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uimobásicos,
S.A. de C.V.

Quimobasicos S.A. de C.V. **CDM Monitoring Report**

CDM
Monitoring Report

of

Quimobásicos HFC Recovery and Decomposition Project

Reference number UNFCCC 00000151 – CDMP

Monitoring period: 31st of December 2006 to 30th March 2007
Version: Version 05 – in effect as of 12th June 2007

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General Manager

PROJECT NAME: Quimobásicos HFC Recovery and Decomposition Project

Contents:

1. Introduction

The objective of this monitoring report is to show the calculation of the emission reductions achieved by the project activity and verified by a Designated Operational Entity.

The monitoring period is from 31st December 2006 to 30th March 2007 (both days included).

The report also shows the Monitoring and Verification Plan for data collection and auditing followed by the project developer in order to determine real and credible emission reductions.

2. Reference

This monitoring plan is in accordance with the registered project design document (version 4.0 – 23rd May 2006), which uses the approved methodology AM0001/Version03 (“*Incineration of HFC 23 Waste Streams”*).

3. General Description of the project activity

3.1. Objectives of the project

The project activity primarily aims at reducing HFC 23 emissions by recovering and decomposing this gas that would otherwise be released to the atmosphere, funded through the sale of carbon credits in the context of the Clean Development Mechanism (CDM) of the Kyoto Protocol.

Quimobásicos S.A. de C.V. leads this project that involves the collection and thermal decomposition through plasma technology of the HFC 23 generated as a by-product of HCFC 22 production at its plant located in Monterrey, México.

Emissions of HFC’s are controlled under the Kyoto Protocol. There are however no national or regional regulations with restrictions on the emission of HFC 23 in México, where the proposed project activity is carried out. At present, most of the HFC 23 generated as a by-product of HCFC 22 production in México would have been released to the atmosphere in the absence of this project activity.

For the proposed project activity, Quimobásicos installed an in-flight argon plasma arc facility to the existing HCFC 22 manufacturing plant by transferring new technology to México.

3.2. Project participants

Organization:	**Quimobásicos S.A. de C.V.**
Street/P.O.Box:	Ave. Ruiz Cortines Nº. 2333 Pte.
City:	Monterrey
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First Name:	Sergio
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3.3. Technical description of the project

The plasma based decomposition system is a proven technology for destroying fluorocarbons. Actually, there are plasma CFC destruction plants operating since 1997.
As a brief description of the process, the waste gas stream enters into the plasma torch, which is of segmented design, using argon as plasma gas. The argon plasma is generated by a direct current discharge between a cathode and an anode.

At typical operating conditions the mean exit enthalpy of the plasma is about 11 MJ/Kg at a mean exit temperature in excess of 10,000°C. The torch is rated at 150 kw and has an electrical efficiency of roughly 50%.
Argon was chosen as the plasma gas since it has suitable thermodynamic properties, is monatomic and for its inertness to the torch components. A durable, long-life torch design is therefore possible which is crucial to any industrial application.

Waste gas enters into the torch at an injection manifold and instantly mixes with the plasma at a temperature of 3,000ºC.

The waste is rapidly pyrolyzed (degraded by heat) in the injection zone and the hot gases pass down into the flight tube, a water-cooled reaction chamber, undergoing further pyrolysis. The hot plasma gases are cooled in the flight tube to approximately 1,000ºC.

In addition, steam is added at the injection manifold in order to assure that all carbon, produced during pyrolysis, is converted to carbon gases.

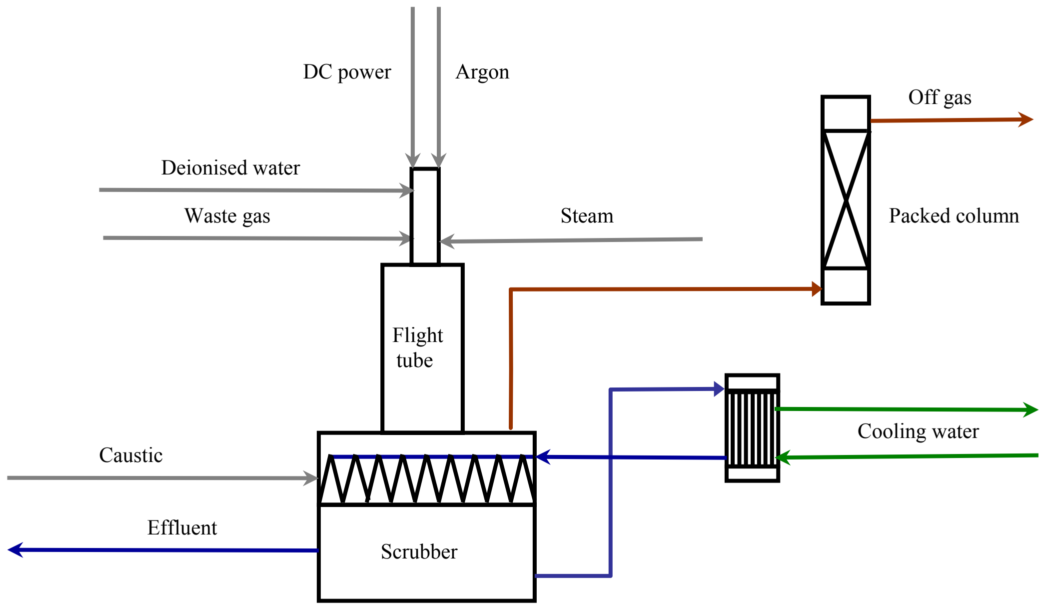
The hot gas mixture at the bottom of the flight tube is composed by carbon gases, halide gases, argon, and water vapour, together with trace of amounts of carbon fines (less than 0.1% of the feed).

Then, these gases are rapidly quenched to approximately 50ºC by direct sprays of cool alkaline scrubber liquor to neutralize the acid halide gases. This rapid quenching prevents the formation of any undesired organic molecules such as dibenzodioxins or dibenzofurans.

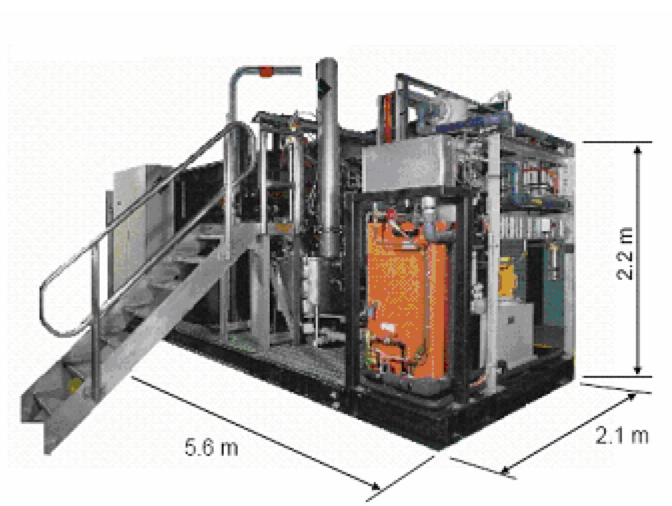
The gas mixture is then passed to a counter-current packed column where final traces of acid gases are removed. Because no fuel gas is needed for the destruction, the gas volume produced is much smaller than with the conventional thermal oxidizers, resulting in a more economical scrubbing system.

The process input, electricity, argon, steam, and sodium hydroxide, are significantly less than those required for a comparably sized high temperature incinerator. Consequently, the process effluents are also substantially less. Additionally, the facility includes a complete water treatment system, which removes fluoride as a solid by using calcium hydroxide.

The following figures show the facility installed at Quimobásicos' plant to decompose the waste gas stream, and the inputs and outputs of the process.



