CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 03 - in effect as of: 28 July 2006

CONTENTS

Annexes

SECTION A. General description of project activity

A.1 Title of the project activity:

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Title: Yingpeng HFC23 Decomposition Project

Version: 1.4 (revision as per the request for review)

Date: 29/11/2008

A.2. Description of the project activity:

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As one of the leading HCFC22 manufacturer in China and located in Zhejiang Province, Yingpeng Chemical Co., Ltd. now has a HCFC22 production capacity of 25,000 ton/year. As an undesirable by-product of HCFC22, most of the HFC23 (as a high-potent GHG with GWP: 11,700) is directly emitted to the atmosphere during the production process of HCFC22 without any legally-binding control by the Chinese environmental laws and regulations.

The purpose of this proposed project is to collect all of the waste stream of HFC23 from HCFC22 production process, and decompose it almost completely by an incinerator to be installed in Yingpeng Chemical Co., Ltd. HFC23 will be decomposed to carbon dioxide (CO_2), hydrogen chloride (HCl), and hydrogen fluoride (HF) *etc*., with high temperature and low pH value, and be further processed by the cooling and de-acid process before being emitted to the atmosphere.

HFC23 will be decomposed to low GWP CO_2 and other non-GHGs in this process. The proposed project will reduce the potential impact of global warming and achieve GHG abatement considerably. According to the *Montreal Protocol*, developed countries shall stop Ozone Depleting Substances (ODS) substitute production (HCFCs) by 2020. While developing countries is allowed to produce HCFC22 until 2040 based on their respective economic and technical capabilities. According to the *Kyoto Protocol*, developing countries have no commitment to limit its GHG emissions at present, but they can contribute developed countries to meet their commitments through the credits (CERs) accrued by the Clean Development Mechanism (CDM) projects in their countries. HFC23 is one of the six types of GHGs stipulated in the *Kyoto Protocol*, and this project will be an example of contribution of China in terms of the implementation of the *Kyoto Protocol*.

With a high economic growth over the last 20 years, the GDP per capita of China reached 1,000 USD per year in 2002. China is now undergoing industry modernization rapidly with outstanding improvements in people's living standard. Driven by the increasing consumption of public building, houses and cars, the demand for air-conditioners, refrigerators, and other cooling products has been increasing dramatically recently in China. As a main material of refrigerators, vesicants, and fire extinguishers, and driven by the strong market demand, the production of HCFC22 also has and will increase considerably as shown in TEAP reports.[1]

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[1] For example, see "Report of the Technology and Economic Assessment Panel" by the Montreal Protocol on Substances that Deplete the Ozone Layer, HCFC Task Force Report, May 2003.

There was only one HCFC22 production line with a total capacity of 500 ton/year in Yingpeng Chemical Co., Ltd. before 1997.[2] Due to the demand driven, Yingpeng Chemical Co., Ltd. expanded the total HCFC22 production capacity to 3,000 ton/year in 1999,[3] and further expanded the total HCFC22 production capacity to 25,000 ton/year in 2001.[4]

Following the steps of industry modernisation in China, and the rise of living standard of Chinese people, the demand of HCFC22 production will definitely increase as specified by TEAP Reports before. The HCFC22 production capacity of Yingpeng Chemical Co., Ltd. may be further expended in the future.[5] Therefore, it's very important to decompose HFC23 by this proposed project through Clean Development Mechanism (CDM).

According to the *Kyoto Protocol*, the key purpose of CDM is to promote sustainable development of the host developing country, and HFC23 decomposition project in Yingpeng Chemical Co., Ltd. will serve this purpose. The CERs by the project will generate the revenue, of which 65% will be utilized by the Chinese Government to achieve its sustainable development, and the remaining part of the revenue will be owned by Yingpeng Chemical Co., Ltd. This proposed project can create 24 new local job opportunities thanks to the profit. Meanwhile, it can contribute to the fiscal income of the local government.

In addition, HFC23 decomposition project will improve the private awareness of Yingpeng Chemical Co., Ltd. about global environment protection, strengthen its capacity in international cooperation, accelerate its technology progress and make it involve in more environmental protection process. Meanwhile, this proposed project can improve the awareness of local government in terms of environmental protection and contribute to the local sustainable development.

A.3. Project participants:

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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)
People's Republic of China (host)	Yingpeng Chemical Co., Ltd.	No
Italy	Enel Trade S.p.A	No
Ireland	Infinity Clean Air Development	No

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2 Ratification of construction of F12 and F22 production facility in Yongkang county's Chemical Plant, approved by the Economic Commission of Yongkang County in 1987.

3 Ratification of the FSR regarding to expansion of F22 production facility with annual output of 3,000 ton/year in Zhejiang Yingpeng Chemical Co., Ltd. approved by the Planning and Economic Commission of Yongkang County in 1999.

4 Ratification of the FSR regarding to expansion of F22 production facility with annual output of 25,000 ton/year in Zhejiang Yingpeng Chemical Co., Ltd. approved by the Planning and Economic Commission of Yongkang County in 2000.

5 It is noted that the proposed CDM project targets HFC23 generation at the existing HCFC22 production lines only as specified in the approved methodology AM0001 v.5.2.

	Limited	

(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

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A.4.1.1. Host Party(ies):

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People's Republic of China

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

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Zhejiang Province

A.4.1.3. City/Town/Community etc:

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Yongkang City

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

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Yongkang City is located in Zhejiang Province in the Eastern coast area of China. It is about 300 km to the south of Shanghai, the largest commercial city of China, and down below the economic area of Yangzi River Delta. Yongkang City is a county-level city with the area of 1,049 km^2 and the population of 0.536 million. The GDP per capita of Yongkang City was over 3,000 USD in 2004.

Yongkang City is located in the semitropical area with typical monsoon climate and clear seasonal changes. The average temperature in the whole year is 17.4 ºC, the average temperature in the hottest month is 34.3 ºC and 1.7 ºC in the coldest month. The average rainfall of this city is 1,387.3 mm, and relative humidity is 76% in summer and 78% in winter respectively. Most of the local wind comes from the northwest, and in summer, it comes from southeast. The average wind speed in Yongkang City is 3 m/s.

The HFC23 decomposition project will be implemented in Yingpeng Chemical Co., Ltd., located at Yonghua road in the western area of Yongkang City. The factory is about 4 km far from the downtown area of Yongkang City, and located in the west and downstream area of the city. The factory is also close to the No. 330 National Road with convenience transportation conditions. According to development plan of Yongkang city, this area is the industrial area of chemical and construction material production. The location of Yongkang city in Zhejiang Province of China and location of Yingpeng Chemical in Yongkang are shown in Figure 1 and Figure 2, respectively below.

Figure 1: Location of Yongkang City in Zhejiang Province

Figure 2: Location of Yingpeng Chemical Co., Ltd. in Yongkang City

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

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This project falls into Category 11:
"Fugitive emissions from production and consumption of halocarbons and sulphur hexafluoride".

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

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The technology to be employed by the proposed project is from Japan because the technology for thermal oxidation of HFC23 is not available indigenously. The technology and equipments used in the proposed project will be imported from TNCE (Tsukishima Nittetsu Chemical Engineering Ltd., Tokyo, Japan) which are similar compared to those used in Japanese. The operating know-how will be transferred to Yingpeng Chemical Co., Ltd. by training the Chinese technical staffs and workers to operate and maintain the whole operation process and equipment.

Due to stable chemical character with atmospheric lifetime of around 260 years, HFC23 is difficult to be decomposed. The state-of-the-art technology—high decomposition temperature of HFC23, and quick and stable cooling—will guarantee high decomposition rate of HFC23 (more than 99.99%) and low generation rate of Dioxin. The entire process includes high-temperature decomposition process, neutralization process, and wastewater treatment. The detailed information of this process is shown as follows:

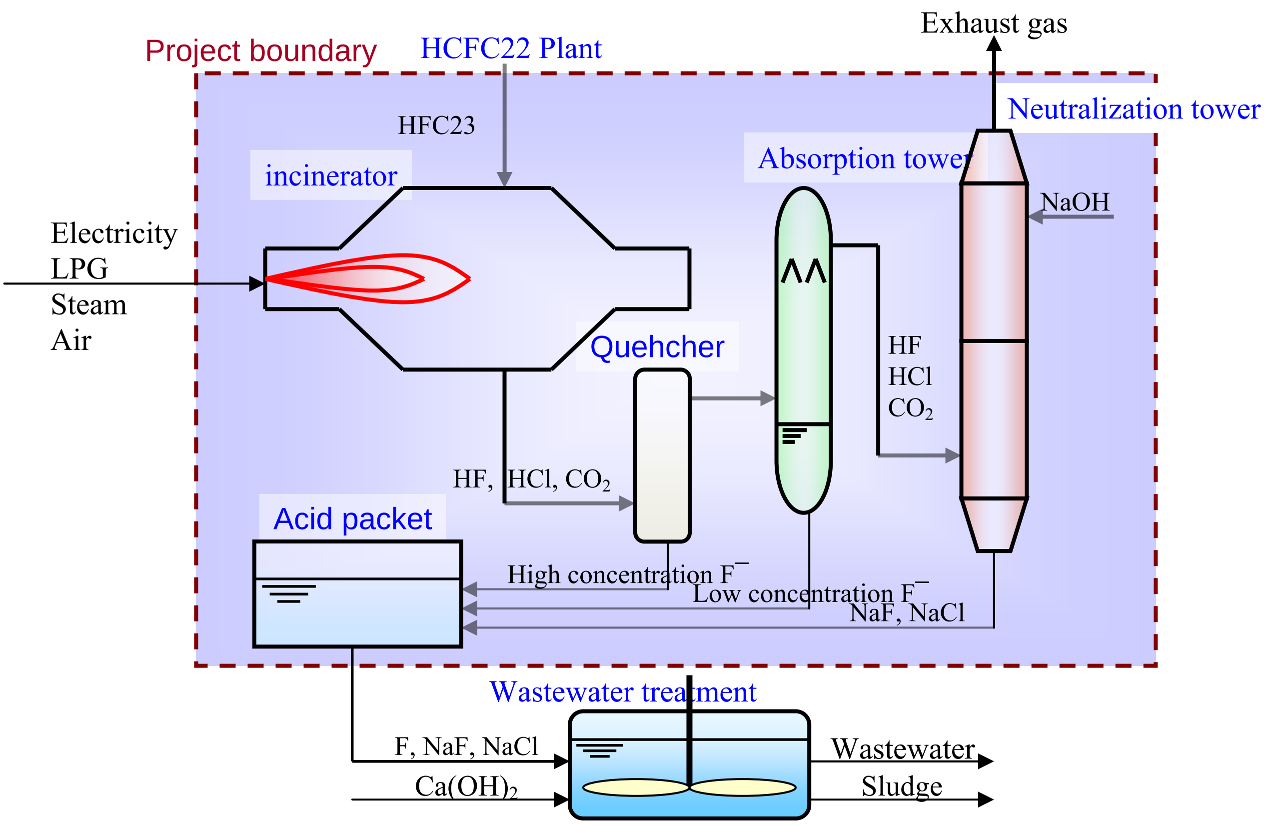
1. High-temperature decomposition process:

HFC23 waste gas is collected and stored during the HCFC22 production process. After concentration analysis and measurement of its flow, HFC23 is then fed into the incinerator together with combustion-supporting materials such as LPG, air and steam. In the main reactor, the temperature will rise to 1200–1400^{o}C. Through a series of chemical reaction process including hydrolyze, pyrogenation and oxidation, HFC23 will be decomposed to other gases of HF, HCl, CO_2 and so on. The decomposition rate is over 99.99%. The detailed chemical reaction formulations are as follows:

$$CHF_3\,(HFC23) + H_2O + {}^1/_2\,O_2 \rightarrow CO_2 + 3\,HF$$
$$CHClF_2\,(HCFC22) + H_2O + {}^1/_2\,O_2 \rightarrow CO_2 + 2\,HF + HCl$$

High-temperature and high-humidity post-decomposition acid gases including HF, HCl, and CO_2, *etc.*, will be sent to the neutralization process for cooling and antacid with alkali.

Figure 3: Outline of the HFC23 Decomposition Process



2. Neutralization process

Neutralization process is composed of three key processes including cooling, absorption and neutralization. High-temperature and high-humidity post-decomposition acid gases including HF, HCl, and CO_2, *etc*., from thermal decomposition process will be firstly fed into the quencher to lower the temperature, and then fed into the absorption tower to be absorbed. Gases coming out after the cooling and absorb processes will then go into a two-sect neutralization tower. Acid gases like HF, HCl will be neutralized by NaOH washing process. The detailed chemical reaction formulations are shown as follows:

$$HF + NaOH \rightarrow NaF + H_2O$$
$$HCl + NaOH \rightarrow NaCl + H_2O$$

The exhaust gases de-acided by alkali washing process will be vented into the atmosphere directly.

The wastewater containing high concentration of F hydronium from the cooling process, wastewater containing low concentration of F hydronium from the absorption process, and the acid wastewater from the neutralization process will go into the waste water treatment process together.

