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Quimobásicos, 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 2007 to 30th March 2008
Version: Version 06 – in effect as of 06th August 2007

Quimobasicos S.A. de C.V.
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Date: 16-June-2008

The person who is in charge of this Monitoring Report:

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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 2007 to 30th March 2008 (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
State/Region:	Province of Nuevo León
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Person in charge of the monitoring report	General Manager
Last Name:	Lozano-García
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.

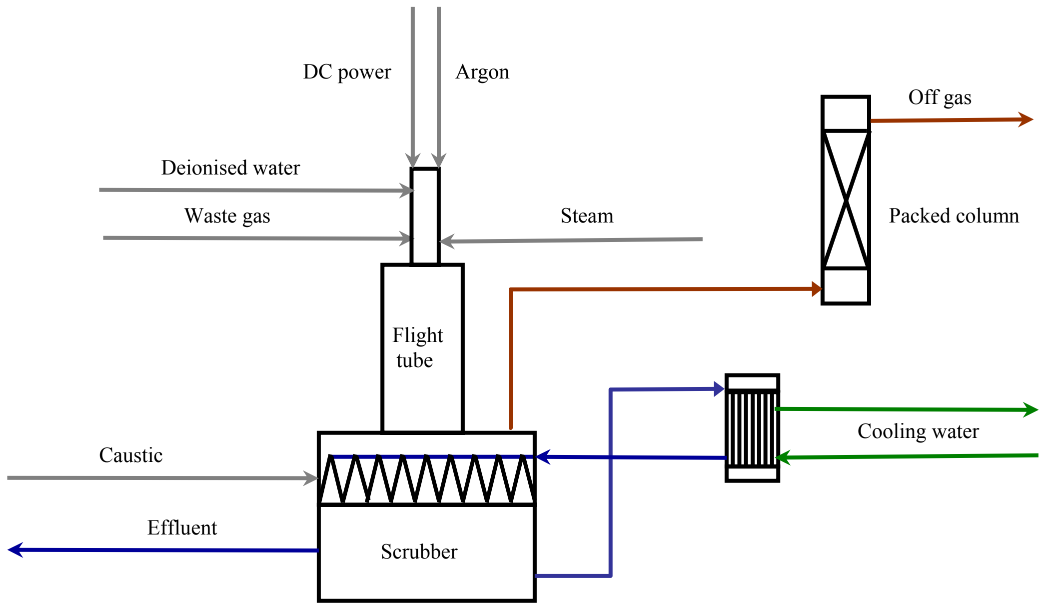
The hot gas mixture at the bottom of the flight tube is composed by carbon gases, halide gases, argon, and water vapour, together with trace of amounts of carbon fines (less than 0.1% of the feed).

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.

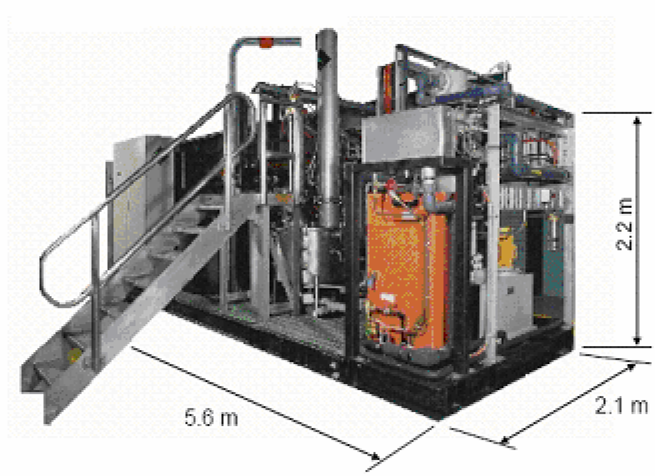
The gas mixture is then passed to a counter-current packed column where final traces of acid gases are removed. Because no fuel gas is needed for the destruction, the gas volume produced is much smaller than with the conventional thermal oxidizers, resulting in a more economical scrubbing system.