Process inputs and outputs



Plasma arc facility

4. Current status of the project

The Quimobásicos HFC Recovery and Decomposition Project started operating on 31st March 2006, decomposing the HFC 23, generated as by-product of the HCFC 22 production, in the new plasma unit.

The water treatment system is not completely implemented yet. The first part of the system is expected to be finished on October 2006 and the second part on January 2007. However, the liquid effluent is suitable for discharge to an industrial sewer. Thus, it will be treated in the existing treatment system of Quimobásicos industrial facility until the specific water treatment system is finished.

4.1. Batch Process Description

The purpose to change the actual operating procedure of the plasma process from continuous to batch is in order to reduce the steam and power consumption per unit of feed mixture.

In the storage tank, the gas mixture is kept until the pressure of the thank raises to a defined value and allows the feed to the plasma unit at maximum flow rate of G22/G23. After that, the vessel pressure goes down and as it nears a low set point, the plasma unit shuts down and waits until the pressure raises again to the high set point and a new cycle begins.

With the modifications mentioned above, the batch operation results in lower consumption of this utilities, as well as significant reduction in operating time of the plasma unit throughout the month and less maintenance cost for the plant.

The batch process is not the definitive way to operate the plasma unit; the results will be evaluated to decide the convenience of the batch process.

5. Monitoring plan

5.1 Data monitored

The data to be collected by Quimobásicos' staff in order to monitor the emissions from the project activity is shown in the following table.

#	Data variable	Data unit	Recording frequency	Comment
1	Quantity of HFC 23 supplied to the decomposition process (q_HFC23_y)	tonnes	Monthly	Measured by two flow meters located before entering into the decomposition facility.
2	Purity of the HFC 23 supplied to the decomposition process (P_HFC23_y)	%	Monthly	Determined by sampling, before entering into the decomposition facility, using gas chromatography.
3	Quantity of HFC 23 supplied to the decomposition process after purity adjustments (Q_HFC23_y)	tonnes	Monthly	Calculated using data number 1 and 2. (See Equation 2 below)
4	Quantity of HFC 23 in gaseous effluent (ND_HFC23_y)	tonnes	Monthly	Measured from the gas effluent of the decomposition facility.
5	Emissions from HFC 23 not destroyed by the decomposition facility ($CO_2\_NDHFC23_y$)	tonnes	Monthly	Calculated using data number 4. (See Equation 1 below)
6	CO_2 emissions from HFC 23 decomposition itself ($CO_2\_HFC23_y$)	tonnes	Monthly	Calculated using data number 3. (See Equation 1 below)
7	Project emissions inside of the boundary (PE_y)	tonnes	Monthly	Calculated using data number 5 and 6. (See Equation 1 below)

The data to be collected by Quimobásicos' staff for determining the baseline GHGs emissions within the project boundary is shown in the following table.

#	Data variable	Data unit	Recording frequency	Comment
3	Quantity of HFC 23 supplied to the decomposition process after purity adjustments (Q_HFC23_y)	tonnes	Monthly	Calculated using data number 1 and 2. (See Equation 2 below)
8	Quantity of HCFC 22 produced in the plant generating the HFC 23 waste (Q_HCFC22_y)	tonnes	Monthly	It is reference data to check cut-off condition and rough estimation of HFC 23 generation. (See Equation 5 below)
9	HFC 23 sold by the facility generating the HFC 23 waste ($HFC23\_sold_y$)	tonnes	Annually	It is reference data to check cut-off condition and rough estimation of HFC 23 generation. . (See Equation 5 below)
10	Baseline quantity of HFC 23 destroyed (BQ_HFC23_y)	tonnes	Monthly	Estimated taking into account local regulations and using data number 3. (See Equation 4 below)
11	Baseline Emissions (BE_y)	tonnes	Monthly	Calculated using data number 3 and 10. (See Equation 3 below)

The data to be collected by Quimobásicos' staff in order to monitor leakage effects of the project activity is shown in the following table.

#	Data variable	Data unit	Recording frequency	Comment
12	Steam consumption at the decomposition facility (Q_Steam_y)	tonnes	Monthly	Measure by steam meter.
13	Emission coefficient for steam generation (E_Steam_y)	tCO_2/tsteam	Yearly	Calculated from the boiler specific fuel consumption provided by the steam supplier.
14	CO_2 emissions from fuel combustion for steam generation ($CO_2\_Steam_y$)	tonnes	Monthly	Calculated using data number 12 and 13. (See Equation 6 below)
15	Electricity consumption by the decomposition facility (Q_Power_y)	MWh	Monthly	Measured using electricity meter.
16	CO_2 emission factor from the isolated power plant supplying electricity to Quimobásicos (E_Power_y)	tCO_2/MWh	Yearly	The emission rate is computed from the most recent official information of the local energy supplier of Quimobásicos.
17	CO_2 emissions from electricity generation ($CO_2\_Power_y$)	tonnes	Monthly	Calculated using data number 15 and 16. (See Equation 6 below)
18	Leakage (LE_y)	tonnes	Monthly	Calculated using data number 14 and 17. (See Equation 6 below)

In addition, the quantities of gaseous effluents (CO, HCl, HF, and dioxin) and liquid effluents (pH, COD, BOD, suspended solids, and metals) are measured with a frequency of 6 months.
Except Dioxin with an annual frequency.

Data will be archived until two years after finishing the crediting period.

Additionally, the following table shows the fixed values used in calculation of emission reductions.

Parameter	Value	Source
Maximum HCFC 22 production	7,570 tonnes/year	Quimobásicos
Cut-off condition fraction (w)	2.44%	Quimobásicos The waste generation rate of the HCFC 22 production plant (*w*) is checked by comparing the amount of HCFC 22 produced to the sum of the HFC 23 waste and the HFC 23 recovered for sale.
Lower heating value of natural gas	0.03542 GJ/m^3	"Balance Nacional de Energía 2003", Subsecretaría de Planeación Energética y Desarrollo Tecnológico, Secretaría de Energía, México, 2004.
CO_2 emission factor of natural gas	0.0561 tCO_2/GJ	IPCC Guidelines for National Greenhouse Gas Inventories, Reference Manual Volume 3 (1996). Table 1-1 page 1.13. Natural gas (dry): 15.3 t C/TJ lower heating value basis. X 44/12 = 56.10 tCO2/TJ.
Global warming potential HFC 23	11,700 tCO_2e/tHFC23	Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual, page 2.45, table 2-26.
CO_2 emission factor of HFC 23	0.629 tCO_2/tHFC23	Value considered in the AM0001.
Quantity of CaF_2 generated per tonnes of HFC 23 destroyed	1.67 $tCaF_2$/tHFC23	Stoichiometric relation.
Emission factor of solid waste transport	5.45 $kgCO_2$/twaste	Quimobásicos
Amount of energy of plant of residual water treatment	0.13311 MW/months	Quimobásicos
ton CO_2 emission by sampling of gas mixture	Average monthly date (ton) *11,700*day operation of plant plasma	Quimobásicos

The monitoring methodology describes the procedure and equations for calculating project and baseline emissions from monitored data. For this specific project, the methodology is applied through a spreadsheet model. The staff responsible for project monitoring must complete the electronic worksheets on a monthly basis. The spreadsheet automatically provides the total GHG emission reductions achieved through the project.

The models contain a series of worksheets with different functions:

Data entry sheets:

- *HCFC 22*
- *HFC 23*
- *Steam and Electricity*

Calculation sheets:

- *Baseline Emissions*
- *Project Emissions*
- *Leakage*

Result sheet:

- *Emission Reductions*

There are worksheets where the user is allowed to enter data. All other cells contain model fixed parameters or computed values that cannot be modified by the staff.

