomass-based power generation unit.

The major equipment deployed in the project activity are as follows:



Black Liquor Boiler details

The configuration details of the boilers are as Follows: -

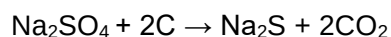
Black Liquor Boiler:

Table 1: Boiler details

Description	1no.
Steam generating capacity (tons per hour)	12 TPH
Steam pressure (kg/cm ²)	42 Kg/cm ²
Steam outlet temperature (°C)	405+/- 5°C

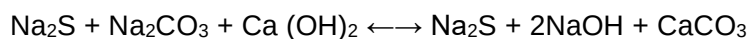
Other Technical Details: -

The weak black liquor is evaporated (in Evaporation plant) and burned in the recovery boiler to recover the inorganic chemicals for reuse in the pulping process. The combustion is carried out such that sodium sulfate is reduced to sodium sulfide by the organic carbon in the mixture:



The molten salts ("smelt") from the recovery boiler are dissolved in process water (in Smelt Dissolver). This process water, is composed of all liquors used to wash lime mud and green liquor precipitates. The resulting solution of sodium carbonate and sodium sulfide is known

as "green liquor". This liquid is mixed with calcium oxide (in Causticizing Plant), which becomes calcium hydroxide in solution, to regenerate the white liquor used in the pulping process through an equilibrium reaction (Na_2S is shown since it is part of the green liquor, but does not participate in the reaction):



Breakdown details: -

The project has undergone continuous operation and there is no major incident observed for the monitoring period. Breakdown details has been submitted.

There has been no event that may have an impact on the GHG emissions or removals during the current monitoring period.

3.2 Deviations

2.3.1 Methodology Deviations

There are no methodology deviations.

2.3.2 Project Description Deviations

There are no Project Description deviations

3.3 Grouped Projects

This is not a grouped project activity.

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data / Parameter	E _{BT} (ex- post)					
Data unit	kWh/tonne annually					
Description	Annual Electricity consumed in producing 1 tonne of soda by the soda manufacturer during the crediting period.					
Source of data	Annual reports of the soda manufacturers or any other authentic published data.					
Value applied	<table><tr><th>Year</th><th>Electricity Consumed for Producing 1 Tonne of Soda (kWh/tonne)</th><th>Source: Annual Report</th></tr></table>			Year	Electricity Consumed for Producing 1 Tonne of Soda (kWh/tonne)	Source: Annual Report
Year	Electricity Consumed for Producing 1 Tonne of Soda (kWh/tonne)	Source: Annual Report				

	2010-11	2576	The Andhra Sugars Ltd
	2011-12	2583	Aditya Birla Chemicals Ltd
	2012-13	2626	Aditya Birla Chemicals Ltd
	2013-14	2466	Aditya Birla Chemicals Ltd
	2014-15	2398	Aditya Birla Chemicals Ltd
	2016-17	2035	Govt of India Manual Chlor-Alkali Sector; pg 24
	Average Value has been Considered		2447
Justification of choice of data or description of measurement methods and procedures applied	Data Type: Measured Monitoring Procedure: The details regarding the energy consumption in the production of soda by the chemical manufacturer has been procured from the manufacturer through the published annual reports of the company. Monitoring Frequency: Annually		
Purpose of Data	To calculate Baseline Emissions		
Comments	The NEWNE/northern grid emission factor has been taken into consideration for the baseline emissions as the NEWNE/northern grid is the supplier of electricity for the soda manufacturers.		

Data / Parameter	EF _{ff, y}
Data unit	Tonne CO ₂ /tonne of fossil fuel (furnace oil)
Description	Emission factor of the fossil fuel used for generating thermal energy
Source of data	Calculated from the NCV and emission factor value mentioned in the IPCC Guideline 2006 ⁴
Value applied	3.13 Tonne CO ₂ /tonne of fossil fuel (furnace oil)
Justification of choice of data or description of measurement methods and procedures applied	Data Type: Estimated Monitoring Procedure: Default value as per IPCC. Value obtained from published sources Monitoring Frequency: Annually Archiving Procedure: Paper/Electronic
Purpose of Data	To calculate Project Emissions
Comments	To be used for Project emissions related to thermal energy consumption