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 and second part of the system is expected to be finished in 2007. In 2008 we will initiate with the operation tests. 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 will be 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 will be connected to Distributed Control System (DCS) and their data will be archived in the database of the plant. Calibration of the pattern flow meters will be done according to the calibration procedure of an external national or international company. The pattern flow meters will be recalibrated by an external company. The instrument supervisor shall ask the contract department for the calibration certificate from this external company. In order to have more accurate data, the zero check of the flow meters will be done by instrument personnel using the pattern flow meters. The zero check * of the flow meters will be done weekly and, most of the time, under normal operation. Should the zero check indicate that the flow meter will be not stable; an immediate calibration of the flow meter will be undertaken by an officially accredited entity. Both flow meters will 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 will be investigated and the fault remedied. For the sake of conservativeness, the lower value of the two readings will always be used to estimate HFC 23 mass flow. The decomposition facility includes other two flow meters in order to check the waste gas input. Note: for more information, to see annexed 1 and annexed 2. * See note at the end of the table.
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.

*** Note:**
According to the resolution of EB 33 meeting, dated July 27 2007, the recommendations are implemented in the monitoring report.

Annexed 1:

FUNCTIONALITY TESTS
MEASURERS OF FLOW FED THE PLASMA

	DATE	HOUR	FIQ-201	FIQ-202	% DIFFERENCE	OBSERVATIONS
Ene-08	03-Ene	09:00	97085.13	97015.42	0.071854557	
	14-Ene	09:00	101421.55	101351.60	0.069017164	
	23-Ene	09:00	108854.2	108777.10	0.070878889	
	28-Ene	09:00	111832.10	111755.23	0.068784253	

FUNCTIONALITY TESTS
MEASURERS OF FLOW FED THE PLASMA

	DATE	HOUR	FIQ-201	FIQ-202	% DIFFERENCE	OBSERVATIONS
Feb-08	05-Feb	09:00	118063.99	117987.18	0.065100293	
	12-Feb	13:00	121750.95	121673.00	0.064065158	
	22-Feb	09:00	128720.47	128642.08	0.060936515	
	26-Feb	09:00	131928.05	131847.80	0.060865634	

FUNCTIONALITY TESTS						
MEASURERS OF FLOW FED THE PLASMA						
	DATE	HOUR	FIQ-201	FIQ-202	% DIFFERENCE	OBSERVATIONS
	03-Mar	09:00	135812.10	135783.10	0.021357592	
	10-Mar	09:00	141116.95	141085.97	0.021958243	
Mar-08						
	16-Mar	09:00	145989.95	145957.91	0.021951534	
	25-Mar	09:00	4633.53	4630.49	0.065651799	

Annexed 2:
Report of verification/zero check:

							Report of verification		
Place			QUIMOBÁSICOS S.A. DE C.V.				Made zero check a ?:		
Date							Measurer to verification		
Measurer to verification			Measuring pattern of reference		Report No.		Measuring pattern		
Company			Company				Registry 0 kgs/min in ?:		
Type			Type				Measurer to verification		
Model			Modelo		Identification Flowed		Measuring pattern		
N° of Series			N° of Series		Genetrón 23		P(Kg/cm2)		
Identification			Identification		Plasma Unit		T pattern °C		
Certificate of measurer			Certificate of the pattern				T measurer °C		
							Flow feeding		
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									
MF Average				F0 (Hz)		S Relative	Corrected pattern		
Deviation (s)				F0 Rate (Kg/min)			Average	Measuring flow	Error %
error (%)				K = (F0/ F0 rate) *60					
Factor MF pattern measuring									
It made		INSTRUMENTATION			It approved		QUALITY CONTROL		
Name					Name				
Signature					Signature				

January 2008:

						Summary of report of verification/zero check	
	Place	Monterrey N.L.	QUIMOBÁSICOS S.A. DE C.V.				
	Month	Dic-07					
	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-710-314/2007		
	MF Average	1.0001	It made	Instrumentation		It approved	Quality Control
	Deviation (s)	0.037	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz
31-Dic-07	error (%)	-0.006	Signature			Signature	
	MF Promedio	1.0000	It made	Instrumentation		It approved	Quality Control
	Desviacion (s)	0.065	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz
09-Ene-08	error (%)	0.004	Signature			Signature	
	MF Promedio	1.0000	It made	Instrumentation		It approved	Quality Control
	Desviacion (s)	0.054	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz
14-Ene-08	error (%)	-0.002	Signature			Signature	
	MF Promedio	1.0001	It made	Instrumentation		It approved	Quality Control
	Desviacion (s)	0.070	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz
22-Ene-08	error (%)	-0.012	Signature			Signature	

						Summary of report of verification/zero check	
	Place	Monterrey N.L.	QUIMOBÁSICOS S.A. DE C.V.				
	Month	Dic-07					
	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-710-314/2007		
	MF Average	1.0000	It made	Instrumentation		It approved	Quality Control
	Deviation (s)	0.027	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz
31-Dic-07	error (%)	-0.001	Signature			Signature	
	MF Promedio	1.0002	It made	Instrumentation		It approved	Quality Control
	Desviacion (s)	0.049	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz
09-Ene-08	error (%)	-0.017	Signature			Signature	
	MF Promedio	1.0004	It made	Instrumentation		It approved	Quality Control
	Desviacion (s)	0.070	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz
14-Ene-08	error (%)	-0.036	Signature			Signature	
	MF Promedio	1.0000	It made	Instrumentation		It approved	Quality Control
	Desviacion (s)	0.068	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz
22-Ene-08	error (%)	0.001	Signature			Signature	

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February 2008:

							Summary of report of verification/zero check		
	Place	Monterrey N.L.	QUIMOBÁSICOS S.A. DE C.V.						
	Month	Dic-07							
	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-710-314/2007				
	MF Average	1.0000	It made	Instrumentation		It approved	Quality Control		
	Deviation (s)	0.053	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz		
07-Feb-08	error (%)	-0.002	Signature			Signature			
	MF Promedio	1.0002	It made	Instrumentation		It approved	Quality Control		
	Desviacion (s)	0.046	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz		
12-Feb-08	error (%)	-0.016	Signature			Signature			
	MF Promedio	1.0000	It made	Instrumentation		It approved	Quality Control		
	Desviacion (s)	0.030	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz		
19-Feb-08	error (%)	-0.001	Signature			Signature			
	MF Promedio	0.9999	It made	Instrumentation		It approved	Quality Control		
	Desviacion (s)	0.044	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz		
26-Feb-08	error (%)	0.015	Signature			Signature			

							Summary of report of verification/zero check		
	Place	Monterrey N.L.	QUIMOBÁSICOS S.A. DE C.V.						
	Month	Dic-07							
	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-710-314/2007				
	MF Average	1.0000	It made	Instrumentation		It approved	Quality Control		
	Deviation (s)	0.048	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz		
07-Feb-08	error (%)	0.004	Signature			Signature			
	MF Promedio	1.0009	It made	Instrumentation		It approved	Quality Control		
	Desviacion (s)	0.355	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz		
12-Feb-08	error (%)	-0.085	Signature			Signature			
	MF Promedio	1.0000	It made	Instrumentation		It approved	Quality Control		
	Desviacion (s)	0.035	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz		
19-Feb-08	error (%)	-0.001	Signature			Signature			
	MF Promedio	0.9999	It made	Instrumentation		It approved	Quality Control		
	Desviacion (s)	0.036	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz		
26-Feb-08	error (%)	0.008	Signature			Signature			

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Quimobásicos, S.A. de C.V.