3. Waste water treatment process

Acid wastewater from the neutralization process including HF, HCl, NaF, NaCl, *etc.*, is neutralized by $Ca(OH)_2$ in the wastewater treatment process. The F hydronium will be transformed into unsolvable CaF_2. Solid wastes coming out from the wastewater treatment facility through agitation, concretion and press dehydration process will be transported to a nearby landfill site and the treated water will be in full compliance with the China's industrial wastewater standards and other environmental regulations.

4. Emergency Treatment

The HFC23 storage tanks used for storage of HFC23 in case of emergency will be installed in the HCC23 decomposition facility. The total capacity of HFC23 storage in these tanks is expected to be 43 tons. It doesn't lead to leakage because of no electricity consumed by these tanks which are operation through the pressure.

When the emergency accident of HFC23 decomposition facility occurs, the HFC23 transportation to the incinerator will be shut down immediately, and then HFC23 will be switched to feeding into the HFC23 storage tanks until the HFC23 decomposition facility fixed.

A.4.4 Estimated amount of emission reductions over the chosen crediting period:

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Years	Annual estimation of emission reductions in tonnes of CO_2e
Oct 1st 2008—Dec 31st 2008	1,966,319
2009	7,865,277
2010	7,865,277
2011	7,865,277
2012	7,865,277
2013	7,865,277
2014	7,865,277
Jan 1st 2015—Sept 31th 2015	5,898,958
Total estimated reductions (tonnes of CO_2e)	55,056,939
Total number of crediting years	7 yeas of each period (3 crediting periods in total)

Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	7,865,277

For detailed calculation, please see Section B.6.3 as well as Annex 3.

A.4.5. Public funding of the project activity:

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The investment of this project completely comes from the market financing, and has no relationship with the ODA or other public funding.

SECTION B. Application of a baseline and monitoring methodology

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

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The methodology of HFC23 decomposition project of Yingpeng Chemical Co., Ltd. is the approved methodology AM0001/version 5.2.

The detailed information of the methodology is available on the following website: http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html.

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

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AM0001/version 5.2 is applicable under the following conditions:

- *The project activity is the destruction of HFC 23 (CHF_3) waste streams from an existing HCFC22 production facility,*
- *The HCFC-22 production facility has an operating history of at least three (3) years between beginning of the year 2000 and the end of the year 2004 and has been in operation from 2005 until the start of the project activity;*
- *The HFC-23 destruction occurs at the same industrial site where the HCFC-22 production occurs (i.e. no offsite transport occurs); and*
- *where no regulation requires the destruction of the total amount of HFC23 waste.*

The proposed project complies with all the four requirements of AM0001/Version 5.2 in terms that:

(1) The proposed project will decompose the HFC23 generated from the existing HCFC22 production process in Yingpeng Chemical Co., Ltd.

(2) The existing HCFC22 production facility started its operation in 1988, and has been in operation for more than three years between beginning of the year 2000 and the end of the year 2004, and has been in operation from 2005 until now, and will continue operation for whole the proposed project period. The actual annual production of HCFC 22 production was 15,115.37 tons in 2002, 22,723.90 tons in 2003 and 23,269.14 tons in 2004 respectively.

The production facility is dedicated for HCFC 22 production, and has never been used for CFCs swing production.

(3) The HFC23 destruction occurs at the same industrial site where HCFC22 production occurs in Yingpeng Chemical Co., Ltd.

(4) As a developing country, there are no regulations which require the destruction of the total amount of HFC23 waste in China at this moment or in the near future.

The approved baseline methodology is used in conjunction with the approved monitoring methodology AM0001/Version 5.2 in this PDD.

B.3. Description of the sources and gases included in the project boundary

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According to the AM0001/Version 5.2, the project boundary begins from decomposition process, through cooling, absorption, and neutralization process, to waste gases emission to the atmosphere.

The project boundary of this project is shown in Figure 3 (Section A.4.3), including HFC23 decomposition process, neutralization process, from incinerator, through quencher, absorption tower, neutralization tower, to waste gases emission. It also includes acid storage. The wastewater disposal process will use the original facility of Yingpeng Chemical Co., Ltd. The acid wastewater from HFC23 decomposition process will be mixed with the acid wastewater from another production process for further treatment, thus the wastewater treatment process is out of the project boundary. The project boundary of this project is the same as that in the AM0001/Version 5.2, and the calculation formulas of emission reductions are identical to those specified in the AM0001/Version 5.2.

The leakage outside the project boundary includes all key parameters like electricity and steam consumptions. The emissions resulting from electricity and steam consumptions outside of project boundary can be calculated based on related emission factors.

NaOH used for the neutralization processing and $Ca(OH)_2$ used for the wastewater processing in this project will lead to leakage during NaOH and $Ca(OH)_2$ production and transportation. These emissions will be calculated as leakage outside the project boundary based on related emission factors.

The leakage outside the project boundary also includes the emission resulting from electricity consumed by processing wastewater generated by this project.

The acid water can be disposed if it can reach the national emission standard after neutralization treatment. This treatment process will generate some sludge; it also will generate some emissions to this project during the transportation of the sludge to the landfill. This emission will be calculated as leakage outside the project boundary based on related emission factors.

All conditions of this project are the same as those stipulated in the AM0001/Version 5.2. From the determination of project boundary to main emission sources and emission calculation method, this project is in full compliance with the AM0001/Version 5.2.

	Source	Gas	Included?	Justification / Explanation

Baseline	HCFC22 Facility	HFC23	Yes	Most contributing emissions
		CO_2	No	Common for baseline scenario and project scenario
		CH_4	No	
		N_2O	No	
Project	HFC23 Destruction Facility	HFC23	Yes	Non-destructed portion
		CO_2	Yes	Oxidized carbon content of destructed HFC23, LPG fuel combustion
		CH_4	No	Negligible (much below whole uncertainty)
		N_2O	No	
Leakage	Steam generator	CO_2	Yes	Steam used for destruction facility operation
		CH_4	No	Negligible (much below whole uncertainty)
		N_2O	No	
	Grid	CO_2	Yes	Electricity used for destruction facility operation and wastewater processing
		CH_4	No	Negligible (much below whole uncertainty)
		N_2O	No	
	NaOH production and transportation	CO_2	Yes	NaOH used for the neutralization processing
		CH_4	No	Negligible (much below whole uncertainty)
		N_2O	No	
	$Ca(OH)_2$ production and transportation	CO_2	Yes	$Ca(OH)_2$ used for the wastewater processing
		CH_4	No	Negligible (much below whole uncertainty)
		N_2O	No	
	Sludge transport	CO_2	Yes	Transportation of the sludge to the landfill.
		CH_4	No	Negligible (much below whole uncertainty)
		N_2O	No	

B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

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The proposed project is in full compliance with the requirements of the AM0001/Version 5.2, the baseline methodology and GHG emission reduction formulations of AM0001/Version 5.2 can be directly applied to this project without any changes.

The methodology concludes that

In the absence of regulations requiring the destruction of HFC 23 waste, the typical situation in non-Annex B Parties, $r_y = 0$. Absent regulations on HFC 23 emissions, the HFC 23 waste is typically released to the atmosphere so the baseline is zero destruction.

Therefore, the baseline scenario concluded in AM0001/Version 5.2 is to emit HFC23 in compliance with the national laws and regulations. As mentioned earlier, there are no laws or regulations which would restrict emissions of HFC23 in China.

As a result, the amount of baseline emissions BE_y [t CO_2e/yr] of the proposed project is given by

$$BE_y = (Q\_HFC23_y - B\_HFC23_y) * GWP\_HFC23 \quad (1)$$

with $B\_HFC23_y = 0$ (or $r_y = 0$), where

Q_HFC23_y: Quantity of waste HFC 23 generated from HCFC22 production facility [t HFC23/yr],
B_HFC23_y: Baseline quantity of HFC 23 to be destroyed by the regulation in China [t HFC23/yr],
r_y: fraction of the waste stream required to be destroyed by the regulations $= B\_HFC23_y / Q\_HFC23_y$ [no dimension].

as specified in the methodology.

The key information and data associated with the identification of the baseline scenario are:

Information and parameter		Description
Local regulation	B_HFC23_y	No regulation in China. Therefore, $B\_HFC23_y = 0$
HFC23 emitted to the atmosphere in the baseline scenario	Q_HFC23_y	Equivalent to the quantity of waste stream of HFC23 generated from HCFC22 production facility. Waste stream is defined as the input HFC23 to the incinerator, which is equivalent to the generated amount minus sold amount of HFC23.[6]

In addition to the above formula, the methodology AM0001/Version 5.2 specifies the followings:

To exclude the possibility of manipulating the production process to increase the quantity of waste, the quantity of HFC23 waste (Q_HFC23_y) is limited to a fraction (w) of a maximum quantity of HCFC22 production at the originating plant that is eligible for crediting ($Q\_HCFC22_{y,\max}$).

$$Q\_HFC23_y \leq Q\_HCFC22_{y,\max} * w \quad (2)$$

Where:

$Q\_HCFC_{y,\max}$ = Maximum annual production of HCFC-22 at the originating plant that is eligible for crediting (metric tones per year),

w = Waste generation rate (HFC 23)/(HCFC 22) for the originating plant (metric tons of HFC23 per metric tons of HCFC22)

The maximum annual HCFC 22 production quantity that is eligible for crediting ($Q\_HCFC22_{y,\max}$) is the lower value between

6 Q_HFC23_y is measured (as the product of the flow q_HFC23_y times purity P_HFC23_y) at the inlet point of the incinerator. Therefore, the sales amount of HFC23 is used only for the calculation of "w" as specified in the methodology.

(a) The actual HCFC 22 production in year y (Q_HCFC*y*); and

(b) The maximum historical annual HCFC22 equivalent production level (Q_HCFC$_{Hist}$) 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.

The historical waste generation rate *w* 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 HFC23 produced per tonne of HCFC22 manufactured).

If insufficient data is available for the calculation of HFC23 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%.

The measurement procedures, calculations and assumptions used to determine *w* should be documented transparently in the CDM-PDD.

The associated historical records are:

Maximum of historical annual HCFC22 production during 2002–2004 [Q_HCFC22$_y$]	23,269.14 t HCFC22/yr (2004)
Lowest historical waste generation rate *w* during 2002–2004	2.89% (The w value based on F balance in 2004)

The underlying calculations and assumptions as well as the additional technical documents are shown in Annex 3 and to be provided to the DOE at the time of validation.

Therefore, Q_HFC23$_y$ has a ceiling as below:

$$
\begin{aligned}
Q\_HFC23_y &\leq Q\_HCFC22_y * w \\
&\leq 23{,}269.14 * 2.89\% \\
&= 672.478 \text{ tHFC23/yr} \qquad (3) \\
&= 7{,}867{,}993 \text{ tCO}_2\text{e/yr}
\end{aligned}
$$

B.5. 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 (assessment and demonstration of additionality):

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The HFC23 waste gas generated by HCFC22 production process is emitted to the atmosphere directly up to now and will be continued if CER incentive would not be obtained by Yingpeng Chemical Co., Ltd. The main obstacles to decompose HFC23 are as follows:

1) International laws/regulations:
   According to the *Kyoto Protocol*, there is no restriction for the developing countries to reduce or control their GHG emissions; meanwhile, the *Montreal Protocol* also has no limit on the developing countries to produce HCFC22 productions and emit HFC23. Therefore, in terms of China, there is no HFC23 emission restriction according to the international laws/ regulations;
2) Domestic laws/regulations:
   HFC23 is not the air pollutant that is restricted by national or local environmental laws/ regulations, therefore, there is no HFC23 emission restriction in China according to domestic laws/regulations;
3) No economic incentives to decompose HFC23:
   HFC23 decomposition requires investment and technological support, and it cannot generate any profits from usual business. Therefore, it is impossible for any companies to develop this kind of project if there are no regulations requiring them to do so. In addition, the voluntary decomposition of HFC23 will weaken the company's market competitiveness, and may have a negative influence on the company's development;
4) Lack of treatment equipment and technology:
   Since there are no voluntary HFC23 decomposition activities in China at this moment, there are no related treatment equipments and technologies in China at this moment.

Due to the above-mentioned analysis of obstacles, the Chinese HCFC22 companies will emit HFC23 "waste" gas to the atmosphere directly in the absence of CDM incentive.

There is no doubt that CDM will change this kind of situation. HCFC22 companies will get additional income by the transfer of CERs, and there will be enough incentives for the companies to take part in the HFC23 decomposition activities. Meanwhile, the HFC23 decomposition project also can generate more revenue to local government and increase the local employment rate.

HFC23 decomposition project is a process that decomposes HFC23 to CO_2 by high temperature. With high GWP (11,700), HFC23 decomposition process will make huge GHG emission reduction benefit. There is only small amount of HFC23 that cannot be decomposed in this process and that can be ignored. And it will not impose any negative influence on the overall effect of GHG emission reductions.

HFC23 decomposition process requires additional energy input, such as LPG, steam, and electricity, *etc*. It will generate some CO_2 emissions by such kind of energy consumption, but the amount is extremely small comparing with the total amount of GHG emission reductions by HFC23 decomposition, thereby achieving significant GHGs emission reductions and contributing to the climate change mitigation.

