CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 02 - in effect as of: 1 July 2004)

CONTENTS

Annexes

SECTION A. General description of project activity

A.1 Title of the project activity:

Title: Destruction of HFC-23 at refrigerant (HCFC-22) manufacturing facility of Chemplast Sanmar Ltd
Version: Ver. 2;
Date of completion of the PDD: 4th October 2006

A.2. Description of the project activity:

The proposed project activity aims to reduce Green House Gas (GHG) emissions by decomposing HFC-23 at refrigerant (HCFC 22) manufacturing facility of Chemplast Sanmar Limited (CSL). CSL belongs to the Sanmar Group of companies. CSL has been manufacturing and selling CFC-11, CFC-12 and HCFC-22 since 1989. CFC-11 & CFC-12 and HCFC-22 are manufactured on a mutually exclusive basis (in a swing plant which runs on campaign basis).

HFC-23 is an inevitable by-product generated during production of HCFC-22. HFC-23 has a high Global Warming Potential (GWP) (11700 - reference: The IPCC 2nd Assessment Report).

As there is no active market for sale of HFC-23 and as there are also no regulatory mandates by the Government of India to destroy it, HFC-23 is normally released into the atmosphere. It is technically possible to eliminate HFC-23 but abatement procedure requires intervention and carries capital and operating cost. Being environmentally & socially conscious, CSL has decided to undertake the project activity of capturing and decomposing HFC 23 that would otherwise be released in to the atmosphere and back it up with the revenues generated from CER sale accruing from it.

CSL has chosen a technology[1] known as Thermal Oxidation to decompose HFC-23. Technology and equipment for thermal oxidation of HFC-23 is being sourced from Caloric Anlagenbau GmbH, Germany, who is a world leader in this field. This technology shall completely (~99.999%) decompose the waste stream primarily comprising of HFC-23. The plant is expected to start storage of HFC23 from November 2006, and incineration plant is expected to get commissioned in March 2007. CSL will store HFC23 and will incinerate the stored HFC23 in the thermal oxidation plant.

The project activity has many strong sustainable development[2] aspects. The project will lead to reduced GHG emissions as HFC23 is identified as one of the most potent green house gas. Direct & indirect employment would be generated in the plant for the project implementation & management. Activities during construction & operation will not affect the bio-diversity in the region. There is no negative impact on soil, water quality, and forest cover due to the project activity. The technology is considered environmentally the safest amongst current technology options.

[1] Details attached in Annex 7

[2] Please refer Annex 5 for details

A.3. Project participants:

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) Project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
India (Host Party)	Chemplast Sanmar Limited (CSL)	No

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

Government of India

A.4.1.2. Region/State/Province etc.:

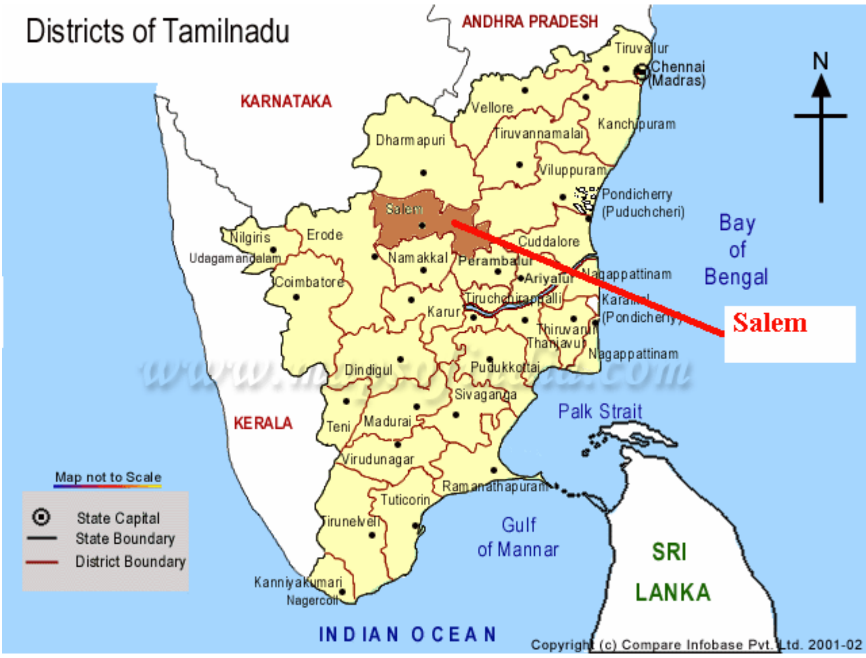
State of Tamil Nadu, India

A.4.1.3. City/Town/Community etc:

Town: Mettur
District: Salem
State: Tamil Nadu

A.4.1.4. Detail of physical location, including information allowing the unique identification of this project activity (maximum one page):

The project activity plant will be located in the existing HCFC 22 production plant of CSL. CSL plant is near the Mettur Dam at Mettur. Mettur latitude is around 11.52^0N and the longitude is 77.50^0E. The nearest airport is at Coimbatore, which is 150 km from the plant, and the nearest railway station is at Salem, around 45 km from the plant location.



A.4.2. Category(ies) of project activity:

The project is principally categorized in Sectoral Scope 11: "Fugitive emissions from production and consumption of halocarbons and sulphur hexafluoride". The methodology AM0001/ Version 3, applied to this project.

A.4.3. Technology to be employed by the project activity:

The project activity will use Thermal Oxidation to decompose HFC-23. This technology shall completely (~99.999%) decompose the waste stream comprising of HFC-23.

Thermal Oxidation (Incineration) is an engineered process designed to effect complete oxidation of the organic materials present in waste streams. The process is fully controlled and stable and involves a rapid high temperature flame combustion in a continuous process in the presence of a stoichiometric excess of oxygen and without treatment of the intermediate products of combustion.

The incineration of HFC 23 – Organic waste generated from the process of manufacturing HCFC 22 involves the oxidation of HFC-23 at a temperature above 1200oC by providing excess air to ensure complete combustion. As HFC 23 has a very low calorific value, supplemental fuel has to be given for maintaining the temperature. For the complete conversion of the halocarbons to their respective hydrogen halides, the supplemental fuel should also provide the Hydrogen for the conversion. Hence Hydrogen is chosen as the supplemental fuel.

The annual discharge of HFC23 waste stream is approximately 46 MT and currently the plant has enough storage facilities. The storage is required to ensure some minimum measure of quantity (so that the operation is optimally used) and also to act as buffer in the rare possibility of interruption in the plant operation. The waste gases are compressed by the raw gas compressors and transferred to the storage tanks. A complete compliance to compressed gas storage regulations and adequate safety measures are already in place for the current storage tanks.

Other technology details are provided in annex-7

A.4.4. Brief explanation of how the anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed CDM project activity, including why the emission reductions would not occur in the absence of the proposed project activity, taking into account national and/or sectoral policies and circumstances:

The proposed project activity would reduce GHG emissions by decomposing HFC-23 by Thermal Oxidation technology. In the project activity, high GWP GHG emissions (HFC23) would get reduced to low GWP GHG emissions (primarily CO_2), therefore leading to reduction in GHG emissions.

There is no market in India for HFC-23, a by-product of HCFC-22 production and also there are no regulatory requirements mandated by government to destruct HFC-23. Unless a destruction facility is installed, which in CSL's case, is a Thermal Oxidation plant (the proposed CDM project activity), the GHG emission would not be reduced. Installing the Thermal Oxidation technology would entail large investment by CSL without any revenue stream from the project; and hence, without CDM benefits, the project activity would not happen.

The estimated amount of emissions reduction over the 10 year crediting period is : 5,391,630 tonnes of CO_2 equivalent.

A.4.4.1. Estimated amount of emission reductions over the chosen crediting period:

Years	Annual estimation of emission reductions in tones of CO_2 e
2006-07	539163
2007-08	539163
2008-09	539163
2009-10	539163
2010-11	539163
2011-12	539163
2012-13	539163
2013-14	539163
2014-15	539163
2015-16	539163
Total estimated reductions (tonnes of CO2 e**)**	5,391,630
Total number of crediting years	10 years (fixed crediting period)
Annual average over the crediting period of estimated reductions (tonnes of CO_2e**)**	539,163

A.4.5. Public funding of the project activity:

No public funds are being used for undertaking this project activity.

SECTION B. Application of a baseline methodology

B.1. Title and reference of the approved baseline methodology applied to the project activity:

Methodology: "Incineration of HFC 23 waste streams"

Reference: Revision to approved baseline methodology AM0001; Version 03/Sectoral Scope 11/13 May 2005

B.1.1. Justification of the choice of the methodology and why it is applicable to the project activity:

The project activity meets applicability conditions provided in AM0001/Version 3 as follows:

Applicability conditions in the AM0001/Version3	Position of the CDM project activity of CSL vis-à-vis applicability conditions
Existing HCFC22 production facility with at least three (3) years of operating history between beginning of the year 2000 and the end of the year 2004	The HCFC 22 production facility of CSL, where the project activity is undertaken, has been operating since 1989 and it has more than 3 years of operating history between beginning of the year 2000 and the end of the year 2004.
No regulation requires the destruction of the total amount of HFC23 waste	The project activity is located in India and no regulation of central/state/local government requires the destruction of total amount of HFC23 waste.

B.2. Description of how the methodology is applied in the context of the project activity:

SN	Key Information	Value	Information Source
1	**Q_HCFC_y :** Maximum Production quantity	1694.59 metric tonnes	The maximum historical annual production of HCFC22 during consecutive three years performance (Obtained in year 2000)
2	**w:** HFC-23 production rate from HCFC-22 production	2.723%	The lowest of the last three historical annual values (Obtained in year 2002)
3	**$r_{y:}$:** The fraction of the waste stream required to be destroyed by the regulations during the year	0	Analysis of Government policies/ regulations

The project activity uses the approach described in the AM0001/Version03**- "Incineration of HFC 23 waste streams"** for determining the baseline.

Step 1: Estimation of baseline quantity of HFC-23 destroyed:
The AM0001/Version3 provides guidelines to estimate baseline emissions. These guidelines are applied in the following manner to estimate baseline scenario and emissions.