⁴ <http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol2.html>

4.2 Data and Parameters Monitored

Data / Parameter	Quantity of soda																		
Data unit	Tonnes/annum																		
Description	Quantity of soda recovered in the process																		
Source of data	Plant Records- Data records maintained at plant site																		
Description of measurement methods and procedures to be applied	Data Type: Measured Monitoring Procedure: The volume of the soda recovered per day is measured in m³ through flow meter on daily basis. The strength of the soda recovered (grams per litre (GPL)) is calculated at the laboratory at the plant site. Strength in GPL is multiplied with flow & divided by 1000 (GPL*m³/1000) to calculate the soda recovered in tonnes.																		
Frequency of monitoring/recording	The tonnes of soda recovered are measured & recorded in log books in 8 hours shift basis & 24 hours basis																		
Value monitored	<table border="1"> <thead> <tr> <th>Year</th><th>Quantity of Soda (Tonne/Year)</th></tr> </thead> <tbody> <tr> <td>(01/09/2010 – 31/12/2010) 2010</td><td>4123.73</td></tr> <tr> <td>2011</td><td>12374.79</td></tr> <tr> <td>2012</td><td>12068.03</td></tr> <tr> <td>2013</td><td>10689.17</td></tr> <tr> <td>2014</td><td>12043.15</td></tr> <tr> <td>2015</td><td>13026.53</td></tr> <tr> <td>(01/01/2016 – 27/03/2016) 2016</td><td>3264.83</td></tr> <tr> <td>Total</td><td>67,590 MT</td></tr> </tbody> </table>	Year	Quantity of Soda (Tonne/Year)	(01/09/2010 – 31/12/2010) 2010	4123.73	2011	12374.79	2012	12068.03	2013	10689.17	2014	12043.15	2015	13026.53	(01/01/2016 – 27/03/2016) 2016	3264.83	Total	67,590 MT
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(01/01/2016 – 27/03/2016) 2016	3264.83																		
Total	67,590 MT																		
Monitoring equipment	Flow meter for measuring flow and burette and pipette for measuring the strength of soda recovered																		
QA/QC procedures to be applied	In order to ensure the highest levels of accuracy in the monitoring procedure the monitoring equipment are calibrated annually. Also, the observed values are compiled to arrive at a consolidated value reported in the log books on a daily basis by the monitoring supervisors. The log book reported values are used to prepare reports on a monthly basis which are finally reviewed by the top management officials responsible for the monitoring procedures as mentioned in monitoring plan described under the heading “Roles and Responsibilities “in this document. The uncertainty level of the equipment used for the monitoring is ± 1%																		
Purpose of the data	This is used to calculate baseline as well as project emissions																		

Calculation method	-
Comments	-

Data / Parameter	E_{PT}																		
Data unit	kWh/annum																		
Description	Annual Electricity consumed ⁵ to recover soda in recovery plant																		
Source of data	Plant Records- Data records maintained at plant site																		
Description of measurement methods and procedures to be applied	Data Type: Measured Monitoring Procedure: The parameter would be measured using the electronic energy meters installed at the plant location and the observed values are reported on a daily basis in the plant log books.																		
Frequency of monitoring/recording	Readings taken daily and compiled on a monthly basis																		
Value monitored	<table border="1"> <thead> <tr> <th>Year</th><th>Annual Electricity Consumed (kWh)</th></tr> </thead> <tbody> <tr> <td>(01/09/2010 – 31/12/2010) 2010</td><td>2370530.38</td></tr> <tr> <td>2011</td><td>7465491.07</td></tr> <tr> <td>2012</td><td>7963830.45</td></tr> <tr> <td>2013</td><td>7578661.00</td></tr> <tr> <td>2014</td><td>8020459.32</td></tr> <tr> <td>2015</td><td>10851877.00</td></tr> <tr> <td>(01/01/2016 – 27/03/2016) 2016</td><td>2504684.00</td></tr> <tr> <td>Total</td><td>46755533.22</td></tr> </tbody> </table>	Year	Annual Electricity Consumed (kWh)	(01/09/2010 – 31/12/2010) 2010	2370530.38	2011	7465491.07	2012	7963830.45	2013	7578661.00	2014	8020459.32	2015	10851877.00	(01/01/2016 – 27/03/2016) 2016	2504684.00	Total	46755533.22
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2014	8020459.32																		
2015	10851877.00																		
(01/01/2016 – 27/03/2016) 2016	2504684.00																		
Total	46755533.22																		
Monitoring equipment	Electronic Energy Meters																		
QA/QC procedures to be applied	In order to ensure the highest levels of accuracy in the monitoring procedure the monitoring equipment has been calibrated annually. Also, the observed values are compiled to arrive at a consolidated value reported in the log books on a daily basis by the monitoring supervisors. The log book reported values are then used to prepare reports on a monthly basis which are finally reviewed by the top management officials responsible for the monitoring procedures as mentioned in monitoring plan described section under the heading																		