A color-coded key is used to facilitate data input. The key for the code is as follows***:***

- ***Input Fields:*** Pale yellow fields indicate cells where project operators are required to supply data input, as is needed to run the model;
- ***Result Fields:*** Green fields display key result lines as calculated by the model.

Other sheets are shown in subsequent pages. All fields in these sheets include fixed values, or values that are computed from data in the data entry sheets. The last sheet shows the total emissions reductions obtained through the project activity.

All electronic data is backed up on a daily basis, and two electronic copies of each document are kept in different locations: the plant and its Head Office.

5.2. Quality Control (QC) and Quality Assurance (QA)

The quality control (QC) and quality assurance (QA) procedures implemented by Quimobásicos are the following.

Data	QA/QC procedures
1 q_HFC23_y	Mass flow of HFC 23 waste gas produced is measured by two Micro Motion flow meters placed in the entrance of the decomposition facility. The flow meters have an accuracy of +/- 0.35%. The flow meters are connected to Distributed Control System (DCS) and their data is archived in the database of the plant. Verification of the flow meters is done by instrument personnel using the pattern flow meters. Calibration of the pattern flow meters is done according to the calibration procedure of an external company. The pattern flow meters are recalibrated by an external company. The instrument supervisor should ask the contract department for the calibration certificate from this external company. In order to have more accurate data, flow meter verification is done weekly and, most of the time, under normal operation; both flow meters measure the same amount of HFC 23 mass flow simultaneously. Where the flow meter readings differ by greater than 0.70%. The reason for the discrepancy should be investigated and the fault remedied. For the sake of conservativeness, the lower value of the two readings is always used to estimate HFC 23 mass flow. The decomposition facility includes two flow meters in order to check the waste gas input. Note: for more information, to see annexed 1 and annexed 2.
2 P_HFC23_y	It is measured by sampling using gas chromatography before entering into the decomposition facility. Verification of the equipment for gas chromatography is carried out according to the instructive CCL-7.602-01, using the HFC 23 standard. The analysis should be repeated in case of doubt regarding its veracity.
4 ND_HFC23_y	It is measured from the gas effluent of the decomposition facility. In order to determine the quantity of HFC 23 not destroyed, this project activity proposes to measure the quantity of the gas effluent released to the atmosphere using a flow meter, and to determine the fraction of HFC 23 of such effluent by gas chromatography. The quantity of HFC 23 not destroyed is obtained by multiplying the quantity of gas effluent by the fraction of HFC 23 of such effluent. Verification of the equipment for gas chromatography is carried out according to the instructive CCL-7.602-01, using the HFC 23 standard. The analysis should be repeated in case of doubt regarding its veracity.
8 Q_HCFC22_y	It is obtained from production records of the facility. It is reference data to check cut-off condition and rough estimation of HFC 23 generation.
9 $HFC23\_sold_y$	It is obtained from production records of the facility. It is reference data to check cut-off condition and rough estimation of HFC 23 generation.
12 Q_Steam_y	It is measured by steam meters.
15 Q_Power_y	It is measured using electricity meter.

Annexed 1:

FUNCTIONALITY TESTS MEASURERS OF FLOW FED THE PLASMA						
	DATE	**HOUR**	**FIC-201**	**FIC-202**	**% DIFFERENCE**	**OBSERVATIONS**
January	01-Ene	09:00	27896.44	27925.64	**0.104672854**	
	08-Ene	09:00	33261.45	33301.59	**0.120680247**	
	15-Ene	09:00	38809.07	38867.71	**0.151098699**	
	22-Ene	09:00	43584.95	43661.85	**0.17643705**	
	30-Ene	09:00	48758.93	48855.38	**0.197809919**	
						OBSERVATIONS
February	05-Feb	09:00	52411.88	52525.25	**0.2166305921**	
	12-Feb	09:00	56707.17	56841.23	**0.236407495**	
	19-Feb	09:00	60529	60684	**0.256075600**	
	25-Feb	09:00	63532.10	63703.85	**0.270335783**	
						OBSERVATIONS
	09-Mar	07:00	64406.85	64582.53	**0.272766018**	
March	14-Mar	07:00	65685.75	65867.65	**0.276924599**	
	19-Mar	09:00	68226.19	68419.16	**0.282838599**	
	26-Mar	09:00	72083.6	72293.48	**0.291161929**	

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Annexed 2:
Report of verification:

							Report of verification		
	Place		QUIMOBÁSICOS S.A. DE C.V.				F0 (Hz)		S Relative
	Date						F0 Rate (Kg/min)		
	Measurer to verification		Measuring pattern of reference		Report No.		K = (F0/ F0 rate) *60		
	Company		Company				Corrected pattern		
	Type		Type				Average	Measuring flow	Error %
	Model		Modelo		Identification Flowed				
	N° of Series		N° of Series		Genetrón 23				
	Identification		Factor k						
	MF now		Observations:		Certificate of the pattern		Factor MF pattern measuring		
Factor k (KF) Pulses/Kg									
Number of Test	q_m Pattern (Kg/min)	q_m Measuring to verification (Kg/min)	MF	q_m Pattern (Kg/min)	q_m Measuring to verification (Kg/min)	MF	q_m Pattern (Kg/min)	q_m Measuring to verification (Kg/min)	MF
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
	P(Kg/cm^2)			P(Kg/cm^2)			P(Kg/cm^2)		
	T pattern °C			T pattern °C			T pattern °C		
	T Measurer °C			T Measurer °C			T Measurer °C		
	MF Average		It made	Instrumentation		It approved	Quality Control		
	Deviation (s)		Name			Name			
	error (%)		Signature			Signature			

January 2007:

							Summary of report of verification		
	Place	Monterrey N.L.	QUIMOBÁSICOS S.A. DE C.V.						
	Month	January 2007							
	Measurer to verification		Measuring pattern of reference						
	Company	Micromotion	Company	Micromotion					
	Type	Mass	Type	Mass					
	Model	CMF02M313NQBUSZZZ	Model	CMF025M313NQBUSZZZ	Identification Flowed				
	N° of Series	11030316	N° of Series	11017931	Genetrón 23				
	Identification	FIT-06-201	Factor k	300,000 Pulses/Kg					
	MF now	1.0000	Observations:	Zero to pattern occurred	Certificate of the pattern				
Factor k (KF) Pulses/Kg		150,000	and to the measurer to recalibrate		CNM-CC-096/2006				
	MF Average	1.0008	It made	Instrumentation		It approved	Quality Control		
	Deviation (s)	0.155	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz		
05-Ene-07	error (%)	-0.076	Signature			Signature			
	MF Promedio	0.9998	It made	Instrumentation		It approved	Quality Control		
	Desviacion (s)	0.121	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz		
12-Ene-07	error (%)	0.017	Signature			Signature			
	MF Promedio	1.0006	It made	Instrumentation		It approved	Quality Control		
	Desviacion (s)	0.041	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz		
20-Ene-07	error (%)	-0.064	Signature			Signature			
	MF Promedio	0.9998	It made	Instrumentation		It approved	Quality Control		
	Desviacion (s)	0.152	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz		
26-Ene-07	error (%)	0.022	Signature			Signature			