March 2008:

							Summary of report of verification/zero check		
	Place	Monterrey N.L.	QUIMOBÁSICOS S.A. DE C.V.						
	Month	Dic-07							
	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-710-314/2007**				
	MF Average	1.0002	It made	Instrumentation		It approved	Quality Control		
	Deviation (s)	0.123	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz		
04-Mar-08	error (%)	**-0.022**	Signature			Signature			
	MF Promedio	**0.9997**	It made	Instrumentation		It approved	Quality Control		
	Desviacion (s)	**0.053**	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz		
11-Mar-08	error (%)	**0.031**	Signature			Signature			
	MF Promedio	**1.0003**	It made	Instrumentation		It approved	Quality Control		
	Desviacion (s)	**0.086**	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz		
18-Mar-08	error (%)	**-0.032**	Signature			Signature			
	MF Promedio	**0.9996**	It made	Instrumentation		It approved	Quality Control		
	Desviacion (s)	**0.083**	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz		
25-Mar-08	error (%)	**0.043**	Signature			Signature			

							Summary of report of verification/zero check		
	Place	Monterrey N.L.	QUIMOBÁSICOS S.A. DE C.V.						
	Month	Dic-07							
	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-710-314/2007**				
	MF Average	**0.9999**	It made	Instrumentation		It approved	Quality Control		
	Deviation (s)	**0.143**	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz		
04-Mar-08	error (%)	**0.006**	Signature			Signature			
	MF Promedio	**0.9996**	It made	Instrumentation		It approved	Quality Control		
	Desviacion (s)	**0.079**	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz		
11-Mar-08	error (%)	**0.040**	Signature			Signature			
	MF Promedio	**1.0001**	It made	Instrumentation		It approved	Quality Control		
	Desviacion (s)	**0.079**	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz		
18-Mar-08	error (%)	**-0.009**	Signature			Signature			
	MF Promedio	**0.9997**	It made	Instrumentation		It approved	Quality Control		
	Desviacion (s)	**0.083**	Name	Ing José Luis Romero		Name	Ing J Armando Ortega Rmz		
25-Mar-08	error (%)	**0.026**	Signature			Signature			

*** Note:**
According to the resolution of EB 33 meeting, dated July 27 2007, the recommendations are implemented in the monitoring report.

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 six month. * Flow meters zero check: every week. * * See note at the end of the table.	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.

*** Note:**
According to the resolution of EB 33 meeting, dated July 27 2007, the recommendations are implemented in the monitoring report.

Annexed table of control of equipment and instruments.

REQUIREMENTS FOR MONITOREO								
N°	DATA	Measurement/Equipment	Registries	Frequency	Date Calibration	Next Date Calibration	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 Report of process plasma	every 2 hours Day				
		3) Calibration	External report	every six months	August 2007	February 2008		
		4) Zero check	sheet report of verification	Weekly				
		Measuring pattern (1)						
		1) Identification	SAM tag FIT 06 203	N/A			99.50%	0.1023
		2) Reading: Kgs	sheet report of calibration					
		3) Calibration	External report	year	June 2007	June 2008		
2	Purity of the HFC 23 supplied to the decomposition process (P_HFC23_y)	Analysis of chromatography						
		1) Identification	HP 5890 II SERIES 2612AO7449	NA				
		2) Sampling	Leaf of registry of samples	every 4 hours				
		2) Analysis in chromatograph	Laboratory	every 4 hours				
		3) Calibration of chromatograph	External report	year	August 2006	August 2007	99.53%	0.061
		4) Verification method	Registry of verifications	Monthly				
		5) Standard sample	External report	year				
		6) Scale	External report	every 6 monthly	June 2007	December 2007	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				

*** Note:**
According to the resolution of EB 33 meeting, dated July 27 2007, the recommendations are implemented in the monitoring report.