⁵ Annual Electricity consumed although monitored is not used in project emission calculations as energy requirement of the recovery plant is met by the power produced at the plant site from the renewable biomass fired power generation plant.

	"Roles and Responsibilities "in this document. The accuracy level of the electronic energy meters used is $\pm 1\%$.
Purpose of the data	To calculate the Project emissions
Calculation method	-
Comments	-

Data / Parameter	$Q_{ff,y}$																		
Data unit	Tonnes/annum																		
Description	Quantity of fossil fuel (furnace oil) consumed for thermal energy in the recovery process																		
Source of data	Plant Records- Data records maintained at plant site																		
Description of measurement methods and procedures to be applied	Data Type: Measured Monitoring Procedure: The quantity is measured using standard scales and the observed values are reported in the plant log books on a daily basis and can be cross checked with the purchase records of furnace oil. Furnace oil received in kl is multiplied with density of oil i.e.0.95 (kl*0.95) to arrive at quantity in tons Monitoring Frequency: Readings taken daily and compiled on a monthly basis.																		
Frequency of monitoring/recording	The Project Proponent will review the appropriateness of the data annually.																		
Value monitored	<table border="1"> <thead> <tr> <th>Year</th><th>Quantity of fossil fuel (Mt)</th></tr> </thead> <tbody> <tr> <td>(01/09/2010 – 31/12/2010) 2010</td><td>211</td></tr> <tr> <td>2011</td><td>624</td></tr> <tr> <td>2012</td><td>517</td></tr> <tr> <td>2013</td><td>707</td></tr> <tr> <td>2014</td><td>706</td></tr> <tr> <td>2015</td><td>1786</td></tr> <tr> <td>(01/01/2016 – 27/03/2016) 2016</td><td>359</td></tr> <tr> <td>Total</td><td>4911</td></tr> </tbody> </table>	Year	Quantity of fossil fuel (Mt)	(01/09/2010 – 31/12/2010) 2010	211	2011	624	2012	517	2013	707	2014	706	2015	1786	(01/01/2016 – 27/03/2016) 2016	359	Total	4911
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2013	707																		
2014	706																		
2015	1786																		
(01/01/2016 – 27/03/2016) 2016	359																		
Total	4911																		
Monitoring equipment	Plant Log book																		
QA/QC procedures to be applied	The scale with least count of 1mm is used for the measurement of the quantity would be calibrated annually to ensure the highest levels of accuracy in the monitoring. The daily reading recorded by the shift																		

	supervisors are reported in the log books. The log book reported values are used to prepare reports on daily and monthly basis which are thoroughly reviewed by the top management officials responsible for the monitoring procedures as mentioned in monitoring plan of the PD.
Purpose of the data	Calculation of Project Emission
Calculation method	-
Comments	-