							Summary of report of verification
	Place	Monterrey N.L.	QUIMOBÁSICOS S.A. DE C.V.				
	Month	January 2007					
	Measurer to verification		Measuring pattern of reference				
	Company	Micromotion	Company	Micromotion			
	Type	Mass	Type	Mass			
	Model	CMF02M313NQBUSZZZ	Model	CMF025M313NQBUSZZZ	Identification Flowed		
	N° of Series	11032275	N° of Series	11017931	Genetrón 23		
	Identification	FIT-06-202	Factor k	300,000 Pulses/Kg			
	MF now	1.0000	Observations:	Zero to pattern occurred	Certificate of the pattern		
Factor k (KF) Pulses/Kg		225,000	and to the measurer to recalibrate		CNM-CC-096/2006		
	MF Average	1.0025	It made	Instrumentation		It approved	Quality Control
	Deviation (s)	0.099	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz
05-Ene-07	error (%)	-0.251	Signature			Signature	
	MF Promedio	1.0006	It made	Instrumentation		It approved	Quality Control
	Desviacion (s)	0.087	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz
12-Ene-07	error (%)	-0.059	Signature			Signature	
	MF Promedio	1.0027	It made	Instrumentation		It approved	Quality Control
	Desviacion (s)	0.076	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz
20-Ene-07	error (%)	-0.272	Signature			Signature	
	MF Promedio	1.0024	It made	Instrumentation		It approved	Quality Control
	Desviacion (s)	0.123	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz
26-Ene-07	error (%)	-0.239	Signature			Signature	

February 2007:

							Summary of report of verification
	Place	Monterrey N.L.	QUIMOBÁSICOS S.A. DE C.V.				
	Month	February 2007					
	Measurer to verification		Measuring pattern of reference				
	Company	Micromotion	Company	Micromotion			
	Type	Mass	Type	Mass			
	Model	CMF02M313NQBUSZZZ	Model	CMF025M313NQBUSZZZ	Identification Flowed		
	N° of Series	11030316	N° of Series	11017931	Genetrón 23		
	Identification	FIT-06-201	Factor k	300,000 Pulses/Kg			
	MF now	1.0000	Observations:	Zero to pattern occurred	Certificate of the pattern		
Factor k (KF) Pulses/Kg		150,000	and to the measurer to recalibrate		CNM-CC-096/2006		
	MF Average	1.0013	It made	Instrumentation		It approved	Quality Control
	Deviation (s)	0.335	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz
02-Feb-07	error (%)	-0.129	Signature			Signature	
	MF Promedio	0.9974	It made	Instrumentation		It approved	Quality Control
	Desviacion (s)	0.189	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz
07-Feb-07	error (%)	0.258	Signature			Signature	
	MF Promedio	0.9990	It made	Instrumentation		It approved	Quality Control
	Desviacion (s)	0.152	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz
13-Feb-07	error (%)	0.102	Signature			Signature	
	MF Promedio	1.0005	It made	Instrumentation		It approved	Quality Control
	Desviacion (s)	0.106	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz
23-Feb-07	error (%)	-0.047	Signature			Signature	
	MF Promedio	Plant outside	It made	Instrumentation		It approved	Quality Control
26 feb a 02 March 07	Desviacion (s)	operation, change	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz
	error (%)	of catalyst	Signature			Signature	

							Summary of report of verification
	Place	Monterrey N.L.	QUIMOBÁSICOS S.A. DE C.V.				
	Month	February 2007					
	Measurer to verification		**Measuring pattern of reference**				
	Company	Micromotion	Company	Micromotion			
	Type	Mass	Type	Mass			
	Model	**CMF02M313NQBUSZZZ**	Model	**CMF025M313NQBUSZZZ**	**Identification Flowed**		
	N° of Series	**11032275**	N° of Series	**11017931**	Genetrón 23		
	Identification	FIT-06-202	Factor k	300,000 Pulses/Kg			
	MF now	1.0000	Observations:	Zero to pattern occurred	Certificate of the pattern		
Factor k (KF) Pulses/Kg		225,000	and to the measurer to recalibrate		**CNM-CC-096/2006**		
	MF Average	**1.0019**	It made	Instrumentation		It approved	Quality Control
	Deviation (s)	**0.294**	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz
02-Feb-07	error (%)	**-0.193**	Signature			Signature	
	MF Promedio	**0.9999**	It made	Instrumentation		It approved	Quality Control
	Desviacion (s)	**0.090**	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz
07-Feb-07	error (%)	**0.010**	Signature			Signature	
	MF Promedio	**1.0020**	It made	Instrumentation		It approved	Quality Control
	Desviacion (s)	**0.106**	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz
13-Feb-07	error (%)	**-0.204**	Signature			Signature	
	MF Promedio	**0.9979**	It made	Instrumentation		It approved	Quality Control
	Desviacion (s)	**0.129**	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz
23-Feb-07	error (%)	**0.213**	Signature			Signature	
	MF Promedio	**Plant outside**	It made	Instrumentation		It approved	Quality Control
26 feb a 02 March 07	Desviacion (s)	**operation, change**	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz
	error (%)	**of catalyst**	Signature			Signature	

March 2007:

							Summary of report of verification
	Place	Monterrey N.L.	QUIMOBÁSICOS S.A. DE C.V.				
	Month	March 2007					
	Measurer to verification		**Measuring pattern of reference**				
	Company	Micromotion	Company	Micromotion			
	Type	Mass	Type	Mass			
	Model	**CMF02M313NQBUSZZZ**	Model	**CMF025M313NQBUSZZZ**	**Identification Flowed**		
	N° of Series	**11030316**	N° of Series	**11017931**	Genetrón 23		
	Identification	FIT-06-201	Factor k	300,000 Pulses/Kg			
	MF now	1.0000	Observations:	Zero to pattern occurred	Certificate of the pattern		
Factor k (KF) Pulses/Kg		150,000	and to the measurer to recalibrate		**CNM-CC-096/2006**		
	MF Average		It made	Instrumentation		It approved	Quality Control
	Deviation (s)	**Plant 1 outside operation**	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz
02-Mar-07	error (%)		Signature			Signature	
	MF Promedio		It made	Instrumentation		It approved	Quality Control
	Desviacion (s)	**Plant plasma outside operation**	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz
09-Mar-07	error (%)		Signature			Signature	
	MF Promedio	**0.9987**	It made	Instrumentation		It approved	Quality Control
	Desviacion (s)	**0.195**	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz
16-Mar-07	error (%)	**0.129**	Signature			Signature	
	MF Promedio	**1.0004**	It made	Instrumentation		It approved	Quality Control
	Desviacion (s)	**0.167**	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz
23-Mar-07	error (%)	**-0.036**	Signature			Signature	
	MF Promedio	**1.0014**	It made	Instrumentation		It approved	Quality Control
	Desviacion (s)	**0.130**	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz
30-Mar-07	error (%)	**-0.137**	Signature			Signature	

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Quimobásicos, S.A. de C.V.

							Summary of report of verification		
	Place	Monterrey N.L.	QUIMOBÁSICOS S.A. DE C.V.						
	Month	March 2007							
	Measurer to verification		**Measuring pattern of reference**						
	Company	Micromotion	Company	Micromotion					
	Type	Mass	Type	Mass					
	Model	**CMF02M313NQBUSZZZ**	Model	**CMF025M313NQBUSZZZ**	**Identification Flowed**				
	N° of Series	**11032275**	N° of Series	**11017931**	Genetrón 23				
	Identification	FIT-06-202	Factor k	300,000 Pulses/Kg					
	MF now	1.0000	Observations:	Zero to pattern occurred	Certificate of the pattern				
Factor k (KF) Pulses/Kg		225,000	and to the measurer to recalibrate		**CNM-CC-096/2006**				
	MF Average	**Plant 1 outside operation**	It made	Instrumentation		It approved	Quality Control		
	Deviation (s)		Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz		
02-Mar-07	error (%)		Signature			Signature			
	MF Promedio	**Plant plasma outside operation**	It made	Instrumentation		It approved	Quality Control		
	Desviacion (s)		Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz		
09-Mar-07	error (%)		Signature			Signature			
	MF Promedio	**0.9993**	It made	Instrumentation		It approved	Quality Control		
	Desviacion (s)	**0.258**	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz		
16-Mar-07	error (%)	**0.066**	Signature			Signature			
	MF Promedio	**0.9995**	It made	Instrumentation		It approved	Quality Control		
	Desviacion (s)	**0.127**	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz		
23-Mar-07	error (%)	**0.052**	Signature			Signature			
	MF Promedio	**1.0030**	It made	Instrumentation		It approved	Quality Control		
	Desviacion (s)	**0.216**	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz		
30-Mar-07	error (%)	**-0.296**	Signature			Signature			

Note: The verification mentioned here expresses the requirement of the methodology under the name of: "recalibration or weekly calibration".