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) Identification	Fairbanks, Series: 473786 / 969970	NA				
		2) Calibration	External report	year	July 2007	July 2008	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	July 2007	July 2008		
		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	June 2007	June 2008	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	July 2007	July 2008		

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) Identification 2) Reading: volts/amperes/watts 3) Calibration	SAM tag MEE 0001 Report operation plasma/IA N/A	N/A Day/monthly N/A	July 2007	July 2008	volts: 99.9% amperes: 99.9% watts: 99.8%	NA NA 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 2) Verification	External report SAM Sistem	Year every 2 monthly			99.99%	0.01%
		Measurer of flow 1) Calibration	External report	Year	July 2007	July 2008	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 619878 tCO_2e.

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

#	Data variable	Data unit	Value 31 Dec07- 30 Jan 08	Value 31 Jan 08- 28 Feb 08	Value 29 Feb 08- 30 Mar 08	Comment
1	Quantity of HFC 23 supplied to the decomposition process (*q_HFC23*)	tonnes	19.828	19.726	22.346	
2	Purity of the HFC 23 supplied to the decomposition process (*P_HFC23*)	%	88.252	88.525	89.786	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	17.499	17.462	20.064	Calculated using data number 1 and 2, as shown below.
4	Quantity of HFC 23 in gaseous effluent (*ND_HFC23*)	tonnes	1.71E-06	1.46E-06	3.21E-07	Determined as shown below.
5	Emissions from HFC 23 not destroyed by the decomposition facility (CO_2*_NDHFC23*)	tonnes	2.00E-02	1.71E-02	3.80E-03	Calculated using data number 4, as shown below.
6	CO_2 emissions from HFC 23 decomposition itself (CO_2*_HFC23*)	tonnes	10.999	10.976	12.611	Calculated using data number 3, as shown below.
7	Project emissions inside of the boundary (*PE*)	tonnes	14.910	14.914	16.501	Calculated using data number 5 and 6, as shown below.
8	Quantity of HCFC 22 produced in the plant generating the HFC 23 waste (Q_HCFC22_y)0	tonnes	710.123	751.726	777.646	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	199204	201790	219013	Calculated using data number 3 and 10, as shown below.
12	Steam consumption at the decomposition facility (Q_Steam_y)	tonnes	26.384	21.494	18.381	Quantity of steam consumed at the decomposition facility. Measure by steam meter
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	5.243	4.271	3.652	Calculated using data number 12 and 13, as shown below.
15	Electricity consumption by the decomposition facility (Q_Power_y)	MWh	59.529	59.181	67.456	Quantity of electricity consumed for: decomposition, plant of residual water treatment and water treatment system
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	21.668	21.542	24.554	Calculated using data number 15 and 16, as shown below.
18	Leakage (LE_y)	tonnes	26.911	25.813	28.206	Calculated using data number 14 and 17, as shown below.

Project emissions

Project emissions within the project boundary $\boldsymbol{PE_y}$ (tCO_2e) are expressed as:

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

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

$$Q\_HFC23 = q\_HFC23 \times P\_HFC23$$

31 Dec07-30 Jan08	***Q_HFC23*** = 19.828 tonnes × 0.88252 = **17.499 tonnes**
31Jan08-28Feb08	***Q_HFC23*** = 19.726 tonnes × 0.88525 = **17.462 tonnes**
29Feb08-30Mar08	***Q_HFC23*** = 22.346 tonnes × 0.89786 = **20.064 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	31 Dec07-30 Jan08	31Jan08-28Feb08	29Feb08-30Mar08
Fraction of HFC 23 in gaseous effluent	ppbv	22.043	25.78	5.387
	mg/m^3	0.0631	0.0738	0.0154
Mass flow of HFC 23	g/hr	5.11E-03	4.29E-03	8.54E-04
Hours of operation	hr	333.78	339.9	375.70
Mass of HFC 23 in gaseous effluent	g	1.71	1.46	3.21E-01
	tonne	1.71E-06	1.46E-06	3.21E-07
HFC 23 supplied to the plasma unit	tonne	17.556	17.474	20.078
Destruction efficiency	%	99.999990	99.999992	99.999998