Requirement A:
"The baseline quantity of HFC-23 destroyed is the quantity of the HFC 23 waste stream required to be destroyed by the applicable regulations. If the entire waste stream is destroyed, Q_HFC23_y is the total amount of HFC-23 waste generated and the quantity required to be destroyed by the applicable regulations is:

$\mathbf{B\_HFC23_y = Q\_HFC23_y * r_y}$

Where r_y is the fraction of the waste stream required to be destroyed by the regulations that apply during year y. In the absence of regulations requiring the destruction of HFC 23 waste, *the typical situation in non-Annex B Parties* $r_y = 0$. In the absence of regulations on HFC 23 emissions, the HFC 23 waste is typically released to the atmosphere, and so, the baseline is zero destruction "

Position of the project activity:
In India, there is no such regulations by the Central/State/Local governments requiring any destruction of HFC23 waste. Therefore, $r_y = 0$. Hence,

$$\mathbf{B\_HFC23_y} = Q\_HFC23_y * r_y = Q\_HFC23_y * 0 = 0$$

Requirement B:
"To exclude the possibility of manipulating the production process to increase the quantity of waste, the quantity of HFC-23 waste (Q_HFC23_y) is limited to a fraction (w) of the actual HCFC production during the year at the originating plant (Q_HCFC_y).

$\mathbf{Q\_HFC23_y \leq Q\_HCFC_y * w}$

Where Q_HCFC_y is the actual production of HCFCs during the year at the plant where the HFC-23 waste originates, measured in metric tonnes. Q_HCFC_y is limited to the maximum historical annual production level during any of the last three (3) years between beginning of the year 2000 and the end of the year 2004, including CFC production at swing plants adjusted appropriately to account for the different production rates of HCFC-22 and CFCs."

Position of the project activity:
The maximum historical annual production of HCFC22 in CSL during the three years performance (Obtained in year 2000) was 1,694.59 metric tonnes, including CFC production adjusted appropriately to account for the different production rates of HCFC22 and CFCs.

$\mathbf{Q\_HCFC_y}$ = **1694.59** metric tonnes.

Requirement C:
"The coefficient w is the waste generation rate (HFC 23)/(HCFC 22) for the originating plant. The quantity of HFC 23 used to calculate this coefficient is the sum of HFC 23 recovered for sale plus the waste HFC 23. The historical waste generation shall be estimated for the three (3) most recent years of operation up to 2004. Direct measurement of HFC23 release is to be used where data are available, otherwise mass balance or other methods based on actual data are to be used. Uncertainty in emission rate estimates shall be quantified and conservative emission rate estimates shall be used when calculating expected emission reductions."

"The value of w is set at the lowest of the three historical annual values estimated as specified above and is not to exceed 3% (0.03 tonnes of HFC-23 produced per tonne of HCFC-22 manufactured). If insufficient data is available for the calculation of HFC-23 release for all three (3) most recent years of operation up to 2004, then the default value for w to be used is 1.5%".

Position of the project activity:
CSL has estimated the historical waste generation rate based on Actual data of HFC23 release for the three most recent years which are:

Year	Annual average of historical waste generation rate after accounting for uncertainties
2002	2.723%
2003	2.871%
2004	3.920%

Accordingly, the lowest of the three historical annual values estimated as above, occurs in the year 2002. which is 2.723%.

For detailed understanding of the monitoring of the parameters and variables applied to determine baseline scenario and baseline emission, please refer to Section D of this PDD under the monitoring tables.

Step 2: Estimation of project activity emissions:
The quantity of waste HFC-23 destroyed (Q_HFC23y) would be calculated as the product of the quantity of waste HFC-23 supplied to the Thermal Oxidation process (q_HFC23_y) measured in metric tonnes and the purity of the waste HFC 23 (P_HFC23_y) supplied to the destruction process determined and expressed as the fraction of HFC 23 in the waste.

Step 3: Emission reduction
As suggested by the methodology (AM0001/Version 3), the GHG emission reduction, (ER_y), achieved by the project activity for a given year is

$$ER_y = (Q\_HFC23_y - B\_HFC23_y) * GWP\_HFC23 - E\_DP_y - L_y$$

where,

ER_y = GHG emission reduction in the year y, tonne CO_2 equivalent
Q_HFC23_y = Quantity of waste HFC 23 destroyed during the year y, tonne
B_HFC23_y = The baseline quantity of HFC-23 destroyed during the year measured, tonne
GWP_HFC23 = Global Warming Potential (11,700 tonnes CO_2 e/tonne HFC23)
E_DP_y = Emissions due to destruction process
L_y = Leakage emissions due to project activity

The emissions due to the destruction process (E_DP_y) and leakage (L_y) are both measured in tonnes of CO_2 equivalent[3].

Details provided in section D

B.3. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity:

As per the guidelines provided in the approved baseline methodology AM0001/ Version 3, the project activity is additional.

Additionality Test provided in AM0001/version3:
"In the absence of regulations requiring HFC 23 destruction, it is typically released to the atmosphere because a destruction facility entails significant capital and operating costs and the host entity has no direct economic incentive to incur these costs. If the quantity of HFC 23 destroyed is greater than the baseline quantity destroyed, the project activity is additional. The baseline quantity of HFC 23 destroyed is the quantity, if any, required to be destroyed by the host country's regulations governing the plant."

Position of the project activity:
In India, there are no national/sectoral/local regulation mandating destruction of HFC 23. And there is no market for waste stream of HFC 23, thus it is normally released into the atmosphere. Waste stream released into the atmosphere does not have any toxicity or any visible harm other than being a GHG.

The project activity proposes to decompose entire HFC23 stream. The project activity would entail heavy investments for implementation of technology and regular operating and maintenance of the facility. There is no revenue stream arising from the project activity except for the potential CDM benefits and hence the project activity is additional.

B.4. Description of how the definition of the project boundary related to the baseline methodology selected is applied to the project activity:

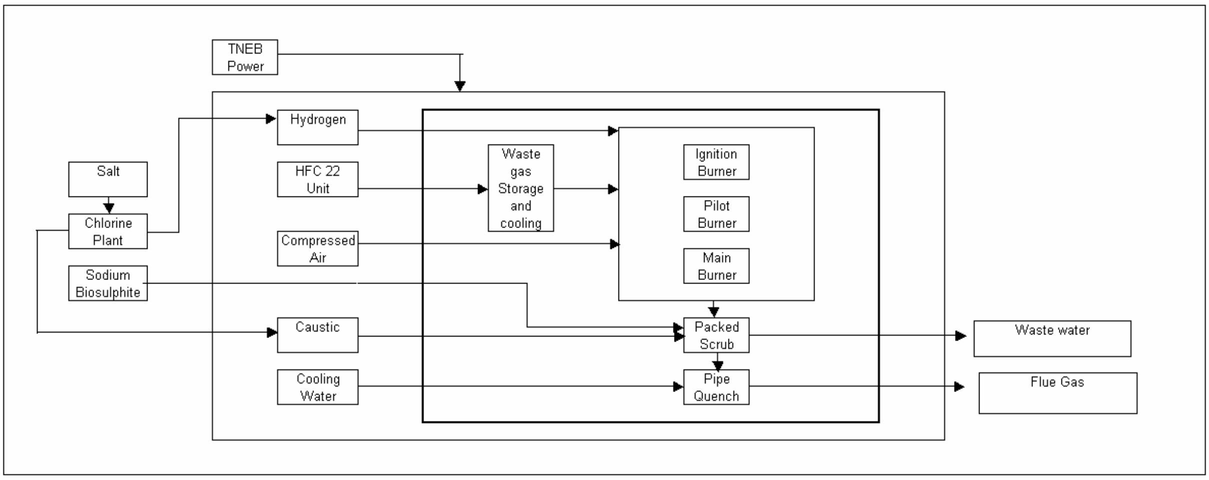
The proposed plant boundary is described by the following elements.

Input
- Waste gas from vent which is part of HCFC-22 plant
- Electrical power input from existing source
- Fuel (hydrogen in the project activity)
- Combustion Air (for oxygen)
- Instrument air (compressed air)
- Caustic from the existing storage
- Sodium bi-sulphite
- Make up water

Out put
- Waste water
- Cooling water
- Flue gas to atmosphere

Equipments within the boundary
- Combustion Chamber
    - Ignition Burner
    - Pilot Burner
    - Main Burner

- Combustion Air Blower
- Waste Gas Storage
- Pipe Quench
- Scrubbing system with a packed scrubber



B.5. Details of baseline information, including the date of completion of the baseline study and the name of person (s)/entity (ies) determining the baseline:

01/10/2005

Chemplast Sanmar Limited

SECTION C. Duration of the project activity / Crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

15/10/2005 (PDD development started). Storage shall start from November 2006, and Incineration plant is expected to start operation by March 2007.

C.1.2. Expected operational lifetime of the project activity:

30 years

C.2 Choice of the crediting period and related information:

C.2.1. Renewable crediting period

C.2.1.1. Starting date of the first crediting period:

C.2.1.2. Length of the first crediting period:

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

15/11/2006

C.2.2.2. Length:

10 years

SECTION D. Application of a monitoring methodology and plan

D.1. Name and reference of approved monitoring methodology applied to the project activity:

Methodology: "Incineration of HFC 23 waste streams"

Reference: Revision to approved baseline methodology AM0001; Version 03/Sectoral Scope 11/13 May 2005.

D.2. Justification of the choice of the methodology and why it is applicable to the project activity:

This methodology is applicable to HFC-23 (CHF_3) waste streams from an existing HCFC-22 production facility with at least three (3) years of operating history between beginning of the year 2000 and the end of the year 2004 where the project activity occurs and where no regulation requires the destruction of the total amount of HFC-23 waste. The present project activity satisfies these conditions.

Note 1 : The revised methodology suggests "Most of the time, under normal operation, both flow meters measure the same amount of HFC 23 flows simultaneously. Where the flow-meter readings differ by greater than twice their claimed accuracy (for example 10% if the accuracy is claimed to be ±5%), then the reason for the discrepancy is investigated and the fault remedied. For the sake of conservativeness, the lower value of the two readings will always be used to estimate the HFC 23 waste flows."