Quimobasicos has an operating manual according to the P-4.2.3-08 procedure and a Distributed Control System (DCS) to support the work of the decomposition unit operator.

All the electronic documents and archives related to DCS or I/A of processes for operating plants of Quimobasicos, are contained in the database ISO ARCHIVER Documents of the company.

The control of the preventive maintenance of critical equipment that affects the process is carried out through the P-6.3-10 procedure, to guarantee the good condition of the equipment, as well as the continuity and security of the operation, apart from providing improvements.

On the other hand, it is assured that control and measuring instruments are in optimal conditions according to the P-7.6-06.

The flow meters placed in line and the pattern flow meters have the identification numbers of the corresponding equipment and are registered in the Management System of Maintenance (MSM).

The decomposition facility is controlled by a fully integrated process control software system that monitors forty-nine parameters on a continuous basis. Data is logged and stored for analysis, fault finding, and to meet regulatory requirements. If set points are exceeded by a specified amount, the entire system instantaneously shuts down. Less than 0.5 g of waste is present in the flight tube at any instant so the probability of significant amounts of untreated waste entering the environment by accident is negligible.

The structure that Quimobasicos has implemented for the monitoring process is showed through the following table.

Task name	Responsible	Frequency	Documentation
Measurement of HFC 23 waste gas production	Decomposition unit operator	At the beginning of each turn and every 2 hours during the turn.	These data is registered in the Decomposition Unit Operation Report.
Calibration of equipment to measure the production of HFC 23 waste gas	Instruments Department	Pattern flow meters calibration: every year Flow meters calibration: every year Flow meters verification: every week.	Measurements made in the internal calibration are registered in the calibration registry. In case of external calibration of equipment, the external company should emit the corresponding registry of calibration. These registries should be archived during nine years.
Measurement of HFC 23 waste gas purity	Quality Assurance Department	Twice in turn	The results are registered in the laboratory analysis system according to instructive CCL-7.4.302-09. Registries should be archived during nine years according to General Procedure of Quality Registry Control P-4.2.4-02.
Calibration of equipment to measure the purity of HFC 23 waste gas	Quality Assurance Department	Calibration: every year Verification: every months	Measurements made in the calibration procedure are registered in the calibration registry.

Annexed table of control of equipment and instruments.

REQUIREMENTS FOR MONITOREO						
N°	DATA	Measurement/Equipment	Registries	Frequency	Exactitude	Standard deviation(Accuracy)
1	Quantity of HFC 23 supplied to the decomposition process	Flow Measurers (2)				
	(q_HFC23$_y$)					(1) 0.074
		1) Identification	SAM tag FIT 06 201/ FIT 06 202	N/A	99.50%	(2) 0.060
		2) Reading: Kgs	Report operation plasma	every 2 hours		
			Report of process plasma	Day		
		3) Calibration	External report	year		
		4) Verification	sheet report of verification	Weekly		
		Measuring pattern (1)				
		1) Identificaction	SAM tag FIT 06 203	N/A	99.50%	0.1023
		2) Reading: Kgs	sheet report of calibration			
		3) Calibration	External report	year		
2	Purity of the HFC 23 supplied to the decomposition process	Analysis of chromatography				
	(*P_HFC23$_y$*)	1) Sampling	Leaf of registry of samples	every 4 hours		
		2) Analysis in chromatograph	Laboratory	every 4 hours		
		3) Calibration of chromatograph	External report	year	99.53%	0.061
		4) Verification method	Registry of verifications	Monthly		
		5) Standard sample	External report	year		
		6) Scale	External report	every 6 monthly	99.98%	0.02
3	Quantity of HFC 23 supplied to the decomposition process after purity adjustments	Calculate with formulates				
	(*Q_HFC23$_y$*)	QHFC23y = qHFC23y * PHFC23y	Report of process plasma	Day/monthly		
4	Quantity of HFC 23 in gaseous effluent (*ND_HFC23$_y$*)	Analysis of chromatography				
		1) Sampling	External report	Monthly		
		2) Analysis in chromatograph	External report	Monthly		
		3) Calibration of chromatograph	External report	Monthly		

5	Emissions from HFC 23 not destroyed by the decomposition facility (*CO_2_NDHFC23$_y$*)	Calculate with formulates CO2NDHFC23y = Flow (kgs) * %HFC23y	Report of process plasma	Day/monthly		
6	CO_2 emissions from HFC 23 decomposition itself (*CO_2_HFC23$_y$*)	Calculate with formulates CO2HFC23y = QHFC23y * FE FE= Factor emission of CO2	Report of process plasma	Day/monthly		
7	Project emissions inside of the boundary (*PE_y*)	Calculate with formulates EPy= CO2NDHFC23y + CO2HFC23y CO2NDHFC23y= NDHFC23y * PCG PCG= Global Warming Potential G23	Report of process plasma	Day/monthly		
8	Quantity of HCFC 22 produced in the plant generating the HFC 23 waste (Q_*HCFC22$_y$*)	Real production G22	Report operation G22	Day/monthly		
		Cells of weight				
		1) Calibration	External report	year	100%	0
9	HFC 23 sold by the facility generating the HFC 23 waste (*HFC23_sold$_y$*)	Sale of the product	Registries of sale	Monthly		
10	Baseline quantity of HFC 23 destroyed QLBHFC23y	Calculate with formulates QLBHFC23y= QHFC23y * Ry QHFC23y <: QHCFC22y * w w= waste generation rate	Report of process plasma	Day/monthly		
11	Baseline emissions ELBy	Calculate with formulates ELBy= QHFC23y - QLBHFC23y * PCG PCG= Global Warming Potential G23	Report of process plasma	Day/monthly		
12	Steam consumption at the decomposition facility (Q_*Steam$_y$*)	Steam measurer				
		1) Identificaction	SAM tag FIT 06 601	N/A		
		2) Reading: Kgs/hour	Report operation plasma/IA	Day/monthly	99.10%	0.00058
		3) Calibration	External report	year		
		Transmitter of temperature line steam				
		1) Identificaction	SAM tag TT 06 601	N/A		
		2) Reading: °C	Report operation plasma/IA	Day/monthly		
		3) Calibration	External report	year	99.92%	0.12
		Transmitter of pressure line steam				
		1) Identificaction	SAM tag PIT 06 601	N/A	99.80%	0.645
		2) Reading: Kgs/cm2	Report operation plasma/IA	Day/monthly		
		3) Calibration	External report	year		