Data / Parameter	Q_{residue}																		
Data unit	Tonne																		
Description	Quantity of residues produced from the recovery plant																		
Source of data	Data records maintained at plant site																		
Description of measurement methods and procedures to be applied	Data Type: Measured Monitoring Procedure: The quantity of residues generated from the recovery unit would be monitored daily through weighbridge (by accounting for the moisture content) and the observed values would be reported in the log books on daily basis.																		
Frequency of monitoring/recording	Readings taken daily and compiled on a monthly basis																		
Value monitored	<table border="1"> <thead> <tr> <th>Year</th><th>Quantity of residues (Mt)</th></tr> </thead> <tbody> <tr> <td>(01/09/2010 – 31/12/2010) 2010</td><td>5969</td></tr> <tr> <td>2011</td><td>16957</td></tr> <tr> <td>2012</td><td>18531</td></tr> <tr> <td>2013</td><td>17640</td></tr> <tr> <td>2014</td><td>18658</td></tr> <tr> <td>2015</td><td>20554</td></tr> <tr> <td>(01/01/2016 – 27/03/2016) 2016</td><td>4834</td></tr> <tr> <td>Total</td><td>103142</td></tr> </tbody> </table>	Year	Quantity of residues (Mt)	(01/09/2010 – 31/12/2010) 2010	5969	2011	16957	2012	18531	2013	17640	2014	18658	2015	20554	(01/01/2016 – 27/03/2016) 2016	4834	Total	103142
Year	Quantity of residues (Mt)																		
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2013	17640																		
2014	18658																		
2015	20554																		
(01/01/2016 – 27/03/2016) 2016	4834																		
Total	103142																		
Monitoring equipment	Weighbridge																		
QA/QC procedures to be applied	The equipment with uncertainty level of 3% used for the measurement of the quantity is calibrated annually to ensure the highest levels of accuracy in the monitoring. The daily reading recorded by the shift supervisors are reported in the log books. The log book reported values are used to prepare reports on daily and monthly basis which are thoroughly reviewed by the top management officials responsible for the monitoring procedures as mentioned in monitoring plan of the PD.																		

Purpose of the data	-
Calculation method	N.A.
Comments	-

Data / Parameter	% residue used for the production of lime
Data unit	%
Description	Portion of residue used for the production of lime.
Source of data	Plant records
Description of measurement methods and procedures to be applied	No amount of residue generated from the project activity is used for the production of lime.
Frequency of monitoring/recording	Readings taken daily and compiled on a monthly basis
Value monitored	Nil
Monitoring equipment	Plant Log book
QA/QC procedures to be applied	The daily reading recorded by the shift supervisors are reported in the log books. The log book reported values are used to prepare reports on daily and monthly basis which are thoroughly reviewed by the top management officials
Purpose of the data	Calculation of Project Emission
Calculation method	N. A
Comments	-

Data / Parameter	% residue disposed off
Data unit	-
Description	Portion of residue that is disposed in a solid waste disposal site
Source of data	Plant records
Description of measurement methods and procedures to be applied	The complete amount of the residue generated from the project plant is disposed of to fill the low-lying areas at the project location.

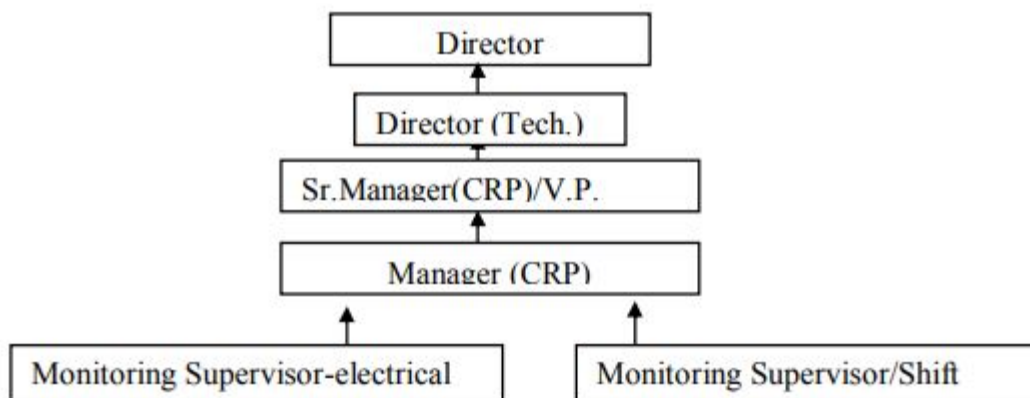
Frequency of monitoring/recording	At least once in a year.
Value monitored	100% residue generated
Monitoring equipment	Plant log book
QA/QC procedures to be applied	The amount of the quantity of the residue disposed off will be reported in the daily log books which would be further used to generate the monthly reports and would be reviewed by the top management officials responsible for the monitoring procedures as outlines under the heading "Roles and Responsibilities "in this document
Purpose of the data	Calculation of Project Emission
Calculation method	N.A.
Comments	-