D.2. 1. Option 1: Monitoring of the emissions in the project scenario and the baseline scenario

D.2.1.1. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:

ID number *(Please use numbers to ease cross-referencing to D.3)*	Data variable & Data Type	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
1	*q_HFC23_y : Quantity of Waste Stream supplied to the destruction process* *Data Type: Mass*	*Actual Plant data*	*Tonnes -HFC*	*m*	*Continuous*	*100%*	*Electronic*	*Measured by flow meters in parallel that are calibrated weekly*
2	*P_HFC23_y : Quantity of HFC23 in the waste stream supplied to the decomposition process* *Data Type: Mass*	*Actual plant data*	*%*	*m*	*Every shift*	*100%*	*Electronic*	*Samples to be taken from the gas stream and gas chromatography method to be used to measure purity.*
3	*ND_HFC23_y : Quantity of HFC23 in Gaseous*	*Actual plant data*	*Tonnes -HFC*	*m*	*Monthly*	*100%*	*Electronic*	*As per technical specifications of the plant, there will be no such discharge in the gaseous effluent and there will be automatic process control. However analysis will be*

	effluent from destruction process *Data Type: Mass*							*carried out on monthly basis.*

In addition the quantities of gaseous effluents (CO, HCl, HF, Cl_2 , dioxin and NOX) and liquid effluents (pH, COD, BOD, n-H (normal hexane extracts), SS (suspended solid), phenol, and metals (Cu, Zn, Mn and Cr) are measured in a manner and with a frequency that complies with local environmental regulations.

D.2.1.2. Description of formulae used to estimate project emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

The emissions due to the destruction process (E_DP_y) are the emissions due to HFC-23 not destroyed in the process and the greenhouse gas emissions of the destruction process. The fuel used is hydrogen hence there won't be any emissions associated with the fuel burning.

E_DPy = ND_HFC23y * GWP_HFC23 + Q_HFC23y * EF

where

E_DP_y	=	Emission due to the destruction process, tCO_2e
ND_HFC23_y	=	Quantity of HFC23 not destroyed during the year, tonnes
GWP_HFC23	=	Global Warming Potential of HFC23, tCO_2e/t HFC23
Q_HFC23_y	=	Quantity of waste destroyed in the year y, tonnes
EF	=	Emission Factor for HFC23 destruction into CO_2; value = 0.62857 (44/70)

Q_HFC23y = q_HFC23y * P_HFC23y

where

Q_HFC23_y	=	Quantity of waste destroyed in the year y, tonnes
q_HFC23y	=	Quantity of HFC23 supplied to the destruction process in the year y, tonnes
P_HFC23y	=	Purity of the HFC23 supplied to the destruction process in the year y

The quantity of HFC 23 not destroyed (ND_HFC23y) is typically small; the monitoring plan provides for its periodic on site measurement. Theoretically, HFC 23 can also leak to the water effluent and then escape to the atmosphere. This possibility is ignored because it is infinitesimally small; the solubility of HFC 23 is 0.1% wt at 25^oC water.

The project activity converts the carbon in the HFC 23 into CO_2, which is released in to the atmosphere. The quantity of CO_2 produced by the destruction process is the product of the quantity of waste HFC 23 (Q_HFC23y) destroyed and the emission factor (EF). The emission factor is calculated as follows:

EF = 44/[(molecular weight of HFC 23)/(number of C in a molecule of HFC 23)] = 44/[70/1] = 0.62857

There are no other GHG emissions related to the project activity.

D.2.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions by sources of GHGs within the project boundary and how such data will be collected and archived:

ID number *(Please use numbers to ease cross-referencing to table D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e),	Recording Frequency	Proportion of data to be monitored	How will the data be archived? (Electronic/ paper)	Comment
4	*Q_HCFC_y: The quantity of HCFC22 produced in the plant generating the HFC23 waste* *Data Type: Mass*	*Actual plant data*	*Tonnes-HCFC22*	*m*	*Monthly*	*100%*	*Electronic*	*Reference data to check cut off condition and rough estimation of Q_HFC23_y*

5	*HFC23_sold: HFC23sold by the facility generating the HFC23 waste* *Data Type: Mass*	*Actual plant data*	*Tonnes-HFC 23*	*m*	*Monthly*	*100%*	*Electronic*	*Based on actual sales data in the year*
6	r_y *The fraction of the waste stream required to be destroyed by the regulations that apply during the year y* *Data Type: %*	*National/ State/ Local Regulations*	*Fraction*	*e*	*Yearly*	*100%*	*Electronic*	*Reference to country regulation mandating the destruction of HFC 23*

D.2.1.4. Description of formulae used to estimate baseline emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

The baseline quantity of HFC 23 destroyed is the quantity of the HFC 23 waste stream required to be destroyed by the applicable regulations. If the entire waste stream is destroyed, Q_HFC23_y is the total amount of HFC 23 waste generated and the quantity required to be destroyed by the applicable regulations

$\mathbf{B\_HFC23_y = Q\_HFC23_y * r_y}$ is the baseline quantity of HFC 23 destroyed during the year measured in metric tonnes.

Where r_y is the fraction of the waste stream required to be destroyed by the regulations that apply during year y. In the absence of regulations requiring the destruction of HFC 23 waste, the typical situation in non-Annex B Parties, $r_y = 0$. In the absence of regulations on HFC 23 emissions, the HFC 23 waste is typically released to the atmosphere and so, the baseline is zero destruction..

Q_HFC23_y is the quantity of waste HFC 23 destroyed during the year measured metric tonnes, and B_HFC23_y is the baseline quantity of HFC 23 destroyed during the year measured in metric tonnes. Q_HFC23_y is limited to a fraction of the actual HCFC production during the year at the beginning of the plant (Q_HCFC_y).

D. 2.2. Option 2: Direct monitoring of emission reductions from the project activity (values should be consistent with those in section E).

D.2.2.1. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:

ID number *(Please use numbers to ease cross-referencing to table D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e),	Recording Frequency	Proportion of data to be monitored	How will the data be archived? (Electronic/ paper)	Comment

D.2.2.2. Description of formulae used to calculate project emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.):

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D.2.3. Treatment of leakage in the monitoring plan

D.2.3.1. If applicable, please describe the data and information that will be collected in order to monitor leakage effects of the project activity

ID number *(Please use numbers to ease cross-referencing to table D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording Frequency	Proportion of data to be monitored	How will the data be archived? (Electronic/ paper)	Comment
7	*$Q\_F_{power, y}$ quantity of power*	*Actual plant data*	*kWh*	*m*	*Monthly*	*100%*	*Electronic*	*Metered as part of the process in plant.*

	consumed for the destruction process during year y *Data Type: Energy*							
8	*E_F $_{power, ,y}$ greenhouse gas emissions factor for power during year y* *Data Type: Ratio of mass and energy*	*Grid data*	*Tonne CO_2/MWh*	*e*	*Yearly*	*100%*	*Electronic*	*Presently power is drawn from the Grid at Tamil Nadu; Tamil Nadu is part of Southern Region Electricity Grid; Emission factor is taken for the Southern Grid*
9	*Q_ $_{NaOH, y}$:Quantity of NaOH (caustic soda) used in the effluent treatment plant in the year y* *Data Type: Mass*	*Actual plant data*	*Tonnes*	*m*	*Monthly*	*100%*	*Electronic*	*Plant operation data on NaOH consumption in effluent treatment plant*
10	*F_ $_{NaOH, Power, y}$:Power used for production of 1MT of NaOH* *Data Type: Energy*	*Sourcing plant data or industry benchmark*	*KWh/ Tonne of NaOH*	*e*	*Half yearly*	*100%*	*Electronic*	*Industry data accessible in public domain to be used, if actual plant data is not available*
11	*F_ $_{NaOH, Fuel, y}$:Fuel used for Transportation of 1MT of NaOH* *Data Type: Mass*	*Estimations*	*KL/Tonne of NaOH*	*e*	*Half yearly*	*100%*	*Electronic*	*Estimated based on data for the type of transport, capacity, distance from the sourcing plant, fuel type, fuel emission factor*

12	$Q\_{NAHSO3, y}$ *:Quantity ofNaHSO3 used in the effluent treatment plant in the year y* *Data Type: Mass*	*Actual plant data*	*tonnes*	*m*	*Monthly*	*100%*	*Electronic*	*Plant operation data on NaHSO3 consumption in effluent treatment plant*
13	$F\_{NAHSO3, Power, y}$ *:Power used for production of 1MT of NaHSO3* *Data Type: Energy*	*Sourcing plant data or industry benchmark*	*KWh/ Tonne of NaHSO3*	*m*	*Half yearly*	*100%*	*Electronic*	*Industry data accessible in public domain can be used, if actual plant data is not available*
14	$F\_{NAHSO3, Fuel, y}$ *:Fuel used for Transportation of 1MT of NaHSO3* *Data Type: Mass*	*Estimations*	*KL/Tonne of NaHSO3*	*e*	*Half yearly*	*100%*	*Electronic*	*Estimated based on data for the type of transport, capacity, distance from the sourcing plant, fuel type, fuel emission factor*
15	$Q\_{HYDROGEN, y}$ *:Quantity of Hydrogen used in the destruction process in the year y* *Data Type: Mass*	*Actual plant data*	Nm^3	*m*	*Daily*	*100%*	*Electronic*	*Measured by the number of Hydrogen cylinders used*
16	$F\_{HYDROGEN, Power, y}$ *:Power used for production of 1Nm3 of Hydrogen* *Data Type: Energy*	*Sourcing plant data or industry benchmark value*	Kwh/Nm^3	*e*	*Monthly*	*100%*	*Electronic*	*Industry data accessible in public domain can be used, if actual plant data is not available*

17	*$F\_{HYDROGEN, Fuel, y}$:Fuel used for Transportation of 1Nm3 o f Hydrogen* *Data Type: Mass*	*Estimations*	*l/Nm^3*	*e*	*Monthly*	*100%*	*Electronic*	*Estimated based on data for the type of transport, capacity, distance from the sourcing plant, fuel type, fuel emission factor*
18	*$Q\_{COMPRESSED\ AIR, y}$:Quantity of Compressed Air used in the destruction process in the year y* *Data Type: Volume*	*Actual plant data*	*Nm^3*	*m*	*Monthly*	*100%*	*Electronic*	*Plant operation data on compressed air consumptions*
19	*$F\_{COMPRESSED\ AIR, Power, y}$:Power used for production of 1Nm3 of Compressed Air* *Data Type: Energy*	*Actual plant data*	*Kwh/Nm^3*	*c*	*Monthly*	*100%*	*Electronic*	*Metered as part of the operation*

D.2.3.2. Description of formulae used to estimate leakage (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

Leakage is emissions of greenhouse gases due to the project activity that occur outside the project boundary. The sources of leakage due to the destruction process are:

- Greenhouse gas (CO_2 and N_2O) emissions associated with the production of purchased energy (electricity)
- Greenhouse gas (CO_2 and N_2O) emissions associated with the production of NaOH using purchased power
- Greenhouse gas (CO_2 and N_2O) emissions associated with the production of $NaHSO_3$ which had used power
- Greenhouse gas (CO_2 and N_2O) emissions associated with the production of Hydrogen using purchased power
- Greenhouse gas (CO_2 and N_2O) emissions associated with the production of Compressed Air using purchased power
- CO_2 emissions due to transport of NaOH

- CO_2 emissions due to transport of $NaHSO_3$
- CO_2 emissions due to transport of Hydrogen

$$L_y = \sum_i (Q\_F_{i,y} * E\_F_{i,y}) + ET_y + \sum_j (Q\_F_{j,y} * E\_F_{j,y}) + + \sum_k (Q\_F_{k,y} * E\_F_{k,y})$$

Where
L_y = Leakage emissions in the year y, tCO_2e
$Q\_F_{i,y}$ = The quantity of energy type F_i purchased for the destruction process during year y,
$E\_F_{i,y}$ = The greenhouse gas emissions factor for energy type Fi during year y,
ET_y =The greenhouse gas emissions associated with sludge transport during year y.
$Q\_F_{j,y}$ = The quantity of energy type F_j in the production of NaOH, $NaHSO_3$, compressed air, hydrogen
$E\_F_{j,y}$ = The greenhouse gas emissions factor for energy type F_j
$Q\_F_{k,y}$ = The quantity of energy type F_k in the transportation of NaOH, $NaHSO_3$, compressed air, hydrogen
$E\_F_{k,y}$ = The greenhouse gas emissions factor for energy type F_k

a. Greenhouse gas (CO_2 and N_2O) emissions associated with the purchased energy (electricity)
In the project activity only electrical power is purchased from outside, hence
$\mathbf{Q\_F_{i,y}} = \mathbf{Q\_F_{power,\ y}}$ = The quantity of power consumed for the destruction process during year y; and
$\mathbf{E\_F_{i,y}} = \mathbf{E\_F_{power,\ ,y}}$ = The greenhouse gas emissions factor for electrical power purchased during year y , t CO_2e/MWh

The greenhouse gas emissions factor for power is based on the emission rate of Southern grid power as CSL draws its requirement exclusively from the Tamil Nadu state electricity board, TNEB grid which in turn is connected to southern region grid**,** $\mathbf{E\_F_{power,\ ,y}}$ = 0.814 tCO_2e/MWh or 0.000814 tCO_2e released per kWh of power consumed at CSL.

b. CO_2 emissions due to transport of sludge to the landfill
$\mathbf{ET_y}$, the greenhouse gas emissions associated with sludge transport during year y. Since no fossil fuel based transportation takes place (manually transferred to treatment site), $ET_y = 0$.

c. CO_2 emissions due to production of NaOH, NaHSO3, compressed air, hydrogen
NaOH, hydrogen and compressed air used in the process will be produced in-house with electrical power bought from TNEB. Production of these require electrical energy and hence there are GHG emissions associated with its production. $NaHSO_3$ is purchased. All these, except for the compressed air, require to be transported to the plant site.

d. CO_2 emissions due to transportation of NaOH, NaHSO3, compressed air, hydrogen
All the above, but for compressed air, need to be transported to the plant site and carried through trucks and specialized tankers. It requires fuel burning in the

vehicles resulting in emissions of GHGs.

D.2.4. Description of formulae used to estimate emission reductions for the project activity (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

$$ER_y = (Q\_HFC23_y - B\_HFC23_y) * GWP\_HFC23 - E\_DP_y - L_y$$

Where

ER_y = GHG emission reduction measured in tonnes of CO_2 equivalents (tonnes CO_2e),

Q_HFC23_y = The quantity of waste HFC 23 destroyed during the year measured metric tonnes,

B_HFC23_y = The baseline quantity of HFC 23 destroyed during the year measured in metric tonnes,

GWP_HFC23 = The Global Warming Potential converts 1 tonne of HFC 23 to tonnes of CO_2 equivalents (tonnes CO_2e/tonnes HFC 23). The approved Global Warming Potential value for HFC 23 is 11,700 tonnes CO_2e/tonne HFC 23,

E_DP_y = GHG emission due to the destruction process, (tonnes CO_2e)

L_y = Leakage in the year y (tonnes CO_2e).

D.3. Quality control (QC) and quality assurance (QA) procedures are being undertaken for data monitored

Data *(Indicate table and ID number e.g. 3.-1.; 3.2.)*	Uncertainty level of data (High/Medium/Low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
D.2.1.1; 1	*Low*	*Yes. A QA & QC organization will be formed and QA & QC procedures that are equivalent to International Standards in terms of equipment and analytical method will be set. Will be measured using two flow meters in Parallel with weekly calibration* *QA & QC procedures are set and implemented in order to,* *1. Secure a good consistency through planning to implementation of this CDM project,* *2. Stipulate who has responsibility for what and,* *3. Avoid any misunderstanding between people and organization involved.*
D.2.1.1; 2	*Low*	*Will be measured using gas chromatography*

D.2.1.1; 3	*Low*	*Will be measured from the gas effluent of the destruction process*
D.2.1.3; 4	*Low*	*Actual HCFC 22 plant production data,*
D.2.1.3; 5	*Low*	*Actual sales record*
D.2.1.3; 6	*Low*	*Government regulations mandating destruction of HFC23, currently no regulation in this regard*
D.2.3; 7, 9,12,,15,18, 19	*Low*	*Actual project activity data*
D.2.3; 8	*Low*	*Power is purchased from the grid. Southern grid emission factor is used*
D.2.3; 10, 13, 16	*Low*	*Power consumption data for production of NaOH, NaHSO3, Hydrogen is taken from the sourcing plant or industry benchmark available in public domain*
D.2.3; 11, 14, 17	*Low*	*Fuel for transportation of NaOH, $NaHSO_3$ and Hydrogen to be either taken from the supplier or estimated*

All of the measurement instruments are to be recalibrated monthly as per internationally acceptable procedures except for HFC 23 flow-meters, for which recalibration frequency is weekly to reduce error level.

D.4 Please describe the operational and management structure that the project operator will implement in order to monitor emission reductions and any leakage effects, generated by the project activity

In order to monitor data required for estimating emission reductions because of the project activity, project operator is planning following operational and management structure.

CSL will nominate a technically qualified senior person with experience of plant operations as CDM project director. CDM project director would be responsible for overall monitoring management.

A CDM project team will be constituted with participation from relevant departments. People will be trained on CDM concept and monitoring plan. This team will be responsible for data collection and archiving. This team will meet periodically to review CDM project activity, check data collected, emissions reduced etc. On a weekly basis, the monitoring reports are checked and discussed by the team. In case of any irregularity observed by any of the CDM team member, it is informed to the concerned person for necessary actions. On a monthly basis, these reports are forwarded to CDM project director. (Refer Annex 4)

D.5 Name of person/entity determining the monitoring methodology:

Chemplast Sanmar Limited

SECTION E. Estimation of GHG emissions by sources

E.1. Estimate of GHG emissions by sources:

SN	Description	Value	Reference
1.	Quantity of HFC23 supplied to Incineration plant	46.14 Tons	Based on annual production level at this plant (in tonnes of HCFC22) and waste generation rate
2.	HFC23 emission factor after destruction, EF	0.62857	AM0001/Version 3

Parameters	Unit	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
Total GHG emissions in the destruction process	Tons CO2	29	29	29	29	29	29	29	29	29	29

E.2. Estimated leakage:

SN	Description	Value	Reference
1.	Electrical power requirement in the incineration plant	20 kW	Specified by equipment supplier
2.	Caustic soda requirement	240 Kg/Hr	Specified by equipment supplier
3.	NaHSO3requirement	1.8 Kg/Hr	Specified by equipment supplier
4.	Compressed air requirement	5 NM3/Hr	Specified by equipment supplier
5.	Hydrogen requirement	1.3 m3/Kg	Specified by equipment supplier
6.	Power consumption for Caustic soda production	1.7 Kwh/Kg NaOH	Benchmark data
7.	Power consumption for NaHSO3 production	1.7 Kwh/Kg NaHSO3	Benchmark data
8.	Power consumption for compressed air production	0.0951.7 Kwh/NM3 of air	Benchmark data
9.	Power consumption for Hydrogen production	0.00688 Kwh/NM3 of hydrogen	Benchmark data
10.	Emission factor for electricity consumed in destruction process and in utilities	0.814	The greenhouse gas emissions factor for power is based on the emission rate of Southern grid power as CSL draws its requirement exclusively from the Tamil Nadu state electricity board, TNEB grid which in turn is connected to southern region grid
11.	Fuel consumption in transportation of Caustic Soda	0.00033 Lt/Kg	Assumption based on past performance

SN	Description	Value	Reference
12.	Fuel consumption in transportation of NaHSO3	0.14 Lt/Kg	Assumption based on past performance
14.	Fuel consumption in transportation of Hydrogen	0.00068 Lt/Kg	Assumption based on past performance
15.	Emission factor of diesel used for transportation	3.574 T CO2/KL	Based on IPCC default values

Parameters	Unit	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
Total GHG emissions due to leakage	**Tons CO2**	**590**	**590**	**590**	**590**	**590**	**590**	**590**	**590**	**590**	**590**

E.3. The sum of E.1 and E.2 representing the project activity emissions:

Parameters	Unit	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
GHG emissions due to destruction process	Tons CO2	29	29	29	29	29	29	29	29	29	29
Leakage	Tons CO2	590	590	590	590	590	590	590	590	590	590
Total	Tons CO2	**619**	**619**	**619**	**619**	**619**	**619**	**619**	**619**	**619**	**619**

E.4. Estimated anthropogenic emissions by sources of greenhouse gases of the baseline:

SN	Description	Value	Reference
1.	Quantity of HFC23 supplied to Incineration plant	46.14 Tons	Based on annual production level at this plant (in tonnes of HCFC22) and waste generation rate

Parameters	Unit	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
Emissions in Baseline	Tons CO2	539782	539782	539782	539782	539782	539782	539782	539782	539782	539782

E.5. Difference between E.4 and E.3 representing the emission reductions of the project activity:

SN	Baseline Emissions	Total Emissions due to project activity	Net Emissions Reduction
Year	Tons CO2	Tons CO3	Tons CO2
2006-07	539782	619	539163
2007-08	539782	619	539163
2008-09	539782	619	539163
2009-10	539782	619	539163
2010-11	539782	619	539163
2011-12	539782	619	539163
2012-13	539782	619	539163
2013-14	539782	619	539163
2014-15	539782	619	539163
2015-16	539782	619	539163

The emissions reduction in tonnes of CO_2 equivalent in the crediting period = 539,163 tCO_2e per annum

E.6. Table providing values obtained when applying formulae above:

SN	Baseline Emissions	Project Activity Emissions	Leakage Emissions	Net Emissions Reduction
Year	Tons CO2	Tons CO2	Tons CO2	Tons CO2
2006-07	539782	29	590	539163
2007-08	539782	29	590	539163
2008-09	539782	29	590	539163
2009-10	539782	29	590	539163
2010-11	539782	29	590	539163
2011-12	539782	29	590	539163
2012-13	539782	29	590	539163
2013-14	539782	29	590	539163
2014-15	539782	29	590	539163
2015-16	539782	29	590	539163

SECTION F. Environmental impacts

F.1. Documentation on the analysis of the environmental impacts, including trans-boundary impacts:

Indian Environmental Regulations do not require an EIA to be conducted for the project activity. However project proponent has conducted an EIA through an independent agency. Following are the key points of the EIA conducted for the project.