Therefore, the project will result in additional GHG emission reductions to the baseline scenario.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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Following the AM0001/Version 5.2, the formulae for project emissions, the leakage and the baseline emissions are given as follows:

Project Emissions

The project emissions PE_y (= E_DP_y) [t CO_2eq/yr] due to the decomposition process is calculated as:

$$PE_y = E\_DP_y = ND\_HFC23_y * GWP\_HFC23 + Q\_LPG_y * E\_LPG + Q\_HFC23_y * EF \quad (4)$$

where:

- E_DP_y : The emissions due to the destruction process [t CO_2eq/yr].
- ND_HFC23_y: The quantity of HFC23 not destroyed in the given year y [t HFC23/yr].
- Q_LPG_y: The quantity of LPG used in the destruction process in the given year y [Nm^3 /yr].
- E_LPG: The emission coefficient for LPG combustion: $E\_LPG_y = 0.00747$[t CO_2/ Nm^3].
- Q_HFC23_y: The quantity of waste HFC23 destroyed, $Q\_HFC23_y = q\_HFC23_y * P\_HFC23_y$ [t HFC23/yr].
- q_HFC23_y: The quantity of HFC23 flow supplied to the destruction facility [t-HFC23/time interval].
- P_HFC23_y: The purity of HFC23 supplied to the destruction facility [no dimension or %].
- EF: The emission factor of decomposing HFC23 to CO_2, equal to 0.62857 [t CO_2e/t HFC23].

Leakage

The leakage (L_y) due to the decomposition process is calculated as:

$$L_y = Q\_Elec_y * E\_Elec + Q\_Steam_y * E\_Steam + Q\_NAOH_y * E\_NAOH + Q\_Ca(OH)_{2y} * E\_Ca(OH)_2 + Q\_sludge_y * E\_sludge + Q\_wastewater_y * E\_wastewater \quad (5)$$

where:

- Q_Elec_y: The quantity of electricity provided for the decomposition process in the given year y [MWh/yr].
- E_Elec: The GHG emissions factor of electricity provided in the given year y [t CO_2e/MWh].
- Q_Steam_y: The quantity of steam provided for the decomposition process in the given year y [t steam/yr].
- E_Steam: The GHG emissions factor of steam provided in the given year y [t CO_2e/t steam].

Q_NaOH$_y$: The quantity of NaOH for the neutralization processing in the given year y [t NaOH/yr].

E_NaOH: The emissions of NaOH used for the neutralization processing during the production and transportation in the given year y [t CO_2e/ t NaOH].

Q_ Ca(OH)$_{2y}$: The quantity of $Ca(OH)_2$ for the wastewater processing in the given year y [t $Ca(OH)_2$/yr].

E_ Ca(OH)$_2$: The emissions of $Ca(OH)_2$ used for the wastewater processing during the production and transportation in the given year y [t CO_2e/ t $Ca(OH)_2$].

Q_sludge$_y$: The quantity of sludge generated in this project in the given year y [t sludge/yr].

E_sludge: The GHG emissions factor of per ton sludge in the given year y [t CO_2e/t sludge].

Q_wastewater$_y$: The quantity of wastewater generated in this project in the given year y [t wastewater/yr].

E_wastewater: The GHG emissions factor of per ton wastewater in the given year y [t CO_2e/t wastewater].

Baseline Emissions

The baseline emissions (BE_y) is given by:

$$BE_y = Q\_HFC23_y * 11{,}700 \quad (6)$$

It is anticipated that the production of HCFC22 is going to increase. However, allowable baseline HCFC22 production Q_HCFC22$_y$ to be claimed for CER is limited to the maximum historical annual production level at this plant (in tonnes of HCFC22) during any of the last 3 years between beginning of the year 2000 and the end of the year 2004 as specified in the AM0001/Version 5.2.

For Yingpeng Chemical, Co., Ltd., the figures of the year 2004 are applied both for setting the maximum historical HCFC22 production as well as the waste generation rate w.

Emission Reductions

The emission reductions is given by

The GHG emission reduction (ER_y) is given by:

$$ER_y = BE_y - (PE_y + L_y) \quad (7)$$

with the notations shown above.

B.6.2. Data and parameters that are available at validation:

Data / Parameter:	Q_HCFC22$_y$
Data unit:	tHCFC22

Description:	Maximum of historical annual HCFC22 production during 2002–2004
Source of data used:	Production records of Yingpeng Chemical Co., Ltd.
Value applied:	23,269.14
Justification of the choice of data or description of measurement methods and procedures actually applied:	The actual production of HCFC 22 in 2002 was 15,115.37 tons; The actual production of HCFC 22 in 2003 was 22,723.90 tons; The actual production of HCFC 22 in 2004 was 23,269.14 tons.
Any comment:	Key parameter

Data / Parameter:	*w*
Data unit:	tHFC23/tHCFC22
Description:	Minimum of historical HFC23 generation rate during 2002-2004
Source of data used:	Production records of Yingpeng Chemical Co., Ltd.
Value applied:	2.89%
Justification of the choice of data or description of measurement methods and procedures actually applied:	The *w* value based on C balance of HFC23 generation rate in 2002 was 3.32%; The *w* value based on F balance of HFC23 generation rate in 2002 was 3.83%; The *w* value based on C balance of HFC23 generation rate in 2003 was 3.24%; The *w* value based on F balance of HFC23 generation rate in 2003 was 3.55%; The *w* value based on C balance of HFC23 generation rate in 2004 was 3.17%; The *w* value based on F balance of HFC23 generation rate in 2004 was 2.89%; In order to be conservative, 2.89% is chosen. The *w* value calculation spreadsheet is provided in annex 5 in this PDD.
Any comment:	Key parameter

Data / Parameter:	*GWP*_HFC23
Data unit:	tCO_2e/tHFC23
Description:	Global warming potential of HFC23
Source of data used:	IPCC Second Assessment Report
Value applied:	11,700
Justification of the choice of data or description of measurement methods and procedures actually applied:	For the first commitment period, COP decided to use the GWPs specified in the Second Assessment Report of the IPCC.
Any comment:	This value may be revised after 2013.

Data / Parameter:	*EF*
Data unit:	tCO_2/tHFC23
Description:	Emission factor of decomposing HFC23 to CO_2
Source of data used:	Chemical calculation
Value applied:	0.62857
Justification of the choice of data or description of	*EF* = 44 / [(molecular weight of HFC23)/(number of C in a molecule of HFC23)] = 44/70

measurement methods and procedures actually applied:	= 0.62857 [tCO_2/tHFC23].
Any comment:	The contribution of the whole emission reductions is minor.

Data / Parameter:	*E*_LPG
Data unit:	tCO_2/ Nm^3
Description:	CO_2 emission factor of LPG per kg
Source of data used:	ex-ante calculated
Value applied:	0.00747
Justification of the choice of data or description of measurement methods and procedures actually applied:	For simplification, the value is ex-ante determined and fixed during the credit period. Basic parameter are shown as follows: Caloric value of LPG is 50179 kJ/ kg (comes from *China Energy Statistical Yearbook 2006*) Carbon content of LPG is 17.2 tC/TJ (comes from IPCC 2006 default value) Liquid LPG/Gasification LPG is 2.36 kg-LPG/ Nm^3-LPG (comes from the LPG supplier) The detailed calculation see annex 3 in this PDD.
Any comment:	The contribution of the whole emission reductions is minor.

Data / Parameter:	*E*_Steam
Data unit:	tCO_2/tSteam
Description:	CO_2 emission factor of the steam
Source of data used:	ex-ante calculated
Value applied:	0.305
Justification of the choice of data or description of measurement methods and procedures actually applied:	For simplification, the value is ex-ante determined and fixed during the credit period. Basic parameter are shown as follows: Coal consumption amount per unit steam is 0.154 kg-ce/kg-steam (comes from the operation record of Yingpeng Chemical) Heat value of coal is 20.908 MJ/kg-ce (comes from China Energy Statistic Yearbook 2006) The carbon emission factor of coal is 0.0946 kg-CO2/MJ (comes from IPCC 2006 default value) The detailed calculation see annex 3 in this PDD.
Any comment:	The contribution to the whole emission reductions is minor.

Data / Parameter:	*E*_sludge
Data unit:	tCO_2/t sludge
Description:	CO_2 emission factor of the sludge
Source of data used:	ex-ante calculated
Value applied:	0.0057
Justification of the choice of data or description of measurement methods and procedures actually applied:	For simplification, the value is ex-ante determined and fixed during the credit period. Basic parameter are shown as follows: Carrying capacity of transporting truck is 10 tonnes (comes from Feasibility study report) Transportation distance of waste is 80 km (comes from Feasibility study report) Diesel consumption per unit distance is 4 km/l (comes from Feasibility study

	report) Proportion of diesel is 0.888 kg/l (comes from National fuel standard in China) Heat value of diesel is 43.33 TJ/k-tonne (comes from IPCC 2006 default value) CO2 emission factor of diesel is 20.2 t-C/TJ (comes from IPCC 2006 default value) The detailed calculation see annex 3 in this PDD.
Any comment:	The contribution to the whole emission reductions is minor.

Data / Parameter:	*E*_ NaOH
Data unit:	tCO_2/t NaOH
Description:	CO_2 emission factor of the NaOH consumed for the neutralization processing
Source of data used:	ex-ante calculated
Value applied:	2.03863
Justification of the choice of data or description of measurement methods and procedures actually applied:	For simplification, the value is ex-ante determined and fixed during the credit period. Basic parameter are shown as follows: Electricity consumption per ton NaOH during production is 2.25MWh/t NaOH (comes from *Technics Manual* published by Juhua Group Corperation) The detailed calculation see annex 3 in this PDD.
Any comment:	The contribution to the whole emission reductions is minor.

Data / Parameter:	*E*_ $Ca(OH)_2$
Data unit:	tCO_2/t $Ca(OH)_2$
Description:	CO_2 emission factor of the $Ca(OH)_2$ consumed for wastewater processing
Source of data used:	ex-ante calculated
Value applied:	0.3394
Justification of the choice of data or description of measurement methods and procedures actually applied:	For simplification, the value is ex-ante determined and fixed during the credit period. Basic parameter are shown as follows: Coal consumption per ton $Ca(OH)_2$ during production is 0.17 t-ce/t $Ca(OH)_2$ (comes from the $Ca(OH)_2$ supplier) The detailed calculation see annex 3 in this PDD.
Any comment:	The contribution to the whole emission reductions is minor.

Data / Parameter:	*E*_ wastewater
Data unit:	tCO_2/t wastewater
Description:	CO_2 emission factor of per tonne wastewater during processing
Source of data used:	ex-ante calculated
Value applied:	0.0023
Justification of the choice of data or description of measurement methods and procedures actually applied:	For simplification, the value is ex-ante determined and fixed during the credit period. Basic parameter are shown as follows: Electricity consumption per ton wastewater during processing is 0.0025MWh/t wasterwater (comes from the operation record of Yingpeng Chemical) The detailed calculation see annex 3 in this PDD.
Any comment:	The contribution to the whole emission reductions is minor.

Data / Parameter:	*E*_Elec
Data unit:	[tCO_2/MWh]
Description:	CO_2 emission factor of the grid electricity (Eastern China Grid)
Source of data used:	Chinese Government calculation (09/08/2007) (http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1364.pdf)
Value applied:	0.90465 (fixed for first crediting period)
Justification of the choice of data or description of measurement methods and procedures actually applied:	Combined margin method specified in ACM0002 is applied: $E\_Elec = (EF_{OM} + EF_{BM}) / 2 = (0.9421 + 0.8672) / 2 = 0.90465$ [tCO_2/MWh]. The detailed calculation see annex 3 in this PDD.
Any comment:	The contribution to the whole emission reductions is minor.

Data / Parameter:	*B*_HFC23 (or *r* = *B*_HFC23 / *Q*_HFC23$_y$)
Data unit:	tHFC23/yr (or no dimension)
Description:	Baseline quantity of HFC 23 to be destroyed by the regulation in China
Source of data used:	Chinese Environmental Regulations
Value applied:	0
Justification of the choice of data or description of measurement methods and procedures actually applied :	There is no regulation in China to limit HFC23 emissions.
Any comment:	None

B.6.3 Ex-ante calculation of emission reductions:

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Ex ante estimation of the project emissions, leakage, and the baseline emissions in a typical year are as follows. The detailed calculation of the related emission factors sees Annex 3.

Project Emissions

Quantitatively, the amount of project emissions is estimated preliminary as

$$PE_y = ND\_HFC23_y * GWP\_HFC23 + Q\_LPG_y * E\_LPG + Q\_HFC23_y * EF$$

$$= 0.001\% * 672.478[tHFC23/yr] * 11{,}700\ [tCO_2e/tHFC23] + 168120\ [Nm^3/yr] * 0.00747\ [tCO_2/Nm^3] + 672.478\ [tHFC23/yr] * 0.62857\ [tCO_2/tHFC23]$$

$$= (78.7 + 1255.8 + 422.7)\ [tCO_2e/yr]$$

$$= 1{,}757\ [tCO_2e/yr] \qquad (8)$$

on an *ex ante* basis.