4.3 Monitoring Plan

The parameters regarding the project activity which need to be monitored accurately are as described below:

- Quantity of Caustic Soda recovered in a year
- Electricity consumed in recovery plant
- Quantity of fossil fuel consumed in the year (if any)
- Emission factor of the fossil fuel used for generating thermal energy (if any)
- Electricity consumed in producing 1 ton of soda by the soda manufacturer annual average.
- Quantity of residues produced from the recovery plant
- Portion of residue used for the production of lime
- Portion of residue that is disposed in a solid waste disposal site.

The above stated parameters would be monitored regularly and the recorded values will be reported in the plant records. In order to ensure systematic and efficient monitoring of the parameters SIL has designed a team which would be responsible for the complete monitoring procedure to be followed.



The monitoring team at the shop floor level records the daily observations and report the same in the plant log books. The field data would be noted by the monitoring supervisors in the log books and then transformed into excel sheets or would be directly reported in the soft format. The daily reports would be sent to the manager for his review. The manager would generate the monthly reports based on the daily reports received from the supervisors and would forward the monthly report to the senior manager for his perusal. The senior manager would review the report and will send the same to the technical director for his perusal. The technical director will finally send the report to the director of the company.

In order to ensure the highest levels of accuracy in the monitoring process, the instruments (such as energy meters) used for monitoring will be calibrated regularly as per the manufacturers' specifications, regular inspection of the plant reports will be made by the VCU monitoring team. Also, regular internal audits would be conducted by teams comprising of technical experts and senior officials to inspect the log books, plant records etc. very critically and in cases of any discrepancies necessary corrective actions would be performed.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

$$BE_y = Q_{rec, y} \times E_{BT} \times EF_B$$

Where,

BE_y - Baseline emissions (CO₂ emissions in absence of the project activity, tonne)

$Q_{rec, y}$ - Quantity of soda recovered in the process (tonnes per annum)

E_{BT} - Electricity consumed for producing 1 tonne of soda (KWh/tonne)

EF_B - Emission factor of the electricity used for soda production (tCO₂/MWh)⁶

Thus,

The Total Baseline Emission for this Monitoring period (01/09/2010 to 27/03/2016)

= 132,822 tCO₂

5.2 Project Emissions

$$PE_y = PE_{y, \text{electrical}} + PE_{y, \text{thermal}}$$

$$PE_{\text{electrical}} = Q_{rec, y} \times E_{PT} \times EF_p$$

where

PE_y - Project activity emissions in the year “y” (tonnes of CO₂ eq)

$Q_{rec, y}$ - Quantity of soda recovered in year “y” (tonnes)

E_{PT} - Electricity consumed for recovering 1 tonne of soda (kwh/tonne of NaOH)

EF_p - Emission factor of the electricity used for recovering soda (tCO₂/MWh)

The electricity requirement of the recovery plant has been met by the power produced at the plant site from the biomass fired power generation plant., the emission due to this consumption is not being considered in project emissions.

Thus, $PE_{y, \text{electrical}} = 0$

$$PE_{y, \text{thermal}} = Q_{ff, y} \times EF_{ff, y}$$

where

$PE_{y, \text{thermal}}$ - Emissions due to thermal energy consumption by the recovery process (tCO₂e)

⁶ The emission factor for the soda production in the baseline has been arrived at by taking the weighted average of the NEWNE grid (now, Indian grid) emission factors according to the- CEA's Baseline Carbon Dioxide Emission Database Version 4.0 www.cea.nic.in.

$Q_{ff,y}$ - Quantity of fossil fuel consumed for thermal energy in the recovery process in year “y” (tonnes)

$EF_{ff,y}$ - Emission factor for the fossil fuel (tCO₂/tonne)⁷

The Total Project Emissions for this Monitoring period (01/09/2010 to 27/03/2016)

= 15,407 tCO₂

5.3 Leakage

No leakages are considered under the project activity

The quantity of residues produced is monitored and disposed off in a solid waste disposal site and hence is not used for producing lime CaO within the project boundary or outside of it. Thus, no leakage calculation is applicable in this case.