SN	Environmental Parameters	Impacts
1	Air	The products of combustion from the Incinerator, chiefly HF are absorbed in a multi stage water absorber and further scrubbed in a packed bed alkaline scrubber to remove even traces of acidic vapors from the incinerator. The emissions from the incinerator will meet the EC Directive.
2	Water	The effluent generated will be treated in the existing Effluent Treatment Plant (ETP), which has enough capacity to take up the additional effluent load arising out of the thermal oxidation system. No major impact predicted.
3	Land	Any solid waste generated will be disposed off in secured landfill, fully complying with Hazardous Wastes (Management and Handling) Rules, 1989, as amended in 2003, under the Environment Protection Act, 1986 and with due Authorisation by the State Pollution Control Board. Hence almost negligible impact is expected on soil and ground water.
4	Noise	The proposed Incinerator may introduce additional sources of noise at the work area but noise is hardly disturbing in the compound which houses other major production facilities and has no issues related to noise generation.
5	Socio-economic	Besides marginal increase in number of direct and indirect employees, the project will generate employment in related and dependent areas. Operations and maintenance workforce are to be employed and these workmen will be exposed to superior technology of Incineration.

F.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

No significant impact to the environment as per the specification of the technology. The studies carried out show that process discharges comply with the environmental standards laid by the regulatory authorities. In addition, the predicted effects of the incineration process will not cause any significant change to the environment, viz., air, land, and water. There will be a positive impact arising from the incineration project due to the abatement of GHG.

SECTION G. Stakeholders' comments

G.1. Brief description how comments by local stakeholders have been invited and compiled:

Representatives of the local governing bodies, people from local community and plant employees' representatives (Office bearers of the Trade Unions), Heads of schools and local businessmen are identified as main stakeholders for the project. Comments from stakeholders have been collected with the following approaches:

- Meetings with the local community and employees to discuss about the project and to invite their comments on the project

G.2. Summary of the comments received:

- The stakeholders have expressed satisfaction over implementation of the project.
- According to them, the project will lead to GHG emissions reduction, employment generation in the plant, and use of CDM revenues for development of other economic activities by CSL.
- A few people have asked questions relating to reliability of destruction process, including potential for safety hazards such as explosions etc. CSL management team had described the technological details of Thermal Oxidation, which has satisfied their queries.
- People have also asked questions about effect of the project on environment, including water quality of the region, compliance with environmental regulations etc. CSL team has shared how the technology would work and how effluent discharge (air, water or solids) are designed to be ether zero or minimal.
- It was suggested that similar projects that lead to reduction in GHG emissions should be encouraged by business houses. It was the common opinion that CDM benefits will definitely lead to reduced GHG emissions and associated socio/economic development of the region.

Generally they expressed complete satisfaction over the explanations furnished and wished the project and the Company success in its effort in improving the local and global environment. The invitees also mentioned that based on the past record of accomplishment of the company, they have full confidence and faith in the Company's assurances, that it would implement this project in a socially and environmentally responsible manner. They also wished the company would get all required approvals as expeditiously as possible and expressed full support for the speedy implementation of this project.

G.3. Report on how due account was taken of any comments received:

No Adverse comment received on the project. There were only queries, which were adequately responded. (Minutes of the formal meeting with the stakeholders is given (Annex 9)

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Chemplast Sanmar Limited
Street/P.O.Box:	Plant I, Mettur Dam RS
Building:	
City:	Mettur Dam
State/Region:	Tamil Nadu
Postfix/ZIP:	636402
Country:	India
Telephone:	+91 4298 222296 (Direct) and +91 4298230381 to 85(through Plant III)
FAX:	+91 4298230394
E-Mail:	
URL:	www.sanmargroup.com
Represented by:	Jayaraman P.S
Title:	Managing Director
Salutation:	Mr.
Last Name:	
Middle Name:	
First Name:	
Department:	
Mobile:	
Direct FAX:	+914428112496
Direct Tel:	+914428118310
Personal E-Mail:	psj1@sanmargroup.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding is used for the project activity.

Annex 3

BASELINE INFORMATION

SN	Description	Value	Reference
1.	Waste generation rate in the HCFC 22 plant, w	2.723%	Actual plant data; The lowest of the last three historical annual values (between 2000-2004) estimated as specified in the approved methodology AM0001/ver 3
2.	The maximum historical annual production level at this plant, Q_HCFCy	1694.59 MT	Actual plant data; The maximum historical annual production level at this plant (in tonnes of HCFC22) during any of the last three (3) years between beginning of the year 2000 and the end of the year 2004,
3.	Global Warming Potential of HFC 23, GWP_{HFC23}	11,700	The IPCC 2nd Assessment Report
4.	CO_2 emission factor of electricity supply: $E\_F_{power, ,y}$	0.814	The greenhouse gas emissions factor for power is based on the emission rate of Southern grid power as CSL draws its requirement exclusively from the Tamil Nadu state electricity board, TNEB grid which in turn is connected to southern region grid
5.	HFC23 emission factor after destruction, EF	0.62857	AM0001/Version 3

Annex 4

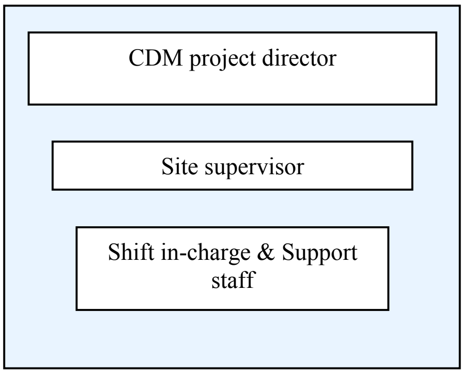
MONITORING PLAN

Project Management Plan:

In order to monitor data required for estimating emission reductions because of the project activity, project operator is planning following operational and management structure.

CSL will nominate a technically qualified senior person with experience of plant operations as CDM project director. CDM project director would be responsible for overall monitoring management.

A CDM project team will be constituted with participation from relevant departments. People will be trained on CDM concept and monitoring plan. This team will be responsible for data collection and archiving. This team will meet periodically to review CDM project activity, check data collected, emissions reduced, etc. On a weekly basis, the monitoring reports are checked and discussed by the team. In case of any irregularity observed by any of the CDM team member, it is informed to the concerned person for necessary actions. On a monthly basis, these reports are forwarded to CDM project director.



CDM Project Director: Overall responsibility for compliance with the CDM monitoring plans.
Site Supervisor: Responsibility for completeness of data, reliability of data (calibration of meters), and monthly report generation
Shift In-charge: Responsibility of data collection

An operating procedure manual for the project activity would be developed. This operating manual would include details about data to be monitored, quality assurance procedures, periodic meter testing and calibration schedules etc. Internationally accepted norms for meter testing and calibration would be followed.

Assurance Process
The manual will prescribe only the periodicity of Internal and External assurances, as there is an elaborate assurance process in vogue in CSL.

Process Reliability:
Start up, operation and shut down of the plant can be carried out automatically by an integrated PLC system. In case of a failure, the plant automatically falls into safe conditions. This safety system protects the plant and its machinery and further more provides safety of any personnel. All operating parameters can be recorded and saved.

In order to protect the system against high temperature, an emergency water supply line to the quench system is used. In case of malfunction of the quench system, the incinerator will be shut down and emergency water will be injected to the quench.

Instrumentation and Controls:
The interlock and control system comprises a control panel with failsafe burner management system and PLC interlock and control system. The digital and analogue functions will be handled by a programmable controller (Siemens PCS7). Any modification of the controlling device can be done from the PLC system in the control room. Additional to the PLC system an independent hardwired trip system is provided to assure an authorized shut down of the plant in case of emergency. The shut down devices are carried out with pre-alarms, which gives the operating personnel an adequate length of time to interfere before the automatic shut down starts.

Emergency shut down can be initiated manually by operating personnel on-site and/or at the control room independent of the PLC system. The PLC system assures that the plant is on duty in the shortest possible time span. This is important for short time interruption, e.g. power failure. Therefore a very high plant safety is available. The operational status of the plant is monitored on a color screen.

Quality Management System:
CSL has an elaborate quality management system for the plant operations. HFC23 destruction plant QMS will also be made part of this standard QMS.

Data to be monitored:
PDD section D elaborates data to be monitored for the CDM project activity. CSL will also monitor following data

- Thermal Oxidation temperature in the oxidising chamber
- HFC 23 storage analysis and frequency
- Power requirement for utilities
- In addition the quantities of gaseous effluents (CO, HCl, HF, Cl2, dioxin and NOX) and liquid effluents (PH, COD, BOD, n-H (normal hexane extracts), SS (suspended solid), phenol, and metals (Cu, Zn, Mn and Cr) are measured in a manner and with a frequency that complies with local environmental regulations.

Data Collection Frequency:
The frequency for data monitoring shall be as per the monitoring details in Section D of PDD.

Day to day data collection and record keeping:
Plant data shall be collected on operation under the supervision of the respective Shift-in-charge and record would be kept in daily logs.

Day Archiving: Data will be archived in electronic/paper form (as per AM0001) and will be kept for crediting period + 2 years .