It is noted that this figure is much smaller than the uncertainty level of the whole emission reductions.

Leakage

Quantitatively, the amount of leakage is estimated preliminary as

L_y = Q_Elec$_y$ * E_Elec + Q_Steam$_y$ * E_Steam + Q_ $NAOH_y$ * E_ $NAOH$ +
Q_ Ca(OH)$_{2\,y}$ * E_ Ca(OH)$_2$ + Q_sludge$_y$ * E_sludge + Q_wastewater$_y$ * E_wastewater
= 168 [MWh/yr] * 0.90465 [tCO_2/MWh] + 400 [tSteam/yr] * 0.305 [tCO_2e/tSteam]
+ 96 [t NaOH] * 2.03863 [tCO_2e/t NaOH]+ 1183 [t Ca(OH)$_2$]* 0.3394 [tCO_2e/t Ca(OH)$_2$]
+ 1154 [t sludge]*0.0057 [tCO_2e/t sludge]+35136 [t wastewater] *0.0023 [tCO_2e/t wastewater]
= 152 + 122 + 195.7 + 401.5 + 6.6 + 80.8 [tCO_2e/yr] = 959 [tCO_2e/yr] (9)

on an *ex ante* basis. See the details in Annex 3.

It is noted that this figure is much smaller than the uncertainty level of the whole emission reductions.

Baseline Emissions

As shown in Section B.6.1., the amount of baseline emissions is capped by

$BE_y \leq$ Q_HCFC22$_y$ * 2.89% * 11,700
= 23,269.14 [tHCFC22/yr] * 0.0289 [tHFC23/tHCFC22] * 11,700 [tCO_2e/tHFC23]
= 7,867,993 [tCO_2e/yr] (10)

The equal relation above is the estimation of the baseline emissions in a typical year.

Emission Reductions

$ER_y = BE_y - PE_y - L_y$
= 7,867,993 [tCO_2e/yr] –1,757 [tCO_2e/yr] – 959 [tCO_2e/yr]
= 7,865,277 [tCO_2e/yr]

Where, ER_y is the total emission reductions of the project activity in the given year *y*, measured in tons of CO_2 equivalent.

B.6.4 Summary of the ex-ante estimation of emission reductions:

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Year	Estimation of project activity emissions (t CO_2e)	Estimation of baseline emissions (t CO_2e)	Estimation of leakage (t CO_2e)	Estimation of overall emission reductions (t CO_2e)
Oct 1st 2008—Dec 31st 2008	439	1,966,998	240	1,966,319
2009	1,757	7,867,993	959	7,865,277
2010	1,757	7,867,993	959	7,865,277

2011	1,757	7,867,993	959	7,865,277
2012	1,757	7,867,993	959	7,865,277
2013	1,757	7,867,993	959	7,865,277
2014	1,757	7,867,993	959	7,865,277
Jan 1st 2015—Sept 31th 2015	1,318	5,900,995	719	5,898,958
Total over crediting period (tCO_2e)	12,299	55,075,951	6,713	55,056,939
Total number of crediting years	7 yeas of each period (3 crediting periods in total)			
Annual average over the crediting period (tCO_2e)	1,757	7,867,993	957	7,865,277

The emission reductions of second and third crediting period are the same as that of the first crediting period in total.

B.7 Application of the monitoring methodology and description of the monitoring plan:

B.7.1 Data and parameters monitored:

Data / Parameter:	q_HFC23_y
Data unit:	kg-HFC23
Description:	Quantity of HFC23 flow supplied to the destruction process in year y
Source of data to be used:	Measurement based on gas flow meter.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	23269.14*2.89%*1000 = 672,478 Historical maximum annual HCFC 22 production and the minimum rate in the last 3 years of operation between 2002 and 2004 are applied to calculate $q\_HFC\ 23_y$ in the case of no actual monitoring data.
Description of measurement methods and procedures to be applied:	Measured by two flow meters in series. Under normal operation, both flow meters measure the same amount of HFC23 flows simultaneously. For the sake of conservativeness the lower value of the two readings will always be used to estimate the HFC 23 waste flows. The monthly quantity of HFC 23 waste flows (q_HFC23_m) is the sum of the lower periodic reading of at least two meters, as follow: $q\_HFC23_m = \sum_{t\text{-number of period in a month}} \min_m [q\_HFC23_{1,t}, q\_HFC23_{2,t}]$
QA/QC procedures to be applied:	The flow meters will be calibrated every six months by an officially accredited entity (for example: ZJIM). The zero check on the flow meters will be conducted every week. If the zero check indicates that flow meter is not stable, and immediate calibration of the flow meter will be undertaken. If the flow meter readings differ by greater than twice the claimed accuracy (for example 10% if the accuracy is claimed to be ±5%), the reason for the discrepancy is investigated

	and the fault remedied.
Any comment:	Monthly recorded, electronically archived. The precision of the meter is ±0.35%.

Data / Parameter:	P_HFC23_y
Data unit:	%
Description:	Purity of HFC23 supplied to the destruction process in year y
Source of data to be used:	Gas chromatography analysis
Value of data applied for the purpose of calculating expected emission reductions in section B.5	100 Assumed because the amount of the HFC23 is calculated based on the mass balance method.
Description of measurement methods and procedures to be applied:	Measured monthly by sampling by using gas chromatography analysys.
QA/QC procedures to be applied:	Periodic calibration as specified by internationally accepted procedures.
Any comment:	Monthly recorded, electronically archived.

Data / Parameter:	Q_LPG_y
Data unit:	Nm^3
Description:	Quantity of LPG consumed by the destruction process in year y
Source of data to be used:	Gas flow meter
Value of data applied for the purpose of calculating expected emission reductions in section B.5	168120 The feasibility study report of the proposed project.
Description of measurement methods and procedures to be applied:	Measured by gas flow meter
QA/QC procedures to be applied:	LPG purchase and consumption records as well as the invoices for purchase LPG are used as cross-check proofs.
Any comment:	Monthly recorded, electronically archived.

Data / Parameter:	ND_HFC23_y
Data unit:	kg-HFC23
Description:	Quantity of un-decomposed HFC23 in stack gaseous effluent in year y
Source of data to be used:	Gas chromatography Monitoring system of the stack effluent gases
Value of data applied for the purpose of calculating expected	0.001%* q_HFC23_y The quantity of HFC23 not destroyed (ND_HFC23y) is typically small. Because the floor level of uncertainty of gas chromatography is 0.0003% in Yingpeng Chemical

emission reductions in section B.5	Co., Ltd., in order to be conservative, we assume ND_HFC23y =0.001%* q_HFC23$_y$ = 0.001%*672,478 = 6.725
Description of measurement methods and procedures to be applied:	During the thermal oxidizer operation (especially when it stops), analysis of the effluent gas is done to check the leaked HFC23 by sampling.
QA/QC procedures to be applied:	Its quality can be ensured through an internal audit procedure. One analyst is responsible for sampling and analyzing, and the other for checking the results.
Any comment:	Monthly recorded, electronically archived.

Data / Parameter:	Q_HCFC22$_y$
Data unit:	t-HCFC22
Description:	The quantity of HCFC 22 produced in the plant in year y
Source of data to be used:	Measured by the weight meter
Value of data applied for the purpose of calculating expected emission reductions in section B.5	23,269.14 (historical record of 2004)
Description of measurement methods and procedures to be applied:	Checked by the production record monthly and aggregately yearly
QA/QC procedures to be applied:	All weighing concerned equipment will be calibrated according to Chinese national regulation and standards. The documents, such as inventory records and sales information, are used as cross-check proofs.
Any comment:	Reference data to check cut off condition and rough estimation of Q_HFC 23$_y$ Monthly recorded, electronically archived

Data / Parameter:	Q_HCFC22$_{y,max}$
Data unit:	t-HCFC22
Description:	Maximum annual production of HCFC 22 at the originating plant that is eligible for crediting.
Source of data to be used:	Production record of HCFC22.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	23,269.14 (historical record of 2004)
Description of measurement methods and procedures to be applied:	The lower value between the actual HCFC 22 annual production (Q_HCFC 22$_y$) and the maximum historical annual production level during any of the last three years between 2000 and 2004 (Q_HCFC 22$_{Hist}$).
QA/QC procedures to be applied:	Will be obtained from production records of the facility where the HFC 23 waste originates.

Any comment:	Yearly recorded, electronically archived

Data / Parameter:	$HFC23\_sold_y$
Data unit:	t-HFC23
Description:	HFC23 sold by the facility generating the HFC23 waste in year y
Source of data to be used:	Measured by the flow meter
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0, because there are no sales records of HFC23 in 2000-2004. According the historical sales records, $HFC23\_sold_{2005}$ = 68 tons, $HFC23\_sold_{2006}$ = 0 tons, $HFC23\_sold_{2007}$ = 0 tons. HFC23 will be entirely decomposed while the proposed project is in operation.
Description of measurement methods and procedures to be applied:	Metered automatically, recorded monthly and aggregately yearly.
QA/QC procedures to be applied:	Cross checked from the production and sales records
Any comment:	Reference data to check cut-off condition and rough estimation of Q_HFC23_y, electronically archived

Data / Parameter:	Q_Elec_y
Data unit:	MWh/yr
Description:	Electricity consumption by decomposition process in year y
Source of data to be used:	Wattmeter
Value of data applied for the purpose of calculating expected emission reductions in section B.5	168 MWh/yr (feasibility study report)
Description of measurement methods and procedures to be applied:	Measured by monthly recording
QA/QC procedures to be applied:	Double-checked by power purchase record.
Any comment:	Non-significant variable.

Data / Parameter:	Q_Steam_y
Data unit:	t Steam/yr
Description:	Steam consumption by decomposition process in year y
Source of data to be used:	Meter
Value of data applied for the purpose of	400 tSteam/yr (feasibility study report)

calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	Direct measurement by a meter with automatic recording
QA/QC procedures to be applied:	Double checked by coal consumption data
Any comment:	Non-significant variable.

Data / Parameter:	Q_NaOH$_y$
Data unit:	t NaOH/yr
Description:	NaOH consumption for neutralization processing in year y
Source of data to be used:	flow meter
Value of data applied for the purpose of calculating expected emission reductions in section B.5	96 t NaOH/yr (feasibility study report)
Description of measurement methods and procedures to be applied:	Measured by flow meter, summed monthly
QA/QC procedures to be applied:	Double checked by NaOH purchase invoice
Any comment:	Non-significant variable.

Data / Parameter:	Q_ Ca(OH)$_{2y}$
Data unit:	t Ca(OH)$_2$/yr
Description:	Ca(OH)$_2$ consumed by wastewater processing from this project in year y
Source of data to be used:	Weight meter
Value of data applied for the purpose of calculating expected emission reductions in section B.5	1183 t Ca(OH)$_2$/yr (feasibility study report)
Description of measurement methods and procedures to be applied:	Q_ Ca(OH)$_{2y}$ = Q_ Ca(OH)$_{2total,y}$ *(Q_wastewater$_y$ / Q_wastewater$_{total,y}$) Where, Q_ Ca(OH)$_{2total,y}$ is the total Ca(OH)$_2$ consumed by wastewater processing plant in year y, measured by weight meter, summed monthly; Q_wastewater$_y$ is wastewater generated by decomposition process in year y, measured by flowmeter meter, summed monthly; B is the total wastewater processed by the wastewater processing plant in year y, measured by flowmeter meter, summed monthly.

QA/QC procedures to be applied:	Double checked by $Ca(OH)_2$ purchase invoice
Any comment:	Non-significant variable.

Data / Parameter:	Q_sludge_y
Data unit:	t sludge/yr
Description:	sludge generated by wastewater processing from this project in year y
Source of data to be used:	Weight meter
Value of data applied for the purpose of calculating expected emission reductions in section B.5	1154 t sludge/yr (feasibility study report)
Description of measurement methods and procedures to be applied:	$Q\_sludge_y = Q\_sludge_{total,y} *(Q\_wastewater_y / Q\_wastewater_{total,y})$ Where, $Q\_sludge_{total,y}$ is the total sludge generated from wastewater processing plant in year y, measured by weight meter for every transportation, summed monthly; $Q\_wastewater_y$ is wastewater generated by decomposition process in year y, measured by flowmeter meter, summed monthly; $Q\_wastewater_{total,y}$ is the total wastewater processed by the wastewater processing plant in year y, measured by flowmeter meter, summed monthly.
QA/QC procedures to be applied:	
Any comment:	Non-significant variable.

Data / Parameter:	$Q\_wastewater_y$
Data unit:	t wastewater/yr
Description:	Wastewater generated by decomposition process in year y
Source of data to be used:	Flow meter
Value of data applied for the purpose of calculating expected emission reductions in section B.5	35136 tWastewater/yr (feasibility study report)
Description of measurement methods and procedures to be applied:	Measured by flowmeter meter, summed monthly
QA/QC procedures to be applied:	
Any comment:	Non-significant variable.

Data / Parameter:	*NCV*_LPG
Data unit:	kJ/ kg
Description:	Net caloric value of LPG consumed by the destruction process in year y

Source of data to be used:	The latest publication of China Statistical Yearbook
Value of data applied for the purpose of calculating expected emission reductions in section B.5	50179kJ/ kg (China Statistical Yearbook 2006)
Description of measurement methods and procedures to be applied:	
QA/QC procedures to be applied:	
Any comment:	Non-significant variable.