5.4 Net GHG Emission Reductions and Removals

The following formula is adopted for calculating emission reductions generated by the project activity:

$$ER_y = BE_y - PE_y - LE_y$$

Where

ER_y is emission reductions in a given year

BE_y is baseline emissions in a given year

PE_y is project emissions in a given year

LE_y is leakage in a given year

$$ER_y = 117,415 \text{ tCO}_2$$

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
2010(01/09/2010 to 31/12/2010)	8,104	662	-	7,442

⁷ IPCC 2006 Database

2011(01/01/2011 to 31/12/2011)	24,318	1,961	-	22,357
2012(01/01/2012 to 31/12/2012)	23,715	1,624	-	22,091
2013(01/01/2013 to 31/12/2013)	21,005	2,221	-	18,784
2014(01/01/2014 to 31/12/2014)	23,665	2,217	-	21,448
2015(01/01/2015 to 31/12/2015)	25,599	5,597	-	20,002
2016(01/01/2016 to 27/03/2016)	6,416	1,125	-	5,291
Total	132,822	15,407	-	117,415

APPENDIX 1: < METER CALIBRATION DETAILS >

Sl .No	Parameter	Meter Used	Equipment	Accuracy	Meter No			
							2009	
						Calibratio Frequency	Calibration date	Certificate no
1	Quantity of Soda	Flow meter		± 1%	8813721-9000	Annually	22/09/2009	5874321
2	Quantity of fossil fuel consumed in recovery process	Measuring scale		Least count – 1 mm	401	Annually	06/10/2009	075

Sl. No	Parameters	Meter Used	Equipment	Accuracy	Meter No			
							2010	
						Calibratio Frequency	Calibration date	Certificate no
1	Quantity of Soda	Flow meter		± 1%	8813721-9000	Annually	21/09/2010	7004610
2	Electricity consumed in Recovery plant	Energy meter	CRP Boiler	± 1%	156228/326 07-3008(new meter)	Annually	28/06/2010	YMPL/177715/30 251
3	Electricity consumed in Recovery plant	Energy meter	Caustisizing	± 1%	5859743	Annually	01/03/2010	812249
4	Electricity consumed in Recovery plant	Energy meter	Evaporator	± 1%	1K040562	Annually	01/03/2010	812248
5	Residue Produced	Weigh bridge		3%	610002	Annually	29/06/2010	190515
6	Quantity of fossil fuel consumed in recovery process	Measuring scale		Least count – 1 mm	401	Annually	21/09/2010	7004611

Sl. No	Parameters	Meter Used	Equipment	Accuracy	Meter No	2011		
						Calibration Frequency	Calibration date	Certificate no
1	Quantity of Soda	Flow meter		± 1%	8813721-9000	Annually	20/09/2011	7028930
2	Electricity consumed in Recovery plant	Energy meter	CRP Boiler	± 1%	156228/32607-3008(new meter)	Annually	06/07/2011	7028931
3	Electricity consumed in Recovery plant	Energy meter	Causticizing	± 1%	5859743	Annually	28/02/2011	7028929
4	Electricity consumed in Recovery plant	Energy meter	Evaporator	± 1%	1K040562	Annually	28/02/2011	7028932
5	Residue Produced	Weigh bridge		3 %	610002	Annually	27/06/2011	448032
6	Quantity of fossil fuel consumed in recovery process	Measuring scale		Least count – 1 mm	401	Annually	15/09/2011	85798