Calibration/Maintenance of Measuring and Analytical Instruments:
All measuring and analytical instruments are being calibrated as per the methodology AM0001 (All meters are to be calibrated every month as per internationally accepted norms except for the measurement of HFC23 whose frequency is weekly to reduce error) Maintenance will be done as per in CSL's Quality management system procedures.

Training of CDM team personnel:
The training of the CDM team and plant personnel will be carried out on thermal oxidation technology by the technology supplier. The CDM team will also be briefed about CDM concepts and data monitoring plan.

Internal audits of CDM project compliance:
CDM audits shall be carried out to check the correctness of procedures and data monitored by the internal auditing team entrusted for the work. Report on internal audits done, faults found and corrective action taken shall be maintained and kept for external auditing.

Emergency preparedness:
Refrigerant plan has a well documented emergency preparedness plan.

Start up, operation and shut down of the plant can be carried out automatically by an integrated PLC system. In case of a failure, the plant automatically falls into safe conditions. This safety system protects the plant and its machinery and further more provides safety of any personnel. All operating parameters can be recorded and saved.
In order to protect the system against high temperature, an emergency water supply line to the quench system is used. In case of malfunction of the quench system, the incinerator will be shut down and emergency water will be injected to the quench.

The project activity does not result in any unidentified activity that can result in substantial emissions from the project activity. No need for emergency preparedness in data monitoring is visualized.

Report generation on monitoring:
After verification of the data and due diligence on corrective ness if required an annual report on monitoring and estimations shall be maintained by the CDM team and record to this effect shall be maintained for verification.

Sustainable Development Indicators Monitoring:
The CDM project activity leads to following improvement sustainable development for the society

- GHG reduction (Monitoring plan elaborated above)
- Employment Generation: CSL will maintain data regarding employees involved in plant construction, plant operations & maintenance.

Annex 5

Sanmar's contribution to Sustainable development
Sanmar is a socially conscious enterprise – the very reason why they intend doing this project activity. Apart from voluntarily contributing to reduction of GHGs, the project enhances economic activity in terms of employment opportunities and ancillary services such as supplies and maintenance.

Environmental well being:
Sanmar's concern for the environment is reflected in the green belts it has developed over the decades around its manufacturing facilities. Several proactive ecology conservation initiatives have been launched and substantial investments have been made in pollution abatement measures. Close to Rs. 60 crores (USD 13 million) has been invested in Safety, Health and Environment measures in the last five years alone across the group. The group's effluent treatment plants scrupulously adhere to statutory requirements.

In the proposed project activity, the HFC 23 produced during the manufacturing of HCFC 22 and normally released into the atmosphere will be destroyed using Thermal Oxidation technology. HFC 23 is among the most stable of the fluorocarbons and decomposes only slowly in the atmosphere, with an atmospheric life of 206 years. It absorbs infrared radiations efficiently and so has a high "Global warming potential (11700 as per IPCC assessment)". The project activity thus helps in reduction in GHG emissions.

Socio/Economic well being:
The Sanmar Group has long been involved in ensuring a better quality of life for the community around it and the underprivileged. For example, providing clean water supply to the township of Mettur has been one of its earliest initiatives in this direction as has been that of street lighting.

Sanmar has played a significant role in industry-institution interaction for several years now. The group has had close ties with IIT Chennai and other leading educational research institutions. In addition, schools supported by the group provide high quality education for boys and girls.

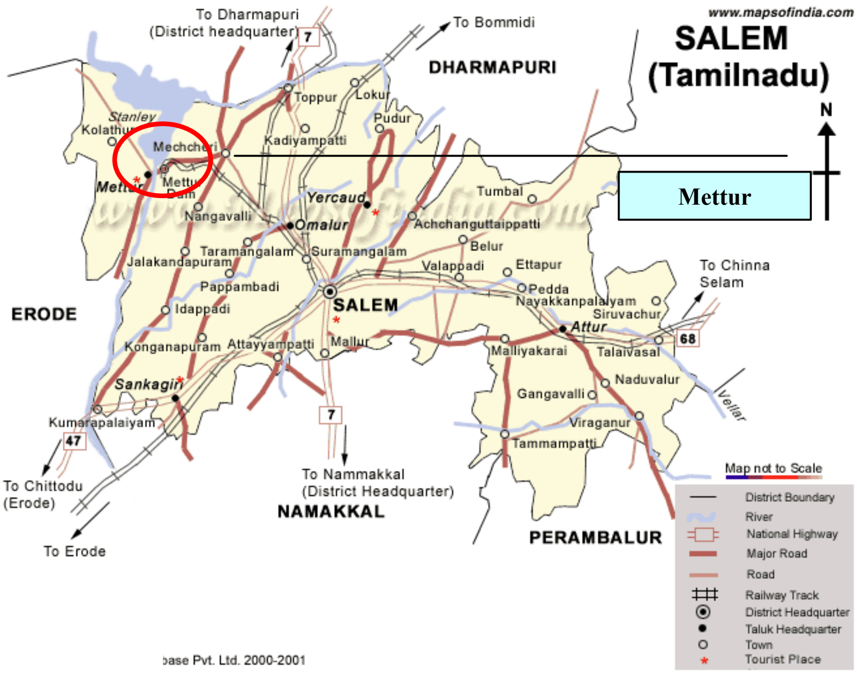
Major beneficiaries of the group's munificence have been such well-known healthcare institutions as the Cancer Institute of Chennai, Sankara Nethralaya, and the Madhuram Narayanan Centre for Exceptional Children, Chennai

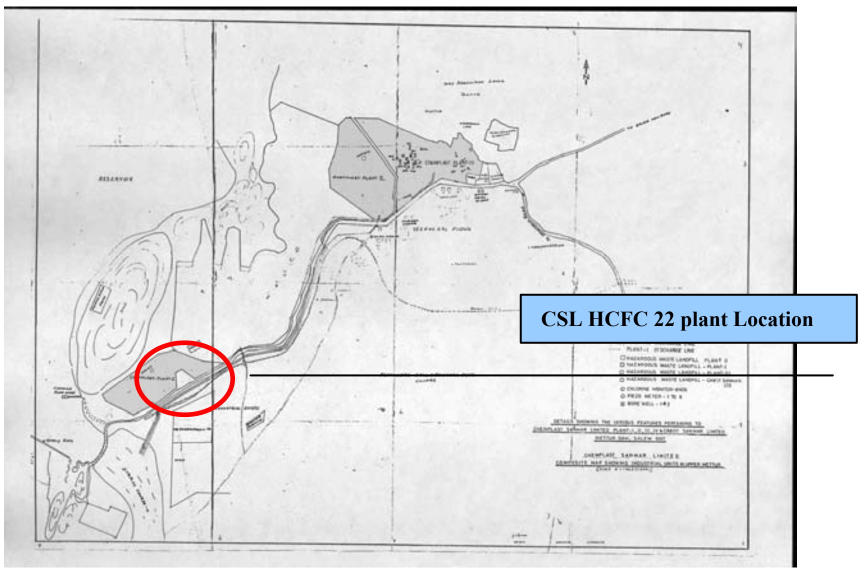
The proposed project activity will lead to employment generation directly in the plant operation. There would also be indirect employment generation during plant commissioning.

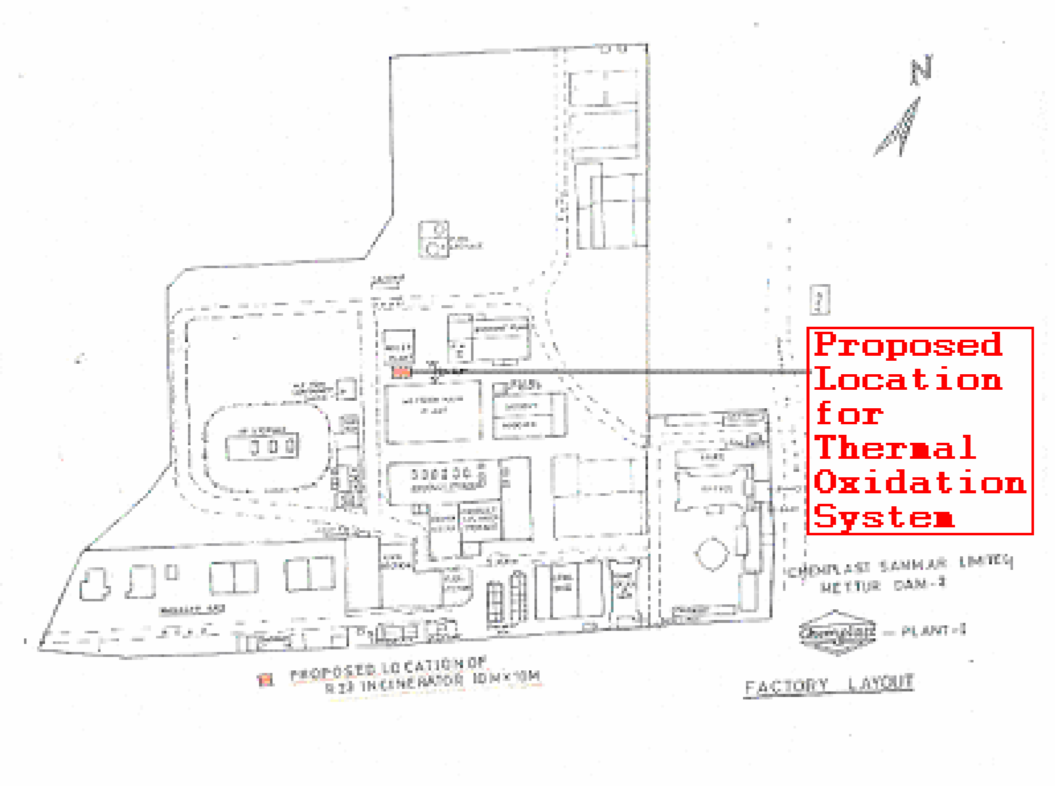
CDM revenue stream from the project activity will also help CSL maintain its socio-economic activities in the region and will also lead to new initiatives taken by CSL for sustainable development of the region.

Annex 6:

Project Location Details






N
Proposed Location for Thermal Oxidation System
CHEMPLAST SANMAR LIMITED
METTUR DAM-2
PLANT-I
PROPOSED LOCATION OF
INCINERATOR 10M x 10M
FACTORY LAYOUT

Annex 7

Thermal Oxidation Technology

The incineration of HFC 23 waste generated from the process of manufacturing HCFC 22 involves the oxidation of HFC-23 at a temperature above 1200^{o}C by providing excess air to ensure complete combustion. As HFC 23 has a very low calorific value, supplemental fuel has to be given for maintaining the temperature. As evident from the reactions 2 and 3 given below, for the complete conversion of the halocarbons to their respective hydrogen halides, the supplemental fuel should also provide the Hydrogen for the conversion. Hence Hydrogen is chosen as the supplemental fuel.