Data / Parameter:	*EF*_LPG
Data unit:	tCO_2/TJ
Description:	Emission factor of LPG consumed by the destruction process in year y
Source of data to be used:	The latest publication of IPCC
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Carbon content of LPG is 17.2 t C/TJ (2006 IPCC Guidelines) So, *EF*_LPG = 17.2 * 44/12 = 63.1 tCO_2/TJ
Description of measurement methods and procedures to be applied:	
QA/QC procedures to be applied:	
Any comment:	Non-significant variable.

Data / Parameter:	*NCV*_diesel
Data unit:	TJ/k-tonne
Description:	Net caloric value of diesel in year y
Source of data to be used:	The latest publication of IPCC
Value of data applied for the purpose of calculating expected emission reductions in section B.5	43.33 TJ/k-tonne (2006 IPCC Guidelines)
Description of measurement methods and procedures to be applied:	

QA/QC procedures to be applied:	
Any comment:	Non-significant variable.

Data / Parameter:	*EF*_diesel
Data unit:	tCO_2/TJ
Description:	Emission factor of diesel in year y
Source of data to be used:	The latest publication of IPCC
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Carbon content of diesel is 20.2 tC/TJ (2006 IPCC Guidelines) So, *EF*_diesel = 20.2 * 44/12 = 74.1 tCO_2/TJ
Description of measurement methods and procedures to be applied:	
QA/QC procedures to be applied:	
Any comment:	Non-significant variable.

B.7.2 Description of the monitoring plan:

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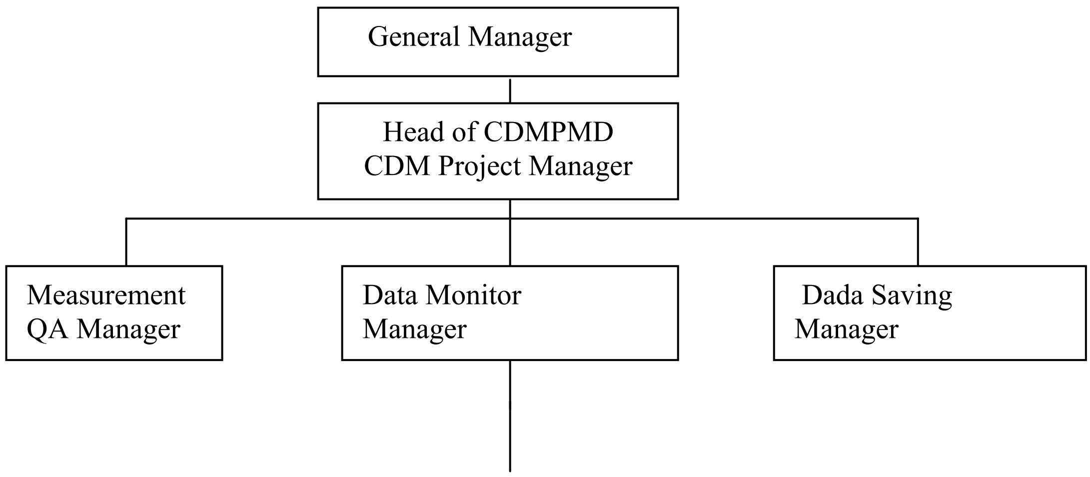
The monitoring plan (MP) defines a standard against which the project performance in terms of its greenhouse gas (GHG) reductions and conformance with relevant Clean Development Mechanism criteria will be monitored and verified. It is therefore a tool to help coordinate all the monitoring requirements for generating certified emission reductions from the proposed project. The implementation of the MP will ensure the emission reductions generated by the project can be tracked.

An independent institution of operation and management for CDM project (CDMPMD, i.e. CDM Project Management Department) will be formed, and directed by the General Manager of Yingpeng Chemical Co., Ltd. Its operation and management framework is shown in the following Figure:



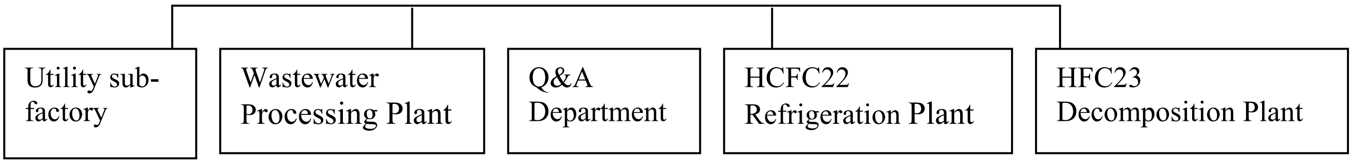


Figure 4 Organizational Structure of Monitoring Management and Operational System

Monitoring and Reporting Procedure

The HFC23 Decomposition Plant takes charge of the implementation of the HFC23 decomposition process, its operators of each shift will record the monitoring data both electronic and paper-based, and the shift heads should check the records to ensure their accuracy, and reported these data to the CDMPMD daily.

Others departments, such as HCFC22 Refrigeration Plant, Utility Sub-factory, Wastewater Processing Plant, Q&A department, and etc. will provide related data and information to the CDMPMD monthly.

The data monitor manager of CDMPMD takes charge of collecting the monitoring data and other supporting information day to day, and reported to the Head of CDMPMD weekly. The CDMPMD reports to the General Manager monthly, and prepares the monitoring report to DOE for verification every two month.

The monitoring parameters are classified into the following two types by data acquisition approach:

(1) Automatic Transfer by DCS

The parameters transferred automatically by DCS include:

- ✓ q_HFC23_y
- ✓ Q_steam_y
- ✓ Q_LPG_y
- ✓ $Q\_wastewater_y$
- ✓ Q_NaOH_y
- ✓ $Q\_HFC23\_pipe_y$
- ✓ $Q\_HFC23\_storage\_in_y$
- ✓ $Q\_HFC23\_storage\_out_y$
- ✓ $Q\_HFC23\_tail\ gas_y$

They are monitored by the electronic metering instruments and the signal is sent automatically to the DCS control room. DCS can automatically produce a daily report. A procedure for archiving DCS data in a secure and retrievable manner, e.g. regular data file backup and screen capture of monthly meter readings.

(2) Manual Transfer

The parameters transferred manually include:

- ✓ p_HFC23_y, analyzed using gas chromatography;
- ✓ ND_HFC23_y, analyzed using gas chromatography;
- ✓ Q_HCFC22_y, comes from the production records;
- ✓ Q_Elec_y, comes from the electricity meter records;
- ✓ $HFC23_y\_sold$, comes from the HFC23 production and sales record;
- ✓ $Q\_Elec\_wastewater_y$, comes from the electricity meter records;
- ✓ Q_sludge_y, comes from the wastewater processing records;
- ✓ $Q\_\ Ca(OH)_{2y}$, comes from the wastewater processing records.

Their daily/monthly data report are produced manually, and integrated with DCS data into the monthly report on the relevant parameters in determining the emission reduction.

Monitoring and Metering Instruments

Monitoring and metering instruments	Location	Objective of monitoring and metering	Precision
Mass flowmeter	On the pipe of HFC23 waste gas in front of the incinerator.	q_HFC23_y Quantity of HFC23 supplied to the destruction process	±0.35%
Mass flowmeter	At the main pipe of HFC23 from HCFC22 facility before mix-point with HFC23 from the storage tanks	$Q\_HFC23\_pipe_y$ Quantity of HFC23 generated directly from the HCFC22 production facility to incinerator	±0.35%
Mass flowmeter	At the inflow pipe of the storage tanks for HFC23	$Q\_HFC23\_storage\_in_y$ Quantity of HFC23 inflow into the HFC23 storage tanks	±0.35%
Mass flowmeter	At the outflow pipe of the storage tanks for HFC23	$Q\_HFC23\_storage\_out_y$ Quantity of HFC23 outflow into the HFC23 storage tanks	±0.35%
Mass flowmeter	At the exhausted chamber of HFC23 decomposition facility	$Q\_HFC23\_tail\ gas_y$ Quantity of un-decomposed HFC23 in the tail gas	±1.5%
Pressure difference flowmeter	At the pipe of steam inflow in front of the incinerator	Q_steam_y Steam consumption by the destruction process	±1.5%
Flow meter	At the pipe of LPG inflow, in front of the incinerator	Q_LPG_y LPG consumption by the destruction process	±1.5%
Flow meter	At the pipe of NaOH inflow, in front of the incinerator	Q_NaOH_y NaOH consumption by the neutralization process	±2.5%
flow meter	At the pipe of wastewater outflow form HFC23 decomposition facility	$Q\_wastewater_y$ watewater generated from HFC23 decomposition facility	±0.5%
Electricity meter	On-site of HFC23 decomposition facility	Q_Elec_y electricity consumption for HFC23 decomposition	2.0 level
platform balance	On-site of wastewater process	$Q\_\ Ca(OH)_{2,total,y}$	GB level Ⅲ

		$Ca(OH)_2$ consumption in the wastewater processing plant	
platform balance	On-site of wastewater process	*$Q\_sludge_{total,y}$* Sludge generated from the wastewater processing plant	GB level III
Electricity meter	On-site of wastewater process	$Q\_Elec_{total,y}$ electricity consumption for the wastewater processing plant	2.0 level
flow meter	At the pipe of outflow from the wastewater processing plant	*$Q\_wastewater_{total,y}$* watewater processed by the wastewater processing plant	±0.5%
Weight meter	On-site in the HCFC22 production plant	Q_HCFC22_y The quantity of HCFC22 production	GB level III

Calibrations and Maintenance of Instruments

1. Calibration and Zero Check

According to AM0001/Version 5.2, the calibration of flow meters for measuring the quantity of HFC23 supplied to the thermal destruction process will be done every six months by an officially accredited entity. The zero check of these flow meters will be conducted every week and documented for DOE verification purpose. The full calibration of mass flow meters is conducted by the officially accredited entity, such as ZJIM, and zero check is done by Yingpeng Company.

2. Testing

The other measurement instruments are tested periodically according to the national required frequency.

3. Troubleshooting Procedures

When the malfunction of instruments occurs, the operators will immediately report the problem to the measurement QA manager, and this manager will inform the Metering Working Unit to fix the instruments and record the results. If the Metering Working Unit can not resolve the problem, the suppliers will be responsible for it during the quality guarantee period.

When small equipments fail to run properly, the factory will be shut down temporarily to fix them. For large equipments, such as incineration system, the overhaul should be done once each year.

Data Management and improvement

A computer system saves and archives the data collected during monitoring process. The monitoring personnel are primarily responsible to manage the computer system and to save data also in hard copy. If the Designed Operational Entity (DOE) makes a reasonable request for information not directly related to the proposed project, Yingpeng Chemical Co., Ltd. is responsible for its provision provided that certain confidentiality is secured and, furthermore, it should be archived in the data management system.

Paper information, for example maps, tables, and governmental approval on environmental impact report, is utilized to supplement the monitoring, in order to verify credibility of the saved information.

Yingpeng Chemical Co., Ltd. has established ISO management system through acquiring the certificates of ISO 9000 and ISO14000. These two updated certificates were issued in 2006. As part of Yingpeng Chemical Co., Ltd.'s platform, Yingpeng Chemical Co., Ltd. will also implement the aforementioned environmental management systems, and enlarge their applicable scopes to cover the project activity after the proposed project is implemented.

Training

The personnel that interact with monitoring will be trained to acquire comprehensive knowledge with regards to general and technical aspects of CDM project. And the monitoring equipment supplier will provide relevant instruction on installation, operation, maintenance and calibration.

B.8 Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies)

>>

Details of the information/data to calculate baseline and project emissions are shown in Annex 3.

The date of completion of the baseline study (current version): 30/10/2006
The contact information of the person who developed the PDD:

Mr. Ding Zhaoming
China Carbon Technology Co., Ltd. (*)
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Fax: (8610) 66575558
E-mail: *dingzm1@gmail.com*

Dr. Naoki Matsuo
Climate Experts Ltd. (*)
E-mail: *n_matsuo@climate-experts.info*

(*) The above individuals or organizations are not the project participants.

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:

>>

07/11/2006

The construction of the project activity was been put on records by the Yongkang development and reform bureau on November 07th 2006.[7]

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

>>

25 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:

>>

01/10/2008

C.2.1.2. Length of the first crediting period:

>>

7 years (to be renewed up to 21 years in total)

C.2.2. Fixed crediting period:

Not applicable.

C.2.2.1. Starting date:

>>

Not applicable.

C.2.2.2. Length:

>>

Not applicable.

[7] Notice for infrastructure construction issued by the Yongkang development and reform bureau on November 07th 2006, No. 229 Yongfashebei[2006]

SECTION D. Environmental impacts

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D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

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Environment situation & environmental protection objectives of this project:

This project site is located at the Southern part of Yingpeng Chemical Co., Ltd., which is in the Western part of Yongkang city and the lower stream of wind and the river of this city. Waste gases and water emitted from this project have a major impact on the lower stream of wind of Yingpeng Chemical Co., Ltd. and the downstream water body of Zhangdian Section of the Yongkang River, but only have little impact on the Yongkang City area.