13	Emission coefficient for steam generation (E_Steam_y)	Calculate with formulates E Steam = tCO2 / t steam	Report of process plasma	year		
14	CO_2 emissions from fuel combustion for steam generation ($CO_2\_Steam_y$)	Calculate with formulates CO2 Steam = Q Vapor * E steam Q Steam = Consumed amount of steam	Report of process plasma	Monthly		
15	Electricity consumption by the decomposition facility (Q_Power_y)	Measurer of electricity				
		1) Identificaction	SAM tag MEE 0001	N/A	volts: 99.9%	NA
		2) Reading: volts/amperes/watts	Report operation plasma/IA	Day/monthly	amperes: 99.9%	NA
		3) Calibration	External report	year	watts: 99.8%	NA
16	CO_2 emission factor from the isolated power plant supplying electricity to Quimobásicos (E_Power_y)	Calculate with formulates E Electricity = t CO2 / MWh	Report of process plasma	Year		
17	CO_2 emissions from electricity generation ($CO_2\_Power_y$)	Calculate with formulates CO2 Electricity = Q Electricity * E Electricity	Report of process plasma	Monthly		
18	Leakage (LE_y)	Calculate with formulates Py = CO2 Steam + CO2 Electricity	Report of process plasma	Monthly		
19	Emission reductions	Calculate with formulates RE y = ELBy - (EP y + Py)	Report of process plasma	Monthly		
20	Water treatment system	Analyzers for ph/redox				
		1) Calibration	External report	Year	99.99%	0.01%
		2) Verification	SAM Sistem	Year		
		Measurer of flow				
		1) Calibration	External report	Year	99.00%	1.00%

5.3 Environmental impact

As mentioned above, the process input, electricity, argon, steam, and sodium hydroxide are significantly less than those required for a comparably sized high temperature incinerator. Consequently, the process effluents are also substantially less. The gaseous effluent consists of a mixture of argon, carbon gases, and water vapour. The liquid effluent is a low volume, alkaline, near saturated aqueous solution of sodium halide salt suitable for discharge to an industrial sewer. The solution also contains sodium carbonate and bicarbonate.

The facility includes a complete water treatment system, which removes fluoride as a solid by using calcium hydroxide. CO_2 emissions due to transportation of solid waste from the water treatment system to the final disposal are estimated to be negligibly small. However, these emissions are considered as leakage in the calculation of emission reductions.

This technology typically has more than 99.9999% of destruction efficiency. Specifically, for HFC 23 decomposition, a destruction efficiency of more than 99.99999% is expected. No toxic residues are generated and emissions to the atmosphere are substantially lower than existing and proposed international standards. Additionally, the key process elements are fully contained to avoid in-process gas leaks to the atmosphere.

Moreover, the quantities of gaseous effluents (CO, HCl, HF, and dioxin) and liquid effluents (pH, COD, BOD, suspended solids, and metals) are measured with a frequency of 6 months. Except dioxin with an annual frequency

6. Emission reduction calculation

The following table provides the formulas used for calculation of emission reductions.

Variable	Formulas
Project emissions within the project boundary	$PE_y = E\_DP_y$ (1) $= CO_2\_NDHFC23_y + CO_2\_HFC23_y$ $= ND\_HFC23_y \times GWP_{HFC23} + Q\_HFC23_y \times EF_{HFC23}$
Quantity of HFC 23 waste supplied to the decomposition process after purity adjustments	$Q\_HFC23_y = q\_HFC23_y \times P\_HFC23_y$ (2)
Baseline emissions	$BE_y = (Q\_HFC23_y - BQ\_HFC23_y) \times GWP_{HFC23}$ (3) with $Q\_HFC23_y \leq Q\_HCFC22_y \times w$ (5)
Baseline quantity of HFC 23 destroyed	$BQ\_HFC23_y = Q\_HFC23_y \times r_y$ (4)
Leakage	$LE_y = CO_2\_Steam_y + CO_2\_Power_y$ (6) $= Q\_Steam_y \times E\_Steam_y + Q\_Power_y \times E\_Power_y$
Emission reductions	$ER_y = BE_y - (PE_y + LE_y)$ (7) $= (Q\_HFC23_y - BQ\_HFC23_y) \times GWP_{HFC23} - (ND\_HFC23_y \times GWP_{HFC23} +$ $+ Q\_HFC23_y \times EF_{HFC23} + Q\_Steam_y \times E\_Steam + Q\_Power_y \times E\_Power_y)$

Where

E_DP_y: emissions due to the decomposition process (tCO_2e/year)

$CO_2\_NDHFC23_y$: emissions from HFC 23 not destroyed by the decomposition facility (tCO_2e/year)

$CO_2\_HFC23_y$: CO_2 emissions from HFC 23 decomposition itself (tCO_2/year)

ND_HFC23_y: quantity of HFC 23 in gaseous effluent (tHFC23/year)

GWP_{HFC23}: Global Warming Potential of HFC 23. The approved Global Warming Potential value for HFC 23 is 11,700 tCO_2e/tHFC23.

Q_HFC23$_y$: quantity of HFC 23 supplied to the decomposition process after purity adjustments (tHFC23/year)

EF$_{HFC23}$: *CO_2 emission factor of HFC 23 (tCO_2/tHFC23)*

q_HFC23$_y$: quantity of HFC 23 supplied to the decomposition facility (tHFC23/year)

P_HFC23$_y$: purity of the HFC 23 supplied to the decomposition facility (%)

BQ_HFC23$_y$: baseline quantity of HFC 23 destroyed during the year (tHFC23/year)

r_y: fraction of the waste stream required to be destroyed by the regulations that apply during year *y*

Q_HCFC22$_y$: actual production of HCFC 22 during the year at the plant where the HFC 23 waste originates (tHCFC22/year). This value is limited to the "Existing production capacity". For Quimobasicos, it is considered the maximum annual production value, obtained during the 2002 – 2004 period, of the existing HCFC 22 production facility.

w: waste generation rate (HFC 23)/(HCFC 22) for the originating plant. The quantity of HFC 23 used to calculate this coefficient is the sum of HFC 23 recovered for sale plus the waste HFC 23 (kgHFC23/kgHCFC22).

CO_2*_Steam*$_y$: CO_2 emissions from steam generation (tCO_2/year)

CO_2*_Power*$_y$: CO_2 emissions from electricity generation (tCO_2/year)

Q_Steam$_y$: quantity of steam consumed at the decomposition facility (tsteam/year)

E_Steam$_y$: emission coefficient for steam generation (tCO_2/tsteam)

Q_Power$_y$: electricity consumption at the decomposition facility (MWh/year)

E_Power$_y$: emission factor from the isolated power plant supplying electricity to Quimobásicos (tCO_2/MWh)

7. Emission reduced by the project activity

As it is explained below, the total emission reductions achieved by the project activity through the monitoring period is equal to 455954 tCO_2e.

The following table shows the values obtained during the monitoring period.

#	Data variable	Data unit	Value 31 Dec06-30 Jan07	Value 31 Jan07-27 Feb07	Value 28 Feb07-30 Mar07	Comment
1	Quantity of HFC 23 supplied to the decomposition process (*q_HFC23*)	tonnes	22.264	14.683	11.313	
2	Purity of the HFC 23 supplied to the decomposition process (*P_HFC23*)	%	81.863	83.277	85.096	The purity of the HFC 23 is determiner twice a week. Thus, an average value is considered.
3	Quantity of HFC 23 supplied to the decomposition process after purity adjustments (*Q_HFC23*)	tonnes	18.226	12.228	9.627	Calculated using data number 1 and 2, as shown below.
4	Quantity of HFC 23 in gaseous effluent (*ND_HFC23*)	tonnes	4.73E-8	4.00E-8	2.50E-8	Determined as shown below.
5	Emissions from HFC 23 not destroyed by the decomposition facility (CO_2*_NDHFC23*)	tonnes	5.534E-4	4.680E-4	2.925E-4	Calculated using data number 4, as shown below.
6	CO_2 emissions from HFC 23 decomposition itself (CO_2*_HFC23*)	tonnes	11.456	7.686	6.051	Calculated using data number 3, as shown below.
7	Project emissions inside of the boundary	tonnes	18.446	11.813	9.106	Calculated using data number 5 and 6, as shown