H2 + O2 --------→ H20 - - - - - - - - - - ---- - - - -	(1)
CHF3 (HFC23) + H2O + ½ O2 -----→ CO2 +3 HF -- - - --	(2)
CHClF2 (HCFC22) + H2O + ½ O2--→ CO2 + 2 HF + HCl -	(3)

PLANT DESCRIPTION

The incinerator unit is designed to incinerate vent gas containing HCFC22 and HFC23. It comprises a combustion system and a wet flue gas treatment system, in order to achieve a 15% hydrofluoric acid.

The unit is designed for the disposal of gaseous waste containing fluorine and chlorine, resulting in a Hydrogen Fluoride concentration in the flue gas of approx. 135 g/Nm^3 before the scrubbing system. As the concentration of the Hydrogen fluoride in the Flue gas from the incinerator chamber is high, this could reduce the refractory lifetime and hence a combustion chamber with short duct system is designed to improve the life of the refractory. The plant will be designed for automatic operation with very high 'state of the art' safety system.

Start-up, operation and shutdown of the plant can be carried out automatically by an integrated Programmable Logic Control (PLC) system. In case of a failure, the plant automatically falls into safe shutdown triggered automatically by the PLC. This safety system protects the plant and its machinery and furthermore provides safety of any personnel.

PROCESS DESCRIPTION

The vent gas containing HCFC 22 and HFC23 is oxidized in a refractory lined combustion chamber. The chamber is equipped with main burner, pilot burner and ignition burner. The vent gas is introduced into the combustion chamber together with combustion air and supplemental fuel. The combustion stage will ensure the destruction and oxidation of all organic waste components.

Oxygen, which is necessary for the oxidation of the organic waste compounds, will be fed to the chamber by a combustion air Blower. For the control of the oxygen content in the flue gas, an oxygen analyzer will

be provided. In order to control a proper temperature profile and also to ensure complete combustion excess amount of combustion air will be fed to the chamber.
The pilot burner is used for initial heating of the combustion chamber and Hydrogen is used as the fuel. The entire combustion chamber is heated with the fuel (hydrogen) to reach 1200^{O}C and then the waste gas is fed to the incinerator. The hot flue gas, leaving the combustion chamber is fed directly to a counter current pipe quench, where the flue gas will be cooled to adiabatic saturation temperature and saturated with water vapor. In order to protect the system against high temperature, an emergency water supply line to the quench system is provided. In case of malfunction of the quench system, the incinerator will be shut down and emergency water will be injected to the quench.

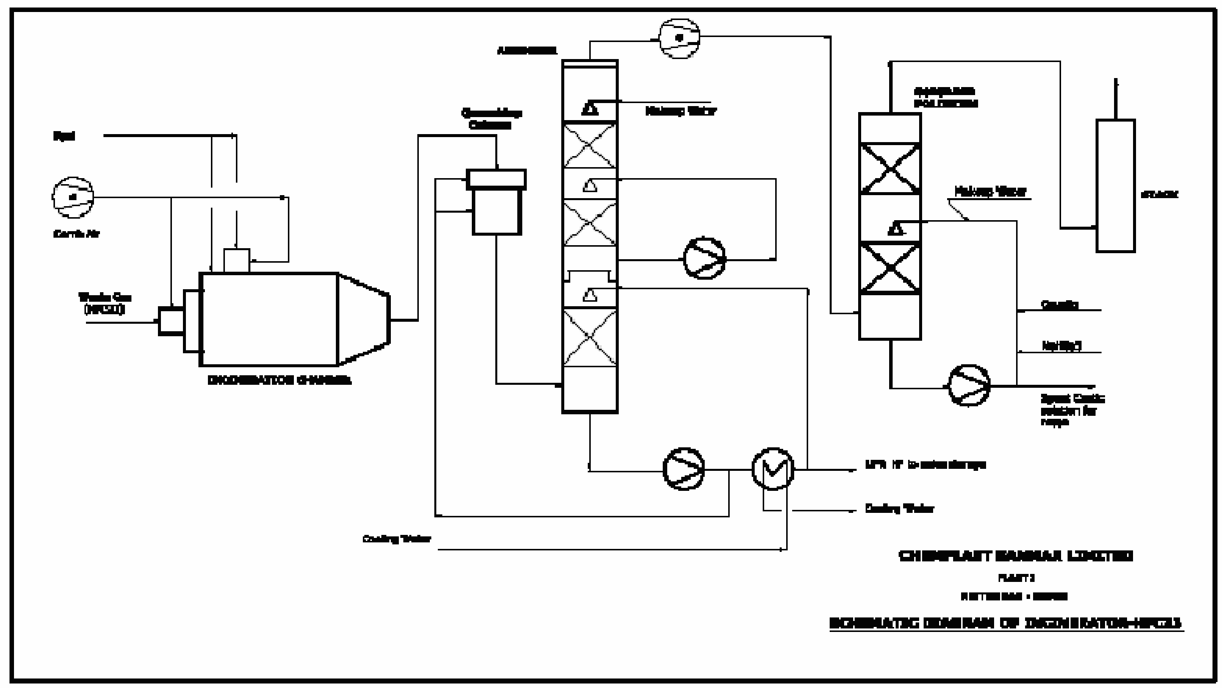
The cooled flue gas is routed from the quench to the absorber column. In order to achieve a 15% hydrofluoric acid the absorber column is equipped with multi stage packed tower and a droplet separator. The absorber is designed as counter-current wet scrubber, operated with pure water as scrubbing liquid. The flue gas, leaving the quench passes the lower packed stage of the absorber, which is operated with a liquid circulation loop. Passing the lower stage, HF and HCL are removed from the flue gas and the quench/scrubbing water is concentrated up to 15% hydrofluoric acid. The lower stage is also designed to cool the flue gas to an exit temperature of 50°C.

The cooled flue gas is then routed to the second absorber stage, which is also operated with a liquid circulation loop. In the second stage, HF and HCL is further removed from the flue gas and transferred to the scrubbing liquid. The surplus scrubbing liquid from the second stage is routed to the lower stage. The flue gas passes the upper stage for final reduction of HF and HCL. The stage is operated with pure water, which is injected at the top. The scrubbing water is then transferred to the second stage. The scrubber circulation loop of the lower stage has a heat exchanger, which cools flue gas to a temperature of max. 50°C.

In order to overcome the pressure drop of the thermal oxidizer unit there is a flue gas suction blower downstream of the absorber, maintaining a constant pressure in the combustion chamber. Downstream the suction blower, the flue gas is routed to a packed bed alkaline scrubber circulated with Caustic Soda and NaHSO3 solutions. This alkaline scrubber ensures that the emission standards of EC directives 2000/76/EC are met. The flue gas from the alkaline scrubber outlet is vented to atmosphere through a Stack.

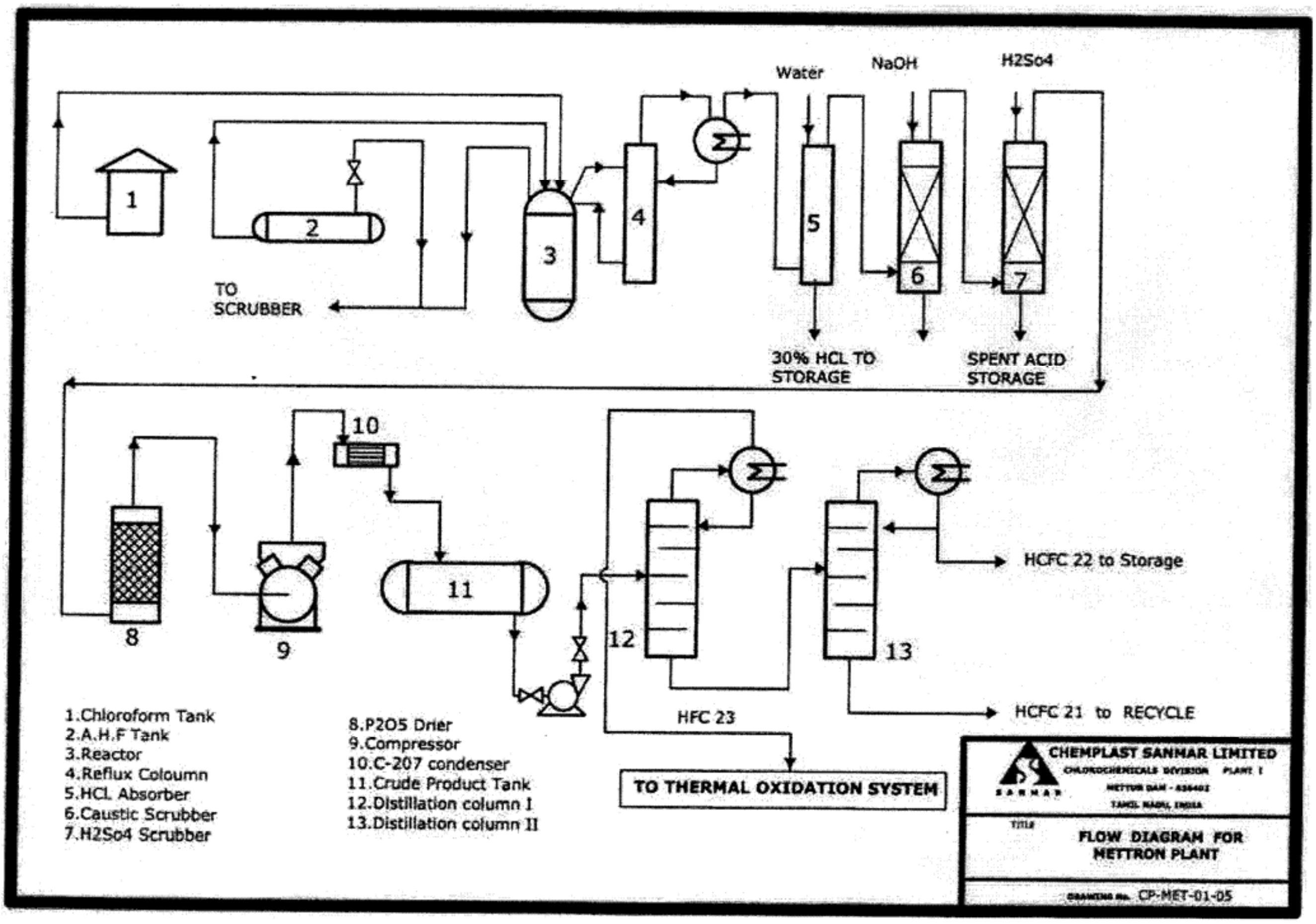
Details about storage of HFC23:
The Condensed HFC 23 from distillation column will be collected in one Storage tank. The tank has a capacity of 20 m3 equivalent to four months generation. The Material of construction of the tank is SS 316 and designed and fabricated to meet the SMPV rule requirements. The HFC 23 will be stored at -10 Deg C and at a pressure of 19 Bar. The tank is insulated with 125 mm thickness with PUF suitably. The vapor phase of the tank is again connected to the condenser of the distillation column such that the vapor generated due to heat pick up is again rejected to the refrigeration system and this aids in maintaining the pressure and the temperature of the HFC 23 stored in the tank. The refrigeration compressor is equipped with alternate source of power supply such that the system can be maintained even incase of power failure.