The employee dormitory of Yongkang Chemical Co., Ltd. is located at about 250 m to the Eastern part of the plant, and 1000 m further more is the Duantou Village. Beitou Village is located at about 500 m to the South of the plant. Shangyangguan Village is located at about 1000 m to the south-western part of the plant, and about 1500 m of north-western part is Shidongxia Village. To the south-western part of the plant is the western city industrial area. Qiaopeng Chemical Co., Ltd. is located at the north-western part of the plant. The office building and the thermal meter plant of Yingpeng Chemical Co., Ltd., the Zhongheng Locks Company and some other machinery plants are situated to the North of Yingpeng Chemical Co., Ltd. According to above situations, the environment protection objectives of this project are set as follows:

1) Environmental protection objectives of water

The wastewater is disposed to the Yongkang River after the treatment. The water quality from the discharge point to the Tongqin Bridge in downstream of Yongkang River can meet the requirements of the Category III standard in the "National Standards of Surface Water Quality" (GB3838-2002).

2) Environmental protection objectives of air and noise

The air quality in some key environmental sensitive places like the employee dormitory of Yongkang Chemical Co., Ltd., Duantou Village, Shanbeitou Village and Shangyangguan Village can meet the requirements of the Level II standard in the "National Standards of Air Quality" (GB3095-1996). The noise quality can meet the requirements of the Category III standard in the "National Standard of Noise at the Boundary of Industrial Enterprises" (GB12348-90), *i.e.*, 65dB during day time and 55dB at night.

Environmental quality in adjacent area of this project:

According to the monitoring results, Yongkang City has a very good air quality in 2004. Key indicators, such as SO_2, NO_2, PM_{10}, are all better than the level II standard of the "National standard of air quality"(GB3095-1996).

The effusion fluoride and HCl of Yingpeng Chemical Co., Ltd. can meet the requirement of the level II standard of the “National standard of air pollutant emissions” (GB16297-1996) at 3 monitoring points in march 15, 2006.

According to the monitoring results in 2005, the water quality of Yongkang River, from Zhangdian section to Tongqin Bridge section, in particular indicators like oil and phosphate, fluoride could not meet the requirements of the Category III standard in the “National standard of surface water quality”.

Pollution emission and treatment:

The pollution emission and treatment after system commissioning is listed in the following table.

Pollutant	Name	Contents	Production	Treatment Method	Emission	Note
Waste gases	HF		679.4 t/a	Absorb process	0.04 t/a	Vented at 30 m high
		Effluence	0.05 t/a		0.05 t/a	
	Fluoride	Effluence	0.1 t/a	Improve airproof	0.1 t/a	
	HCl		6.7 t/a	Absorb process	0.06 t/a	Vented at 30 m high
Waste water	Total		35136 t/a	Wastewater treatment	35136 t/a	Achieve the emission standard
	CODcr		10.54 t/a	Wastewater treatment	2.0 t/a	Achieve the emission standard
	F^-		645.36 t/a	Wastewater treatment	0.105 t/a	Achieve the emission standard

Basis results of environment assessment:

1) After the system commissioning, HF emission is 0.04 t per year, Its emission rate is 5.56X10^{-3}kg/h and its emission concentration is 0.0058 mg/m^3, accounting for 0.94% and 0.06% respectively of the HF in the new pollution sources of Level II standard in the “National standard of air quality pollutant emissions”. According to the assessment, in the main wind situation of D category, the maximal concentration of HF on the ground is 0.0001 mg/m^3 in the area 282 m far from the venting chimney; in the static wind situation of D category, the maximal concentration of HF on the ground is 0.0001 mg/m^3, near the venting chimney. There is no negative environmental impact, if it overlays with the maximum background concentration of HF.

2) The workshop area of this proposed project is about 1500m^2, the effluence speed of HF is 0.007 kg/h, the protection distance is 69 m and lower than 100 m of the technical standard distance, which means it has no obvious effects on people in the plant and residents nearby. However, when accidental effluence occurs, in the static wind situation of D category, there will be no large range and long time impact, it will be recovered in sort time after the accidental disposal in influence area. Therefore, the protection measures and counter-measures are very important for this project.

3) The total emission of waste water of this project accounts for 22.63% of all the waste water of Yingpeng Chemical Co., Ltd. The emission of key pollutants, such as CODcr and Fluoride accounts for 22.61% and 21% of that of Yingpeng Chemical Co., Ltd., respectively. According to the assessment, after commissioning of this project, the Fluoride concentration of wastewater in the Yongkang River will rise from 2.54 mg/L to 2.5402 mg/L, only 0.0079% increase of Fluoride, and only has very limited impact on the water environment.

D.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:

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According to the Environmental Impact Assessment Report, the environment impact of this proposed project is very low.

SECTION E. Stakeholders' comments

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

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Way of investigation:

To get stakeholders' comment in this area, Yingpeng Chemical conducted an investigation in February and March of 2006. The objects of this investigation have been selected according to the content and result of the Environment Impact Assessment Report (EIAR), including organizations and individuals. The organizations are mainly the local government office and companies in this area, and the individuals are mainly the residents, representative of families and companies which could be influenced by this project. The investigation was carried out by questionnaires and visits to the individuals and collect their opinions.

Purpose and content of the investigation:

The objective of this investigation is to get the recognition of situation, key problems and satisfaction of environment in this area by stakeholders, to get opinions and environmental requirements for this project. The investigation includes organization opinion and individual opinion. The main contents of investigation are as follows:

1) Awareness of this project by stakeholders;
2) Understanding of stakeholders on the economic and social development impact of this project;
3) Understanding of stakeholders on the environment situation in this area;
4) Attitude of stakeholders on the environmental impact of this project;
5) Assessment of stakeholders on the potential impact of this project on their lives;

6) Whether stakeholders support this project;
7) Opinions and suggestions of stakeholders for this project.

Investigated stakeholders:

This investigation received 16 questionnaires from organizations and 40 questionnaires from individuals. The objectives of the investigation are very typical and representative among the stakeholders, the detailed information is listed in the follow table.

Consulted organizations

	Private	Public	Total
Number	13	3	16
Ratio (%)	81.25	18.75	100

Consulted individuals

	Category	Number of people	Ratio (%)
Age (years)	< 30	9	22.5
	30–40	9	22.5
	> 40	22	55
Organization character	Village, Company	28	70
	Institution	12	30
Education degree	Elementary school	5	12.5
	Junior high school	10	25
	Senior high school	7	17.5
	Junior college above	18	45
Occupation	Worker	4	10
	Farmer	36	90

Compilation method:

The comments of investigation were compiled by two categories - organization and individual, and summarize and analysis the comments from the organizations and individuals.

E.2. Summary of the comments received:

>>

Comments summary of stakeholders

	Response	Organization (16)	Individual (40)
Awareness of the project	Notified	3	3
	Know	13	30
	Never heard of		7
Impact on economic and social development	Very beneficial	11	26
	Beneficial	5	12
	Not clear		2
Impact on environment	Serious		
	Not serious	7	15
	No impact	9	22
	Not clear		3
Impact on their lives	Positive	11	10
	Negative		
	No influence	5	30
Whether support this project	Yes	16	40
	No		
Attitude for project location selection	Agree	16	40
	Move to other place		

According to investigation result, all organizations and 82.5% individuals know this project; 68.75% of organizations and 65% of individuals believe this project is very beneficial for the local economic and social development, 31.25% of organizations and 30% of individuals think that the project could be beneficial, 5% of individuals are not clear; As for the environment impact, 43.75% of organizations and 37.5% of individuals think that it's not serious, 56.25% of organizations and 55% of individuals think it's no impact, and 7.5% of individuals are not clear; As for impact on their lives, 68.75% of organizations and 25% individuals think it have positive influence, and 31.25% of organizations and 75% of individuals think that it has no impact; all organizations and individuals support this project and agree the project location selection.

Through this investigation activities, we recognized that a large part of organizations and individuals think this project will be beneficail to local economic, social employment and advancement of industry structure, while in the some time, they also hope the Yingpeng Chemical Co., Ltd. will accept the public opinions and well manage the pollutant disposal and environmental protection.

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

>>

During the investigations, Yingpeng Chemical Co., Ltd. explained the potential impact on air quality, water resource, soil, noise and other environment issues which are stakeholders' concern. Yingpeng also explained the pollutants disposal measures and effects, and introduced the main results and suggestion of EIAR.

The main stakeholders think this project is an environment sound project, and satisfied for the analysis and pollutants disposal measures of EIAR, they recognized that although there are some pollutants will be generated by this project, however it's relatively small comparing with the pollution emission in this area, and with tiny impact on the environment. They hope that Yingpeng Chemical can manage all pollutants well and protect the environment of this area in good quality.

Yingpeng chemical thanks key stakeholders trust, and will adopt their opinion and suggestion seriously, implement the role of pollutants disposal measure in EAIR strictly, doing better job for pollutants disposal and pollution prevent, and fully consider the local requirements and benefits, to support local economic and social development.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Yingpeng Chemical Co., Ltd.
Street/P.O.Box:	#69, Yonghua Road
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Represented by:	
Title:	
Salutation:	Mr.
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Represented by:	
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E-Mail:	
URL:	
Represented by:	
Title:	General Manager
Salutation:	Mr.
Last Name:	Richard
Middle Name:	
First Name:	Lee
Department:	
Mobile:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	richardlee@infinitycleanair.ie

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public fund is used for this project.

Annex 3

BASELINE INFORMATION

Key coefficients and assumptions:

Emission by the HFC23 decomposition process:

The key coefficients are as follows:

1) LPG consumption amount by decomposition process (Q_LPG_y):
   data from feasibility study report;
2) CO_2 emission factor of LPG burning (E_LPG_y):
   It is calculated, please refer to the following explanation (IV);
3) Un-decomposed HFC23 (ND_HFC23_y):
   It is typically small, because the floor level of uncertainty of gas chromatography is 0.0003% in Yingpeng Chemical Co., Ltd., in order to be conservative, ND_HFC23y =0.001%* Q_HFC23_y;
4) Decomposed quantity of HFC23 (Q_HFC23_y):
   please refer to the baseline part below;
5) CO_2 emission factor from HFC23 turn to CO_2 (EF):
   according to formula methodology, it equal to 0.62857.

Baseline:

The key coefficients for the calculation of the baseline emissions are as follows:

1) Emission reductions of HFC23 of baseline (B_HFC23_y):
   set as zero because there is no related regulations in China;
2) HFC23 emission quantity of baseline (*Q*_HFC23y):
   can be calculated by formula (5);

For the historical HCFC22 production records and the underlying technical data to calculate *w* by using the mass balance method is to be provided to the DOE at the time of validation. The result is as follows:

year	2002	2003	2004
HCFC22 production	15,115.37 ton	22,723.90 ton	23,269.14 ton
w based on C balance	3.32%	3.24%	3.17%
w based on F balance	3.83%	3.55%	2.89%
Average *w* based on mass balance	3.58%	3.39%	3.03%

Maximum of historical annual HCFC22 production during 2002–2004 [Cap of Q_HCFC22_y]	23,269.14 t HCFC22/yr (2004)

Lowest historical waste generation rate *w* during 2002–2004 (3%: max specified by AM0001/v.5.2)	2.89% (In order to be conservative, the *w* value based on F balance in 2004 is chosen)

Leakage:

The key coefficients for leakage are as follows:

1) Steam consumption amount in the decomposition process (Q_Steam_y):
Data from the feasibility study report;

2) CO_2 emission factor of steam (E_Steam_y):
The steam supply by Yingpeng Chemical Co., Ltd., emission factor can be calculated by related parameters. For detailed information, please see below;

3) Electricity consumption in the decomposition process (Q_Elec_y):
Data from the feasibility study report;

4) CO_2 emission factor of electricity (E_Elec_y):
The electricity supply by East China Electricity Grid, emission factor can be calculated by related parameters of this grid. For detailed information, please see below;

5) The quantity of wastewater generated in the decomposition process ($Q\_wastewater_y$):
Data from the feasibility study report;

6) CO_2 emissions of wastewater treatment generated in the decomposition process (*E_wastewater*):
For detailed information, please see below;

7) The quantity of sludge generated in the wastewater treatment (Q_sludge_y):
Data from the feasibility study report;

8) CO_2 emissions due to transport of sludge to a brick plant (*E_sludge*):
For detailed information, please see below;

9) The quantity of NaOH consumed in the neutralization processing (Q_NaOH_y):
Data from the feasibility study report;

10) CO_2 emissions of NaOH during e the production and transportation (*E_NaOH*):
For detailed information, please see below.

11) The quantity of $Ca(OH)_2$ consumed in the wastewater treatment ($Q\_ Ca(OH)_{2y}$):
Data from the feasibility study report;

12) CO_2 emissions of $Ca(OH)_2$ during e the production and transportation ($E\_ Ca(OH)_2$):
For detailed information, please see below.