	(*PE*)					below.
8	Quantity of HCFC 22 produced in the plant generating the HFC 23 waste (Q_HCFC22_y)	tonnes	754.256	583.385	543.286	It is reference data to check cut-off condition, as shown below.
9	HFC 23 sold by the facility generating the HFC 23 waste ($HFC23\_sold_y$)	tonnes	0	0	0	It is reference data to check cut-off condition, as shown below.
10	Baseline quantity of HFC 23 destroyed (BQ_HFC23_y)	tonnes	0	0	0	Estimated taking into account local regulations and using data number 3, as shown below.
11	Baseline Emissions (BE_y)	tonnes	206533	139975	109608	Calculated using data number 3 and 10, as shown below.
12	Steam consumption at the decomposition facility (Q_Steam_y)	tonnes	25.493	21.027	10.301	
13	Emission coefficient for steam generation (E_Steam_y)	tCO_2/tsteam	0.1987	0.1987	0.1987	Calculated from the boiler specific fuel consumption provided by the steam supplier, as shown below.
14	CO_2 emissions from fuel combustion for steam generation ($CO_2\_Steam_y$)	tonnes	5.065	4.178	2.047	Calculated using data number 12 and 13, as shown below.
15	Electricity consumption by the decomposition facility (Q_Power_y)	MWh	123.270	106.584	69.382	

16	CO_2 emission factor from the isolated power plant supplying electricity to Quimobásicos (E_Power_y)	tCO_2/MWh	0.364	0.364	0.364	The emission rate is computed from the most recent official information of the local energy supplier of Quimobásicos.
17	CO_2 emissions from electricity generation ($CO_2\_Power_y$)	tonnes	44.870	38.797	25.255	Calculated using data number 15 and 16, as shown below.
18	Leakage (LE_y)	tonnes	49.936	42.975	27.302	Calculated using data number 14 and 17, as shown below.

Project emissions

Project emissions within the project boundary PE_y (tCO_2e) are expressed as:

$$
\begin{aligned}
\boldsymbol{PE} &= \boldsymbol{E\_DP} \\
&= \boldsymbol{CO_2\_NDHFC23} + \boldsymbol{CO_2\_HFC23} \\
&= \boldsymbol{ND\_HFC23} \times \boldsymbol{GWP_{HFC23}} + \boldsymbol{Q\_HFC23} \times \boldsymbol{EF_{HFC23}} \\
&= \boldsymbol{ND\_HFC23} \times 11{,}700\ tCO_2/tHFC23 + \boldsymbol{Q\_HFC23} \times 44/70\ tCO_2/tHFC23
\end{aligned}
$$

The quantity of HFC 23 waste supplied to the decomposition process after purity adjustments is calculated in the following way:

$$\boldsymbol{Q\_HFC23} = \boldsymbol{q\_HFC23} \times \boldsymbol{P\_HFC23}$$

31Dec06-30Jan07	***Q_HFC23*** = 22.264 tonnes × 0.81863 = **18.226 tonnes**
31Jan07-27Feb07	***Q_HFC23*** = 14.683 tonnes × 0.83277 = **12.228 tonnes**
28Feb07-30Mar07	***Q_HFC23*** = 11.313 tonnes × 0.85096 = **9.627 tonnes**

Note:

An improvement to the G22 manufacturing process was made by replacing air injection to the DP transmitter cell of the HCl receiver "U-16" with G22 gas from daily product tanks. This change produced an exhaust stream composition with less air and other non condensable gases to the scavenger, which in turn required less maintenance and fewer shut downs for its refrigeration loop due to the reduced non condensable presence. Additionally, the exhaust from the scavenger and plasma feed stream air percentage was lowered, which improved the plasma unit energy yields by avoiding to handle and heating air during the genetron destruction process.

The quantity of HFC 23 not destroyed is obtained by multiplying the quantity of gas effluent by the fraction of HFC 23 of such effluent, determined by gas chromatography, as follows:

	Units	January 2007	February 2007	March 2007
Fraction of HFC 23 in gaseous effluent	ppbv	0.427	0.466	0.528
	mg/m^3	0.0012	0.0013	0.0015
Mass flow of HFC 23	g/hr	7.10E-05	7.02E-05	6.61E-05
Hours of operation	hr	665.52	570.17	373
Mass of HFC 23 in gaseous effluent	g	4.73E-02	4.00E-02	2.50E-02
	tonne	4.73E-08	4.00E-08	2.50E-08
HFC 23 supplied to the plasma unit	tonne	18.234	12.228	9.629
Destruction efficiency	%	99.9999997	99.99999967	99.9999997

Thus, the quantity of HFC 23 not destroyed results to be:

31Dec06-30Jan07	***ND_HFC23*** **= 4.73E-08 tonnes**
31Jan07-27Feb07	***ND_HFC23*** **= 4.00E-08 tonnes**
28Feb07-30Mar07	***ND_HFC23*** **= 2.50E-08 tonnes**

Thus, project emissions result to be:

To consider following information:
Project emissions = CO_2 emissions from HFC23 decomposition (tCO_2e) + Emission by sampling (tCO_2e).

CO_2 emissions from HFC23 decomposition (tCO_2e):

31Dec06-30Jan07	**CO_2 emissions** = 4.73E-08 tHFC23 × 11,700 tCO_2e/tHFC23 + 18.226 tHFC23 × 44/70 tCO_2/tHFC23 = **11.456 tCO_2e**
31Jan07-27Feb07	**CO_2 emissions** = 4.00E-08 tHFC23 × 11,700 tCO_2e/tHFC23 + 12.228 tHFC23 × 44/70 tCO_2/tHFC23 = **7.686 tCO_2e**
28Feb07-30Mar07	**CO_2 emissions** = 2.50E-08 tHFC23 × 11,700 tCO_2e/tHFC23 + 9.627 tHFC23 × 44/70 tCO_2/tHFC23 = **6.051 tCO_2e**

Emission by sampling (tCO_2e) = Average monthly date (tons) * 11,700 * day operation of plant plasma

31Dec06-30Jan07	***day operation of plant plasma*** = 28 day
31Jan07-27Feb07	***day operation of plant plasma*** = 24 day
28Feb07-30Mar07	***day operation of plant plasma*** = 16 day

31Dec06-30Jan07	***Emission by sampling (tCO_2e)*** = 2.133E-05 * 11,700 * 28 day = **6.989 (tCO_2e)**
31Jan07-27Feb07	***Emission by sampling (tCO_2e)*** = 1.47E-05 * 11,700 * 24 day = **4.127 (tCO_2e)**
28Feb07-30Mar07	***Emission by sampling (tCO_2e)*** = 1.632E-05 * 11,700 * 16 day = **3.055 (tCO_2e)**

31Dec06-30Jan07	***PE*** = **11.456 tCO_2e + 6.989 (tCO_2e)** = **18.446 tCO_2e**
31Jan07-27Feb07	***PE*** = **7.686 tCO_2e + 4.127 (tCO_2e)** = **11.813 tCO_2e**
28Feb07-30Mar07	***PE*** = **6.051 tCO_2e + 3.055 (tCO_2e)** = **9.106 tCO_2e**

Baseline emissions

Baseline emissions ***BE*** (tCO_2e) are described as:

$$BE = (Q\_HFC23 - BQ\_HFC23) \times GWP_{HFC23}$$
$$= (Q\_HFC23 - BQ\_HFC23) \times 11{,}700\ tCO_2/tHFC23$$

To exclude the possibility of manipulating the production process to increase the quantity of waste, the quantity of HFC 23 waste (*Q_HFC23*) is limited to a fraction (*w*) of the actual HCFC 22 production at the originating plant.

$$Q\_HFC23 \leq Q\_HCFC22 \times w$$
$$\leq Q\_HCFC22 \times 0.0244$$

The annual production of HCFC 22 at the plant is limited to the "Existing production capacity". For the existing HCFC 22 production facility of Quimobásicos, it is considered the maximum annual production value, obtained during the 2002 – 2004 period. Its value is 7,570 tonnes/year.
As shown below, the accumulated production of HCFC 22 is lower than the "Existing production capacity".