The stored HFC 23 is vaporized and fed to the Incinerator.



Annex 8

Plant Flow Diagram



Annex 9

MINUTES OF MEETING

CHEMPLAST SANMAR LIMITED
PROPOSED R23 INCINERATION PROJECT

CHEMPLAST's PLANT I OFFICE
Date: November 21, 2005 - Time: 10.00 A.M.

PERSONS PRESENT

CHEMPLAST	TRADE UNIONS	LOCAL COMMUNITY
Mr V. Ranganathan Chief Executive-Operations	Mr M. Venkataraman President Mettur Chemicals Podhu Thozhilalargal Sangam (SLM-379)	Mr P. Ponnuswamy Chairman, P.N.Patti Town Panchayat (Selection Grade) Mettur Dam-636402
Mr T.An.Thenappan Vice President-Operations	Mr S. Manickam President Mettur Chemplast Thozhilalar Munnetra Sangam (SLM-722)	Mr S. Kumaraswamy Municipal Commissioner Metur Dam-636401
Mr K.Parthasarathy Asst. Vice President-Personnel	Mr G. Madhappan Secretary Mettur Chemplast Sanmar Thozhilalar Sangam (SLM-978)	Mr A. Arjunan Sanitary Inspector Municipal Commissioner's Office, Mettur Dam-636401
Mr K.Muthuraman Assistant Vice President-Operations		Mr A. Sanjeevi Councillor P.N.Patti Town Panchayat (Selection Grade) Mettur Dam-636402
Mr K.Ramasubramanian Manager-Public Relations		Mr V.S. Ramakrishna Manager Economic Transport Organisation Salem Main Road Mettur Dam-636402
Mr J. Rajaraman Officer-Support Services		Mr A. Paramasivam Proprietor Goods Carriers India Salem Main Road Mettur Dam-636404

		Mr A. Theerthagiri Headmaster Vaidheeswara Higher Secondary School Mettur Dam R.S. 636402
		Ms. S. Jessie Principal Vaidheeswara Vidya Mandir Matriculation School Mettur Dam R.S. 636402
		Mr K. Rajaram Assistant Vaidheeswara Primary School Mettur Dam R.S. 636402

BUSINESS DISCUSSED

Mr K. Ramasubramanian, Manager-Public Relations welcomed and thanked the office-bearers of the Trade Unions who represented the workforce engaged at its Plants I and III in Mettur and also the other invitees from Mettur Municipal Council, P.N. Patty Town Panchayat and others for having attended the meeting, on behalf of the local community, in response to Company's invitation.

The meeting started with a briefing by Mr Ranganathan, Chief Executive-Operations that Chemplast, at its Plant I facility, has been manufacturing Refrigerant Gases comprising R-11, R-12 and R-22 since the year 1988. India, being one of the signatories to the Montreal Protocol, according to which Ozone Depleting Substances (ODS), have to be phased out in its entirety by the calendar year 2010, starting from the year 2000. In line with this Protocol, as Refrigerants R-11 and R-12 being ODS substances, are to be phased out gradually, year after year, and hence the combined quota of R-11 and R-12 being allotted to Chemplast by Ministry of Environment and Forests (MoEF), Government of India, is progressively reduced.

The market share of Chemplast for the other Refrigerant Gas R-22, also known as Monochloro Difluoromethane or HCF22, both domestic and international is increasing, driven by larger penetration of domestic Air Conditioners. Chemplast wishes to take advantage of this trend and fully utilise the capacity of the Plant, to increase the production of R-22.

Mr Ranganathan further explained that in the process of manufacture of R-22, an inert by-product R-23, also known as Trifluoromethane, is generated in very small quantities – varies between 3-5% in plants around the globe. Since R-23 is absolutely inert and harmless, almost all manufacturers worldwide vent this gas out to the atmosphere. However, some concerns having been expressed about the global warming potential of R-23, Chemplast is considering implementing a project to incinerate R-23 completely by effectively separating R-23 from the product R-22 being manufactured by it.

Mr Ranganthan explained how the incineration would be carried out through the proposed state-of-the-art thermal oxidation plant. He also dwelt at length how the waste gas is completely oxidised to their oxidation products under controlled conditions of temperature, turbulence and time and quenching and scrubbing system. This project would be executed, implemented and operated with all regulatory permissions and consents. It would meet with all environmental regulations and standards that are mandatory.

He then asked the invitees if they had, on behalf of the workforce and community, to which they were representing, any questions/concerns in the Incineration Project or needed any clarifications from the Company.

Accordingly the following questions were raised, discussed and clarified in the meeting:

	Question/Concern	***Clarification***
1	*Is there any specific regulation restricting the emissions from such Incinerators? Would your project adhere to such regulations?*	*The Incinerator proposed to be installed would be a state-of-the-art, adhering to all applicable environmental standards.*
2	*Is there any possibility of the Incinerator getting exploded due to operating it at such high temperatures?*	*The technology for the production of Refrigerant Gas R-22 is not new as far as Chemplast is concerned. What is new is the Incinerator operation for controlled burning of R-23, an inert by-product coming along with R-22. As a matter of fact, Chemplast is operating a large size Incinerator at its Plant-II (PVC Unit) facility for incinerating hi-boils from Plant II as well as Plant III successfully for the past several years, adhering to all environmental standards. The entire quenching and scrubbing system in the proposed Incinerator will be carried out under positive pressure. Therefore, there is no need for such apprehensions and are totally unwarranted.*

3	*How many new jobs would be created?*	*Some opportunities for employment will be created while setting up the plant - 1800-2000 man days and during operation additional man days to the extent of 2000 a year.*
4	*What is the impact on Occupational Health and Safety?*	*The system proposed will be operated as zero emission standard, as guaranteed by the technology supplier. All regulatory norms for environmental protection, safety and health will be followed. We shall also continue to regularly monitor the environment and labour health.*
5	*How do you propose to achieve zero discharge? Will there be solid waste generation? How do you propose to deal with this?*	*Wastewater arises out of scrubbing of vent gases. This will be neutralised with hydrated lime and allowed to settle. After scrubbing, the calcium chloride and fluoride are removed and dried. The resultant wastewater will be treated in the Effluent Treatment Plant and recycled back to the process.* *The solid waste comprising calcium fluoride and chloride will be disposed of in secured landfill, fully complying with Hazardous Wastes (Management and Handling) Rules, 1989, as amended in 2003, under the Environment Protection Act, 1986 and with due Authorisation by the State Pollution Control Board.*

The queries were adequately responded to by Mr V.Ranganathan. The persons participated in the meeting expressed complete satisfaction over the explanations furnished and wished the project and the Company a success in its effort in improving the local and global environment. The invitees also mentioned that based on the past record of accomplishment of the company, they have full confidence and faith in the Company's assurances, that it would implement this project in a socially and environmentally responsible manner. They also wished the company would get all required approvals as expeditiously as possible and expressed full support for the speedy implementation of this project.

Mr K. Parthasarathy concluded the meeting with a vote of thanks to the participants.

V. RANGANATHAN M. VENKATARAMAN P.PONNUSWAMY

T.An.THENAPPAN	**S. MANICKAM**	**S. KUMARASWAMY**
K. PARTHASARATHY	**G. MADHAPPAN**	**A. ARJUNAN**
K. MUTHURAMAN		**A. SANJEEVI**
K.RAMASUBRAMANIAN		**V.S. RAMAKRISHNA**
J. RAJARAMAN		**A. PARAMASIVAM**
		A. THEERTHAGIRI
		S. JESSIE
		K. RAJARAM

Annex 10

Glossary

%	Percentage
CDM	Clean Development Mechanism
CER	Carbon Emission Reduction
CM	Combined Margin
CO_2	Carbon Di Oxide
CSL	Chemplast Sanmar Limited
DNA	Designated National Authority
DOE	Designated Operational Entity
EIA	Environmental Impact Assessment
GHG	Green House Gases
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
kw	Kilo Watt
kWh	Kilo Watt Hour
MNES	Ministry of Non-Conventional Energy Sources
MoEF	Ministry of Environment and Forests
MU	Miilion Units
MW	Mega Watt
OECD	Organisation for Economic Co-operation and Development
Rs.	Indian Rupees
SREB	Southern Regional Electricity Board
TNEB	Tamilnadu Electricity Board
UNFCCC	United Nations Framework Convention on Climate Change

Annex 11

References

Website of United Nations Framework Convention on Climate Change, http://unfccc.int

UNFCCC, Clean Development Mechanism, CDM Project Design Document (CDM-PDD) version 02 (in effect as of: 1 July 2004)

UNFCCC, Clean Development Mechanism, Approved consolidated baseline methodology AM0001/Version03

Technical details of the proposed project activity

Website of Ministry Non-Conventional Energy Sources (MNES), Government of India, www.mnes.nic.in

Stakeholders Comments, (2005), CSL

Environment Impact Assessment (2005), CSL

IPCC-Second & Third assessment report

CSL Power consumption data

CSL Power generation data using fossil fuel

Grid emission factor calculated by MNES India 2002-03

Incineration of HFC 23 waste streams for abatement of emissions from HCFC 22 production: A review of scientific, technical and economic aspects- by A. McCulloch

HFC 23 emissions from HCFC 22 Production- Good practice guidance and uncertainty management in national greenhouse gas inventories- IPPCC