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

31 Dec07- 30 Jan08	***ND_HFC23*** = **1.71E-06 tonnes**
31Jan08-28Feb08	***ND_HFC23*** = **1.46E-06 tonnes**
29Feb08-30Mar08	***ND_HFC23*** = **3.21E-07 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):

31 Dec07- 30 Jan08	**CO_2 emissions** = 1.71E-06 tHFC23 × 11,700 tCO_2e/tHFC23 + 17.499 tHFC23 × 44/70 tCO_2/tHFC23 = **10.999 tCO_2e**
31Jan08-28Feb08	**CO_2 emissions** = 1.46E-06 tHFC23 × 11,700 tCO_2e/tHFC23 + 17.462 tHFC23 × 44/70 tCO_2/tHFC23 = **10.976 tCO_2e**
29Feb08-30Mar08	**CO_2 emissions** = 3.21E-07 tHFC23 × 11,700 tCO_2e/tHFC23 + 20.064 tHFC23 × 44/70 tCO_2/tHFC23 = **12.611 tCO_2e**

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

31 Dec07- 30 Jan08	***day operation of plant plasma*** = 14 day
31Jan08-28Feb08	***day operation of plant plasma*** = 15 day
29Feb08-30Mar08	***day operation of plant plasma*** = 16 day

31 Dec07- 30 Jan08	***Emission by sampling (tCO_2e)*** = 2.37E-05 * 11,700 * 14 day = **3.891 (tCO_2e)**
31Jan08-28Feb08	***Emission by sampling (tCO_2e)*** = 2.230E-05 * 11,700 * 15 day = **3.921 (tCO_2e)**
29Feb08-30Mar08	***Emission by sampling (tCO_2e)*** = 2.07E-05 * 11,700 * 16 day = **3.886 (tCO_2e)**

31 Dec07- 30 Jan08	***PE*** = **11.019 tCO_2e + 3.891 (tCO_2e)** = **14.910 tCO_2e**
31Jan08-28Feb08	***PE*** = **10.993 tCO_2e + 3.921 (tCO_2e)** = **14.914 tCO_2e**
29Feb08-30Mar08	***PE*** = **12.615 tCO_2e + 3.886 (tCO_2e)** = **16.501 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)
31 Dec07- 30 Jan08	710.123
31Jan08-28Feb08	751.726
29Feb08-30Mar08	777.646
Total	**2239.495**

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

	Quantity of HFC 23 (tonnes) ***q_HFC23 × P_HFC23***	**Maximum quantity of HFC 23 (tonnes)** ***Q_HCFC22 × w***	**Limited quantity HFC 23 (tonnes)** ***q_HFC23 × (P_HFC23 – dP)***[1] or ***(Q_HCFC22 × w/ P_HFC23) × (P_HFC23 – dP)***[2]
31 Dec07- 30 Jan08	17.499	17.327	(710.123 × 0.0244 / 0.88252) x (0.88252 – 0.01355)= **17.026**
31Jan08-28Feb08	17.462	18.342	19.726 × (0.88525 - 0.01092) = **17.247**
29Feb08-30Mar08	20.064	18.974	(777.646 × 0.0244 / 0.89786) x (0.89786 – 0.01027)= **18.719**

The quantity of HFC 23 generated is higher than the maximum permissible. Thus, in accordance to the methodology, the quantity of HFC 23 waste is capped to the fraction *w* of the actual HCFC 22 production. As a consequence, the limited quantity of HFC 23, that can

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[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.

be used in baseline emission calculation, is determined considering the limited quantity of HFC 23 generated: $(Q\_HCFC22 \times w/ P\_HFC23) \times (P\_HFC23 - dP)$.