	HCFC 22 production (tonnes)
31Dec06-30Jan07	754.256
31Jan07-27Feb07	583.385
28Feb07-30Mar07	543.286
Total	**1880.927**

Thus, the limited quantity of HFC 23 results to be:

	Quantity of HFC 23 (tonnes) $q\_HFC23 \times P\_HFC23$	**Maximum quantity of HFC 23 (tonnes)** $Q\_HCFC22 \times w$	**Limited quantity HFC 23 (tonnes)** $q\_HFC23 \times (P\_HFC23 - dP)$[1] or $(Q\_HCFC22 \times w / P\_HFC23) \times (P\_HFC23 - dP)$[2]
31Dec06-30Jan07	18.226	18.403	22.264 × (0.81863 – 0.02576)= **17.652**
31Jan07-27Feb07	12.228	14.234	14.683 × (0.83277 – 0.01797)= **11.964**
28Feb07-30Mar07	9.627	13.036	11.313 × (0.85096 – 0.02287)= **9.368**

As it is shown above, during the third periods, the quantity of HFC 23 generated is lower than the maximum permissible. Thus, the limited quantity of HFC 23, that can be used in baseline emission calculation, is determined considering the actual quantity of HFC 23 generated: $q\_HFC23 \times (P\_HFC23 - dP)$.

---

[1] If $Q\_HFC23 \leq Q\_HCFC22$ x w.

Note that *dP* is the starndard deviation of the purity measurements.

[2] If $Q\_HFC23 > Q\_HCFC22$ x w.

Note that *dP* is the starndard deviation of the purity measurements.

Note that, in order to determine baseline emissions, as conservative assumption, the limited quantity of HFC 23 supplied to the decomposition facility after purity adjustments is calculated using the average purity of the HFC 23 waste stream (*P_HFC23)* less the corresponding standard deviation (*dP*).

The baseline quantity of HFC 23 destroyed is estimated taking into account local regulations, as follows:

BQ_HFC23* = *Q_HFC23 × ***r***

To date, domestic law of Mexico does not restrict HFC 23 emissions at all, and thus, the baseline corresponds to zero destruction.

Thus, baseline emissions result to be:

31Dec06-30Jan07	***BE*** = 17.652 tHFC23 × 11,700 tCO_2e/tHFC23 = **206533 tCO_2e**
31Jan07-27Feb07	***BE*** = 11.964 tHFC23 × 11,700 tCO_2e/tHFC23 = **139975 tCO_2e**
28Feb07-30Mar07	***BE*** = 9.368 tHFC23 × 11,700 tCO_2e/tHFC23 = **109608 tCO_2e**

As mentioned above, the waste generation rate of the HCFC 22 production plant should be checked by comparing the amount of HCFC 22 produced to the sum of the HFC 23 waste and the HFC 23 recovered for sale.

The following table shows the results of the monitoring period.

	Quantity of HFC 23 waste (tonnes)	**Quantity of HFC 23 sold (tonnes)**	**Quantity of HCFC 22 produced (tonnes)**	***[(Q_HFC23+ HFC23_sold)/ Q_HCFC22]*** × 100 **(%)**
31Dec06-30Jan07	18.226	0	754.256	**2.416**
31Jan07-27Feb07	12.228	0	583.385	**2.096**
28Feb07-30Mar07	9.627	0	543.286	**1.772**

As it is shown above, during the third periods, the waste generation rate of the HCFC 22 production plant is lower than 2.44%, the rate determined prior to project implementation (*w*). Thus, in accordance to the methodology, the quantity of HFC 23 waste is capped to the fraction *w* of the actual HCFC 22 production.

Leakage

Leakage ***LE*** (tCO_2e) is calculated in the following way:

$$LE = CO_2\_Steam + CO_2\_Power$$
$$= Q\_Steam \times E\_Steam + Q\_Power \times E\_Power$$

The emission coefficient for steam generation is estimated by multiplying the specific natural gas consumption of the boiler producing steam (in m^3/t steam)[3] by the lower heating value of natural gas[4] by the CO_2 emission factor of natural gas[5], as follows:

31Dec06-30Mar07	***E_Steam* =** 100 m^3/tsteam × 0.03542 GJ/m^3 × 0.0561 tCO_2/GJ = **= 0.1987 tCO_2/tsteam**

Thus, the leakage results to be:

To consider following information:
Q Power Total Month = Electricity consumption by the decomposition + Amount of energy of plant of residual water treatment.

31Dec06-30Jan07	***Q Power*** = 123.137 MWh + 0.13311 MWh = 123.270 MWh
31Jan07-27Feb07	***Q Power*** = 106.451 MWh + 0.13311 MWh = 106.584 MWh
28Feb07-30Mar07	***Q Power*** = 69.249 MWh + 0.13311 MWh = 69.382 MWh

31Dec06-30Jan07	***LE* =** 25.493 tsteam × 0.1987 tCO_2/tsteam + 123.270 MWh × 0.3640[6] tCO_2/MWh **= 49.936 tCO_2e**
31Jan07-27Feb07	***LE* =** 21.027 tsteam × 0.1987 tCO_2/tsteam + 106.584 MWh × 0.3640[6] tCO_2/MWh **= 42.975 tCO_2e**
28Feb07-30Mar07	***LE* =** 10.301 tsteam × 0.1987 tCO_2/tsteam + 69.382 MWh × 0.3640[6] tCO_2/MWh **= 27.302 tCO_2e**

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[3] Information provided by the steam supplier.
[4] Lower heating value = 0.03542 GJ/m^3
Source: "Balance Nacional de Energía 2003", Subsecretaría de Planeación Energética y Desarrollo Tecnológico, Secretaría de Energía, México, 2004.
[5] Emission factor = 0.0561 tCO_2/GJ
IPCC default value.
[6] 0.3640 tCO_2/MWh = CO_2 emission factor from the isolated power plant supplying electricity, more information look at page 56 picture 59 in:
http://www.iberdrola.es/wcorp/gc/es/doc/InfSostenibilidad2005CompletoFinal.pdf

Note:

Steam used for heat tracing of caustic feed line to plasma unit, was required with less frequency during February and March due to weather conditions and its overall consumption was reduced as well.

Emission reductions

Emission reductions ***ER*** (tCO_2e) are calculated as follows:

$$ER = BE - (PE + LE)$$

The following table shows the total emission reductions achieved by the project activity through the monitoring period.

	Baseline emissions (tCO_2e)	Project emissions (tCO_2e)	Leakage (tCO_2e)	Emission reductions (tCO_2e)
31Dec06-30Jan07	206533	19	50	206464
31Jan07-27Feb07	139975	12	43	139920
28Feb07-30Mar07	109608	10	28	109570
Total	**456116**	**41**	**121**	**455954**

Consideration:

Values for "project emissions" and "leakage" columns are rounded off from actual data from the Excel worksheet to the next integer.

Effluents analysis

The following tables show the analysis reports corresponding to the gaseous effluents.

Gaseous effluent	Value (mg/m^3)
PST	13.04
NO_x	2,753
CO	34,334
Cl_2	Menor a 0.32
HCl	12.08
F_2	Menor a 0.16
HF	Menor a 0.02

Gaseous effluent	Value (ppbv)		
	January 2007	February 2007	March 2007
Trifluoromethane	0.427	0.466	0.528
Chlorodifluoromethane	53.213	84.743	4.165

Gaseous effluents are in compliance with the environmental regulations.

Additionally, the analysis reports of liquid effluents are in compliance with the environmental regulations.