List of Parameter and Data

	Variable	Value	Data Source
Baseline	1. w (HFC23/HCFC22 ratio)	2.89%	History record of Yingpeng Chemical Co., Ltd. (following

			methodology procedures)
Project	2. Q_HCFC_y (*)	23,269.14 t HCFC22/yr	History record (2004)
	3. GWP_HFC23	11,700	IPCC default value (SAR)
	4. Q_LPG_y (*)	168120 Nm^3	Feasibility study report
	5. *E*_LPG(*)	0.00747 tCO_2/Nm^3	Explanation (IV)
	6. *EF*	0.62857 t CO_2e/ t HFC23	AM0001 default value
Leakage	7. Q_Steam_y (*)	400 t Steam/yr	Feasibility study report
	8. *E*_Steam	0.305 t CO_2e/t-Steam	Explanation (I)
	9. Q_Elec_y (*)	168 MWh/yr	Feasibility study report
	10. *E*_Elec	0.90465 tCO_2/MWh	Explanation (II)
	11. $Q\_wastewater_y$ (*)	35136 t wastewater/yr	Feasibility study report
	12. *E*_wastewater	0.0023 tCO_2/t wastewater	Explanation (VII)
	13. Q_sludge_y(*)	1454 t_Sludge	Feasibility study report
	14. *E*_sludge(*)	0.0057 tCO_2/t	Explanation (III)
	15. Q_NaOH_y (*)	96 t NaOH/yr	Feasibility study report
	16. *E*_NaOH(*)	2.03863 tCO_2/t NaOH	Explanation (V)
	17. $Q\_Ca(OH)_{2y}$ (*)	1183 t $Ca(OH)_2$ /yr	Feasibility study report
	18. *E*_ $Ca(OH)_2$ (*)	0.3394 tCO_2/t $Ca(OH)_2$	Explanation (VI)

Parameters with asterisk (*) are to be revised after monitoring.

Explaination (I):

*E*_Steam calculation method:

The steam for this HFC23 decomposition process is provided by steam boiler of Yingpeng Chemical Co., Ltd., the related parameters are shown in the below table:

Parameter	Value	Data source
Coal consumption amount per unit steam	0.154 kg-ce/kg-steam	Operation record of Yingpeng Chemical
Heat value of coal	20.908 MJ/kg-ce	China Energy Statistic Yearbook
The carbon emission factor of coal	0.0946 kg-CO_2/MJ	IPCC default value

Therefore,

*E*_Steam = 0.154*20.908*0.0946 = 0.305 kg-CO_2e/ kg-steam = 0.305 t-CO_2e/t-Steam

Explanation (II):

*E*_Elec calculation method:

The AM0001/Version 5.2 does not provide calculation method of the emission factor of the grid electricity used by the project. In order to keep consistency between the CDM methodologies, the emission factor *E*_Elec is calculated by the combined margin method specified in ACM0002.

On 16/10/2006, Chinese Government provided the emission factors of each regional grid in China by using confidential information (http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1364.pdf). The PDD uses the information of Eastern China Grid emission factor from such calculation as a fixed value throughout the first crediting period:

$$E\_Elec = (EF_{OM} + EF_{BM}) / 2 = (0.9421 + 0.8672) / 2 = 0.90465 \ [tCO_2/MWh].$$

Explanation (III):

*E*_sludge calculation method:

The emission factor of waste transportation can be calculated by the following formula:

$$E\_sludge = q\_diesel * f\_diesel$$

where:

*q*_ diesel : the diesel consumption of transporting the wastes to a brick plant;

*f*_ diesel : CO_2 emission factor of diesel consumed by transporting the wastes.

The related parameters to calculate *q*_ diesel are shown in the table below:

Parameter	Value	Data source
Carrying capacity of transporting truck	10 tonne	Feasibility study report
Transportation distance of waste	80 km	Feasibility study report
Diesel consumption per unit distance	4 km/l	Feasibility study report
Proportion of diesel	0.888 kg/l	National fuel standard in China

Therefore,

*q*_ diesel = 1/10 * 80 / 4 * 0.888 kg-diesel/t-sludge = 0.001776 t-diesel/t-sludge

The related parameters to calculate *f*_ diesel are shown in the table below:

Parameter	Value	Data source
Heat value of diesel	43.33 TJ/k-tonne	IPCC default value
CO_2 emission factor of diesel	20.2 t-C/TJ	IPCC default value

Therefore,

*f*_ diesel = 43.33*20.2* (44/12)/10000 t CO_2/ t-diesel = 3.21 t CO_2/t-diesel

Thus,

*E*_sludge = q_ diesel * f_ diesel = 0.001776 * 3.21 t CO_2/t-sludge = 0.0057 t CO_2/t-sludge

Explaination (IV):

*E*_LPG calculation method:

The related parameters are shown in the below table:

Parameter	Value	Data source

Liquid LPG/Gasification LPG	2.36 kg-LPG/ Nm^3-LPG	Data provided by LPG supplier
Net caloric value of LPG	50179kJ/ kg	China Statistical Yearbook 2006
Carbon content of LPG	17.2 t C/TJ	2006 IPCC Guidelines

Therefore,

E_LPG = 2.36*50179*17.2*44/12/10^9 = 0.00747 tCO_2/ Nm^3

Explanation (V):

E_NaOH calculation method:

The emission factor of NaOH production and transportation can be calculated by the following formula:

E_ NaOH = q_ NaOH * f_ NaOH + E_Elec * EC_ NaOH

where:

q_ NaOH: the fuel consumption of NaOH transportation;
f_ NaOH: CO_2 emission factor of fuel consumed by NaOH transportation;
E_Elec: CO_2 emission factor of electricity consumed by NaOH production;
EC_ NaOH: Electricity consumption per ton NaOH during production, according *Technics Manual* published by Juhua Group Corperation, this value is 2.25MWh/t NaOH.

The related parameters to calculate q_ NaOH are shown in the table below:

Parameter	Value	Data source
Carrying capacity of transporting truck	30 tonne	Feasibility study report
Transportation distance of NaOH	100 km	Feasibility study report
Fuel consumption per unit distance	3 km/l	Feasibility study report
Proportion of diesel	0.888 kg/l	National fuel standard in China

Therefore,

q_ NaOH = 1/30 * 100 / 3 * 0.888 kg-diesel/t- NaOH = 0.000987 t-diesel/t- NaOH

The related parameters to calculate f_ NaOH are shown in the table below:

Parameter	Value	Data source
Heat value of diesel	43.33 TJ/k-tonne	IPCC default value
CO_2 emission factor of diesel	20.2 t-C/TJ	IPCC default value

Therefore,

f_ NaOH = 43.33*20.2* (44/12)/10000 t CO_2/ t-diesel = 3.21 t CO_2/t-diesel

Thus,

E_ NaOH = q_ NaOH * f_ NaOH + E_Elec * EC_ NaOH
= 0.000987 * 3.21 + 0.90465*2.25 t CO_2/t- NaOH = 2.03863 t CO_2/t- NaOH

Explanation (Ⅵ):

*E*_ $Ca(OH)_2$ calculation method:

The emission factor of $Ca(OH)_2$ production and transportation can be calculated by the following formula:

$$E\_Ca(OH)_2 = q\_Ca(OH)_2 * f\_Ca(OH)_2 + E\_coal * EC\_Ca(OH)_2$$

where:

- *q*_ $Ca(OH)_2$: the fuel consumption of $Ca(OH)_2$ transportation;
- *f*_ $Ca(OH)_2$: CO_2 emission factor of fuel consumed by $Ca(OH)_2$ transportation;
- *E*_coal: CO_2 emission factor of coal consumed by $Ca(OH)_2$ production;
- *EC*_ $Ca(OH)_2$: Coal consumption per ton $Ca(OH)_2$ during production, according to data provided by $Ca(OH)_2$ producer, this value is 0.17 t-ce/t $Ca(OH)_2$.

The related parameters to calculate *q*_ $Ca(OH)_2$ are shown in the table below:

Parameter	Value	Data source
Carrying capacity of transporting truck	30 tonne	Feasibility study report
Transportation distance of $Ca(OH)_2$	100 km	Feasibility study report
Fuel consumption per unit distance	3 km/l	Feasibility study report
Proportion of diesel	0.888 kg/l	National fuel standard in China

Therefore,

$$q\_Ca(OH)_2 = 1/30 * 100 / 3 * 0.888 \text{ kg-diesel/t- } Ca(OH)_2 = 0.000987 \text{ t-diesel/t- } Ca(OH)_2$$

The related parameters to calculate *f*_ $Ca(OH)_2$ are shown in the table below:

Parameter	Value	Data source
Net calorie value of diesel	43.33 TJ/k-tonne	IPCC default value
CO_2 emission factor of diesel	20.2 tC/TJ	IPCC default value

Therefore,

$$f\_Ca(OH)_2 = 43.33*20.2*(44/12)/10000 \text{ t } CO_2\text{/ t-diesel} = 3.21 \text{ t } CO_2\text{/t-diesel}$$

The related parameters to calculate *E*_coal are shown in the table below:

Parameter	Value	Data source
Heat value of coal	20.908 MJ/kg-ce	China Energy Statistic Yearbook
The carbon emission factor of coal	0.0946 kg-CO_2/MJ	IPCC default value

Therefore,

$$E\_coal = 20.908*0.0946 = 1.978 \text{ kg-}CO_2\text{e/ kg-ce} = 1.978 \text{ t-}CO_2\text{e/t-ce}$$

Thus,

$$E\_Ca(OH)_2 = q\_Ca(OH)_2 * f\_Ca(OH)_2 + E\_coal * EC\_Ca(OH)_2$$

= 0.000987* 3.21 + 0.17*1.978 t CO_2/t- $Ca(OH)_2$ = 0.3394 t CO_2/t- $Ca(OH)_2$

Explanation (VII):

*E*_ wastewater calculation method:

The emission factor of wastewater processing can be calculated by the following formula:

*E*_ wasterwater = *E*_Elec * *EC*_ wasterwater

where:

*E*_Elec: CO_2 emission factor of electricity consumed by wastewater processing;

*EC*_ NaOH: Electricity consumption per ton wastewater during processing, according to historical records of Yingpeng Chemical Co., Ltd., this value is 0.0025MWh/t wasterwater.

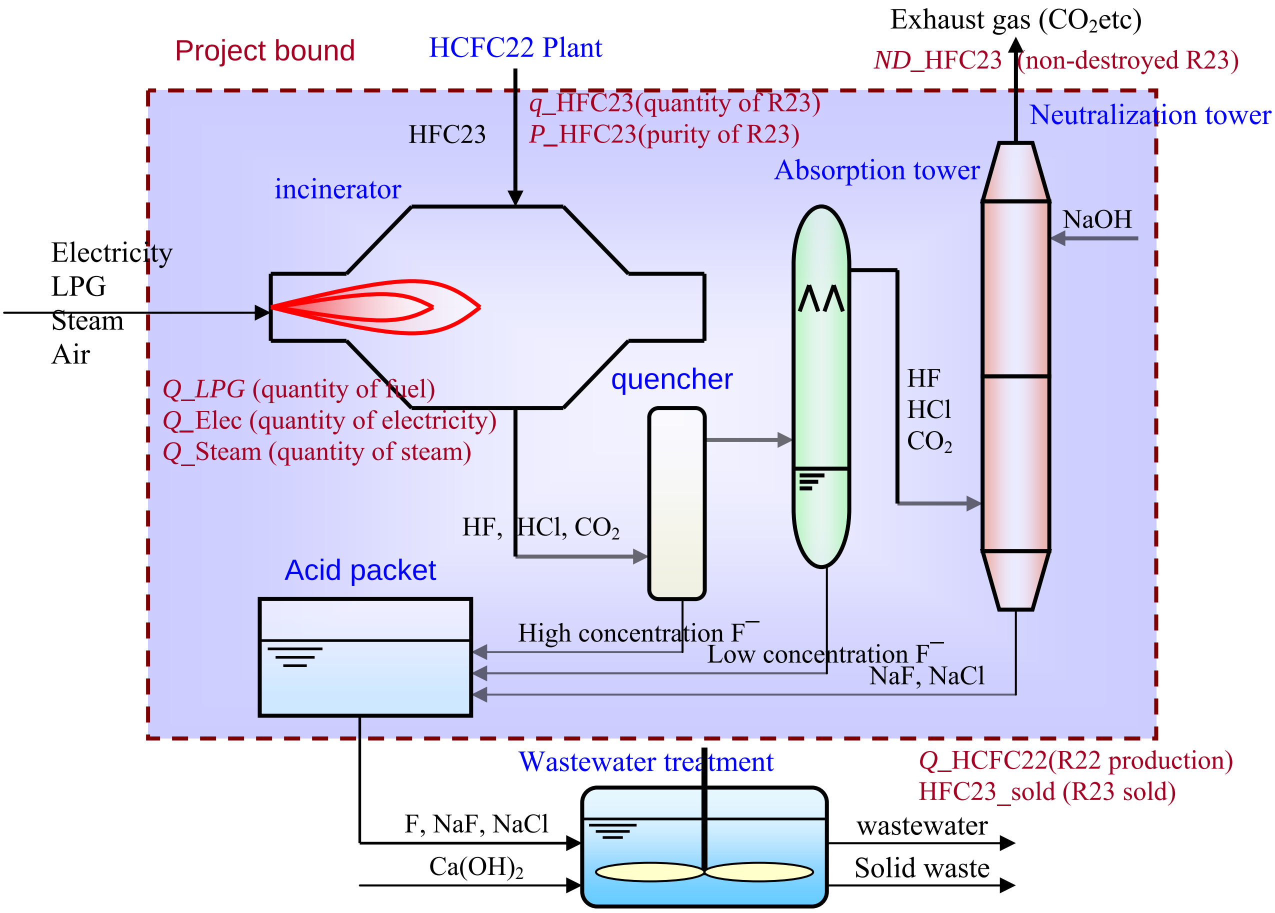
Therefore,

*E*_ wasterwater = 0.90465*0.0025 t-CO_2/t-wastewater = 0.0023 t-CO_2/t-wastewater