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:

$$BQ\_HFC23 = Q\_HFC23 \times r$$

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:

31 Dec07- 30 Jan08	***BE*** = 17.026 tHFC23 × 11,700 tCO_2e/tHFC23 = **199204 tCO_2e**
31Jan08-28Feb08	***BE*** = 17.247 tHFC23 × 11,700 tCO_2e/tHFC23 = **201790 tCO_2e**
29Feb08-30Mar08	***BE*** = 18.719 tHFC23 × 11,700 tCO_2e/tHFC23 = **219013 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 **(%)**
31 Dec07- 30 Jan08	17.499	0	710.123	**2.46**
31Jan08-28Feb08	17.462	0	751.726	**2.32**
29Feb08-30Mar08	20.064	0	777.646	**2.58**

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:

31 Dec 07-30 Mar 08	***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 + Electricity consumption water treatment system

31 Dec07- 30 Jan08	***Q Power*** = 59.395 MWh + 0.13311 MWh + 0.000678 = 59.529 MWh
31Jan08-28Feb08	***Q Power*** = 59.015 MWh + 0.13311 MWh + 0.033 = 59.181 MWh
29Feb08-30Mar08	***Q Power*** = 67.206 MWh + 0.13311 MWh + 0.117 = 67.456 MWh

31 Dec07- 30 Jan08	***LE =*** 26.384 tsteam × 0.1987 tCO_2/tsteam + 59.529 MWh × 0.3640[6] tCO_2/MWh **= 26.911 tCO_2e**
31Jan08-28Feb08	***LE =*** 21.494 tsteam × 0.1987 tCO_2/tsteam + 59.181 MWh × 0.3640[6] tCO_2/MWh **= 25.813 tCO_2e**
29Feb08-30Mar08	***LE =*** 18.381 tsteam × 0.1987 tCO_2/tsteam + 67.456 MWh × 0.3640[6] tCO_2/MWh **= 28.206 tCO_2e**

[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.

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)
31 Dec07- 30 Jan08	199204	15	27	199162
31Jan08-28Feb08	201790	15	26	201749
29Feb08-30Mar08	219013	17	29	218967
Total	**620007**	**47**	**82**	**619878**

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	3.18
NO_x	1304.1
CO	2500.2
Cl_2	1.4293
HCl	0.1607
F_2	0.82
HF	93.2

Gaseous effluent	31 Dec 07-30 Jan 08	31 Jan 08-28 Feb 08	29 Feb 08-30 Mar 08
Trifluoromethane	**22.04**	**25.78**	**5.38**
Chlorodifluoromethane	**489.16**	**1871**	**295**

Gaseous effluents are in compliance with the environmental regulations.

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

8. **Factor w.**

Issue (REQUEST 1, 2 AND 3):

Further clarification is required how the DOE verified that the *w* value cannot exceed the capped value for the past one year period (i.e. April 2007 - March 2008), in accordance with paragraph 90 of EB35.

1. - W factor for one year period: 1 April 2007 to 31 March 2008, in accordance with paragraph 90 EB35 Request:

The G22 production of the period was of: 7550.523 t
The G23 production according to w 2.44% (HCFC22 x w) is: 184.232 t
The G23 production (HFC23 x P_HFC23) was: 182.209 t
The G23 production Limited Quantity: 173.800
The w factor according to HFC23/HCFC22 was: 2.301 %

Annexed table of data of the period:

	HCF 22 T.	G23 T.	G23 T.	G23 T.
	Production	HCF22 X w	HFC23 X P_HFC23	Limited Quantity
Total	7550.523	184.232	182.209	173.800
	Factor w:	2.439	2.413	2.301

2. Factor w.

Period: 31st of December 2007 to 30th March 2008

The G22 production of the period was of: 2239.495 t
The G23 production according to w 2.44% (HCFC22 x w) is: 54.643 t
The G23 production (HFC23 x P_HFC23) was: 55.025 t
The G23 limited quantity (Q_HFC23) was: 52.992
The w factor according to HFC23/HCFC22 was: 2.366 %

Annexed table of data of the period:

	HCF 22 T.	G23 T.	G23 T.	G23 T.
	Production	HCF22 X w	HFC23 X P_HFC23	Limited Quantity
Total	2239.495	54.643	55.025	52.992
	Factor w:	2.439	2.457	2.366