Sl. No	Parameters	Meter Used	Equipment	Accuracy	Meter No	2012		
						Calibration Frequency	Calibration date	Certificate no
1	Quantity of Soda	Flow meter		± 1%	8813721-9000	Annually	10/09/2012	8007888
2	Electricity consumed in Recovery plant	Energy meter	CRP Boiler	± 1%	156228/32607-3008(new meter)	Annually	05/07/2012	8007889
3	Electricity consumed in Recovery plant	Energy meter	Causticizing	± 1%	5859743	Annually	25/01/2012	8007891
4	Electricity consumed in Recovery plant	Energy meter	Evaporator	± 1%	1K040562	Annually	10/02/2012	8104568
5	Residue Produced	Weigh bridge		3%	610002	Annually	25/06/2012	485767
6	Quantity of fossil fuel consumed in recovery process	Measuring scale		Least count – 1 mm	401	Annually	08/09/2012	108794

Sl. No	Parameters	Meter Used	Equipment	Accuracy	Meter No	2013		
						Calibration Frequency	Calibration date	Certificate no
1	Quantity of Soda	Flow meter		± 1%	8813721-9000	Annually	25/08/2013	8104679
2	Electricity consumed in Recovery plant	Energy meter	CRP Boiler	± 1%	156228/32607-3008(new meter)	Annually	20/02/2013	8104680
3	Electricity consumed in Recovery plant	Energy meter	Causticizing	± 1%	5859743	Annually	20/01/2013	8104681
4	Electricity consumed in Recovery plant	Energy meter	Evaporator	± 1%	1K040562	Annually	04/02/2013	8214587
5	Residue Produced	Weigh bridge		3%	610002	Annually	22/05/2013	878294
6	Quantity of fossil fuel consumed in recovery process	Measuring scale		Least count – 1 mm	401	Annually	05/09/2013	204665

Sl. No	Parameters	Meter Used	Equipment	Accuracy	Meter No	2014		
						Calibration Frequency	Calibration date	Certificate no
1	Quantity of Soda	Flow meter		± 1%	8813721-9000	Annually	18/07/2014	8354789
2	Electricity consumed in Recovery plant	Energy meter	CRP Boiler	± 1%	156228/32607-3008(new meter)	Annually	15/05/2014	8354790
3	Electricity consumed in Recovery plant	Energy meter	Causticizing	± 1%	5859743	Annually	10/01/2014	8354791
4	Electricity consumed in Recovery plant	Energy meter	Evaporator	± 1%	1K040562	Annually	03/02/2014	8431745
5	Residue Produced	Weigh bridge		3%	610002	Annually	23/05/2014	1073105
6	Quantity of fossil fuel consumed in recovery process	Measuring scale		Least count – 1 mm	401	Annually	03/09/2014	305678

Sl. No	Parameters	Meter Used	Equipment	Accuracy	Meter No	2015		
						Calibration Frequency	Calibration date	Certificate no
1	Quantity of Soda	Flow meter		± 1%	8813721-9000	Annually	15/06/2015	8441789
2	Electricity consumed in Recovery plant	Energy meter	CRP Boiler	± 1%	156228/32607-3008(new meter)	Annually	05/05/2015	8441890
3	Electricity consumed in Recovery plant	Energy meter	Causticizing	± 1%	5859743	Annually	28/12/2015	8441891
4	Electricity consumed in Recovery plant	Energy meter	Evaporator	± 1%	1K040562	Annually	25/01/2015	8974152
5	Residue Produced	Weigh bridge		3%	610002	Annually	27/05/2015	1086577
6	Quantity of fossil fuel consumed in recovery process	Measuring scale		0.1%	401	Annually	25/08/2015	389568

Sl. No	Parameters	Meter Used	Equipment	Accuracy	Meter No	2016		
						Calibration Frequency	Calibration date	Certificate no
1	Quantity of Soda	Flow meter		± 1%	8813721-9000	Annually	25/05/2016	9075873
2	Electricity consumed in Recovery plant	Energy meter	CRP Boiler	± 1%	156228/32607-3008(new meter)	Annually	01/05/2016	9075874
3	Electricity consumed in Recovery plant	Energy meter	Causticizing	± 1%	5859743	Annually	20/01/2016	9075875
4	Electricity consumed in Recovery plant	Energy meter	Evaporator	± 1%	1K040562	Annually	24/01/2016	8974152
5	Residue Produced	Weigh bridge		3%	610002	Annually	02/06/2016	1291578
6	Quantity of fossil fuel consumed in recovery process	Measuring scale		Least count -1 mm	401	Annually	24/08/2016	489423