Annex 4
MONITORING INFORMATION

The following parameters in the following figure will be monitored:

1. *q*_HFC23*y*: The quantity of HFC23 to be supplied into the decomposition process;
2. *p*_HFC23$_y$: The purity of the HFC23 to be supplied into the decomposition process;
3. *Q*_LPG$_y$: The LPG consumption of HFC23 decomposition process;
4. *Q*_HCFC22$_y$: The quantity of HCFC22 production;
5. HFC23_sold$_y$: The quantity of HFC23 that will be sold;
6. *ND*_HFC23$_y$: The quantity of HFC23 not to be decomposed during the oxidation process;
7. *Q*_Steam$_y$: The steam consumption of the HFC23 decomposition process;
8. *Q*_Elec$_y$: The electricity consumption of the HFC23 decomposition process.
9. *Q*_NaOH$_y$: The NaOH consumption for the neutralization processing;
10. *Q*_Ca(OH)$_{2y}$: The Ca(OH)$_2$ consumption for the wastewater processing;
11. *Q*_sludge$_y$: The sludge generated by wasterwater processing in this project;
12. *Q*_wastewater$_y$: The wastewater generated in the decomposition process.



Annex 5

Calculation Spreadsheet of w value based on mass balance method

Data description	Data variable	Unit	Data source or calculation formula	Year 2004	Year 2003	Year 2002
Raw Material:						
Annual consumption of chloroform	$q_{chloroform}$	tonne	The historical production records	34234.63	33566.13	22740.65
Purity of chloroform	$p_{chloroform}$	%	The historical analysis data	99.99	99.99	99.99
Carbon in annual consumption of 100% chloroform	$q_{C\_chloroform}$	tonne	$q_{C\_chloroform} = q_{chloroform} * p_{chloroform} * M_C / M_{chloroform}$	3441.76	3374.56	2286.22
Annual consumption of HF	q_{HF}	tonne	The historical production records	12411.10	12225.21	8336.18
Purity of HF	p_{HF}	%	The historical analysis data	99.98	99.98	99.98
Fluorine in annual consumption of 100% HF	q_{F_HF}	tonne	$q_{F\_HF} = q_{HF} * p_{HF} * M_F / M_{HF}$	11788.19	11611.63	7917.79
Product:						
Annual output of HCFC22 production	q_{HCFC22}	tonne	The historical production records	23269.14	22723.90	15115.37
Purity of HCFC22	p_{HCFC22}	%	The historical analysis data	99.94	99.92	99.90
C in annual output of 100% HCFC22	q_{C_HCFC22}	tonne	$q_{C\_HCFC22} = q_{HCFC22} * p_{HCFC22} * M_C / M_{HCFC22}$	3228.02	3151.75	2096.04
F in annual output of 100% HCFC22	q_{F_HCFC22}	tonne	$q_{F\_HCFC22} = q_{HCFC22} * p_{HCFC22} *2* M_F / M_{HCFC22}$	10222.06	9980.54	6637.47
Byproduct: HCL acid						
Quantity of HCL acid	$q_{HCL\ acid}$	T	The historical production records	61360.72	59922.92	39859.23
The density of HCL acid	$d_{HCL\ acid}$	g/cm3	Based on the average temperature 25℃ and concentration of HCL 32%.	1.14	1.14	1.14
The saturation solubility of HCFC22 in HCL acid	$s_{HCFC22\_in\_acid}$	%	Page 40 of Product Manual for Fluoration Chemical Industry issued by National Scientific Research Center of Application Chemistry of Russia).	0.32	0.32	0.32
Carbon in HCFC22 solublized in HCL acid	$q_{C\_HCL\ acid}$	tonne	$q_{C\_HCLacid} = q_{HCLacid} * s_{HCFC22\_in\_acid} * M_C / M_{HCFC22}$	27.00	26.37	17.54
Fluorine in HCFC22 solublized in HCL acid	$q_{F\_HCL\ acid}$	tonne	$q_{F\_HCLacid} = q_{HCLacid} * s_{HCFC22\_in\_acid} *2* M_F / M_{HCFC22}$	85.50	83.50	55.54
Annual average concentration of inorganic F in HCL acid	$c_{F\_in\_HCL\ acid}$	g/L	The historical analysis data	9.14	9.51	9.77
Inorganic F in HCL acid	$q_{F\_HCL\ acid\_inorganic}$	tonne	$q_{F\_HCLacid\_Inorganic} = q_{HCLacid} * c_{F\_in\_HCLacid} / d_{HCLacid}$	491.96	499.88	341.60

Byproducr: Spent caustic:						
Quantity of caustic used by the HCFC22 production facility	$q_{caustic}$	tonne	The historical production records	4182.36	2727.81	1901.17
The concentration of caustic	$c_{caustic}$	%	The technical requirement of HCFC22 production facility	30.00	30.00	30.00
The concentration of spent caustic	$c_{spentcaustic}$	%	The technical requirement of HCFC22 production facility	5.00	5.00	5.00
Quantity of spent caustic (density1.05g/cm3) (7)	$q_{spentcaustic}$	tonne	$q_{spentcaustic} = q_{caustic} * c_{caustic} / c_{spentcaustic}$	25094.16	16366.86	11407.02
The density of spent caustic	$d_{\_spent\ caustic}$	g/cm3	Under the average temperature is 25℃	1.05	1.05	1.05
The saturation solubility of HCFC22 in spent caustic	$s_{HCFC22\_in\_spentcaustic}$	%	Page 40 of Product Manual for Fluoration Chemical Industry issued by National Scientific Research Center of Application Chemistry of Russia).	0.32	0.32	0.32
Carbon in HCFC22 solublized in spent caustic	$q_{C\_spentcaustic}$	tonne	$q_{C\_spentcaustic} = q_{spentcaustic} * s_{HCFC22\_in\_spentcaustic} * M_C / M_{HCFC22}$	11.04	7.20	5.02
Fluorine in HCFC22 solublized in spent caustic	$q_{F\_spentcausitc}$	tonne	$q_{F\_spentcaustic} = q_{spentcaustic} * s_{HCFC22\_in\_spentcaustic} *2* M_F / M_{HCFC22}$	34.97	22.81	15.89
Annual average concentration of inorganic F in spent caustic	$c_{F\_in\_spentcausitc}$	g/L	The historical analysis data	10.95	10.85	10.70
Inorganic F in spent caustic	$q_{F\_spentcasutic\_inorganic}$	tonne	$q_{F\_spentcaustic\_Inorganic} = q_{spentcaustic} * c_{F\_in\_spentcaustic} / d_{spentcaustic}$	261.70	169.12	116.24
Byproduct: HCFC21						
The byproduct rate of HCFC21	r_{HCFC21}	%	According to the historical records, the average byproduct rate of HCFC21 within 2002-2004 is 0.19%. To be conservative, we chose 0.2% as the value of r_{HCFC21}	0.20	0.20	0.20
Carbon in HCFC21	q_{C_HCFC21}	tonne	$q_{C\_HCFC21} = q_{HCFC22} * r_{HCFC21} * M_C / M_{HCFC21}$	5.43	5.30	3.53
Fluorine in HCFC21	q_{F_HCFC21}	tonne	$q_{F\_HCFC21} = q_{HCFC22} * r_{HCFC21} * M_F / M_{HCFC21}$	8.59	8.39	5.58
Leakage of HCFC 22						
Leakage ratio of HCFC22	$r_{Leakage\_HCFC22}$	%	Conservative estimate value, refer to note 2	1.00	1.00	1.00
C in leakage of HCFC22	$q_{C\_Leakage}$	tonne	$q_{C\_leakage} = q_{HCFC22} * r_{Leakage\_HCFC22} * M_C / M_{HCFC22}$	32.30	31.54	20.98
F in leakage of HCFC22	$q_{F\_Leakage}$	tonne	$q_{F\_leakage} = q_{HCFC22} * r_{Leakage\_HCFC22} * 2M_F /M_{HCFC22}$	102.28	99.89	66.44

Calculation of purity of carbon and fluorine in the exhaust gas vented from HCFC22 production facility						
The proportion of HFC23 in the exhausted gas vented from the HCFC22 production facility	p_{HFC23}	%	The historical analysis data	89.80	79.52	55.01
The proportion of HFC22 in the exhausted gas vented from the HCFC22 production facility	p_{HCFC22}	%	The historical analysis data	10.17	20.45	44.97
C percentage account for HFC23 in vent tail gas	$p_{C\_emission}$	%	$p_{C\text{-}emission} = p_{HFC23} / M_{HFC23} / (p_{HFC23} / M_{HFC23} + p_{HFC22} / M_{HFC22}) *100$	91.60	82.77	60.17
F Percentage account for HFC23 in in vent tail gas	$p_{F\_emission}$	%	$p_{F\text{-}emission} = 3*p_{HFC23} / M_{HFC23} / (3*p_{HFC23} / M_{HFC23} + 2*p_{HFC22} / M_{HFC22}) *100$	94.24	87.81	69.38
Calculation of w value based on C Balance						
Carbon in the HFC23 exhaust gas vented from the HCFC22 production facility annually	$q_{C\_emission}$	tonne	$q_{C\_emission} = q_{C\_chloroform} - q_{C\_HCFC22} - q_{C\_HCFC21} - q_{C\_HCLacid} - q_{C\_spentCaustic} - q_{C\_leakage}$	137.98	152.40	143.11
The quantity of HFC23 in the exhaust gas vented from the HCFC22 production facility annually based on the carbon efficiency	q_{HFC23_C}	tonne	$q_{HFC23\_C} = q_{C\_emission} * p_{C\_emission} * M_{HFC23} / M_C$	737.26	735.76	502.32
w value based on C balance	$w_{C\ balance}$	%	$w_{C\_balance} = q_{HFC23\_C} / q_{HCFC22} *100$	3.17	3.24	3.32
Calculation of w value based on F Balance						
Fluorine in the HFC23 exhaust gas vented from the HCFC22 production facility annually	$q_{F\_emission}$	tonne	$q_{F\_emission} = q_{F\_HF} - q_{F\_HCFC22} - q_{F\_HCFC21} - q_{F\_HCLacid} - q_{F\_spentCaustic} - q_{F\_leakage} - q_{F\_HCLacid\_InorganicF} - q_{F\_spentCaustic\_Inorganic}$	581.13	747.51	679.01
The quantity of HFC23 in the exhaust gas vented from the HCFC22 production facility annually based on the fluorine efficiency	q_{HFC23_F}	tonne	$q_{HFC23\_F} = q_{F\_emission} * p_{F\_emission} * M_{HFC23} / M_F$	672.55	806.09	578.56
w value based on F balance	$w_{F\ balance}$	%	$w_{F\_balance} = q_{HFC23\_F} / q_{HCFC22} *100$	2.89	3.55	3.83
HFC23 Generation Rate annually						
Annual average *w*value	w_{200x}	%	$w_{200x} = (w_{C\ balance} + w_{F\ balance}) / 2$	3.03	3.39	3.58
Note 1:						
M_C, M_F, $M_{chloroform}$, M_{HF}, M_{HCFC22} M_{HFC23} express the molecular weight of carbon, fluorine, Chloroform, HF and HCFC22 and HFC23. M_C=12, M_F= 19, $M_{Chloroform}$=119.35, M_{HF}=20, M_{HCFC22}=86.45, M_{HFC23}=70						
Notes 2:						
The conservative estimation of the leakage ratio of HCFC22 is as below: The annual leakage of HFC22 is about 47 tonnes, it includes:						

(1). The annual leakage for the reactors of HCFC22 discharging the used catalyst is less than 24 tons;
(2). The annual leakage for maintenance of reactors is less than 6 tones;
(3). The annual leakage for replacing the molecular sieve is less than 14 tones;
(4). The annual leakage for loading and sampling of HCFC22 is less than 3 tons.
So the leakage rate of HCFC22 in 2002, 2003 and 2004 is calculated as follows:

$r_{Leakage\_HCFC22\_2002} = 47/15115.37 * 100\% = 0.31\%$

$r_{Leakage\_HCFC22\_2003} = 47/22723.90 * 100\% = 0.21\%$

$r_{Leakage\_HCFC22\_2004} = 47/23269.14 * 100\% = 0.20\%$

To be conservative, we chose 1% as the value of $r_{Leakage\_HCFC22}$.

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