



**TOGETHER**  
*for a sustainable future*

## OCCASION

This publication has been made available to the public on the occasion of the 50<sup>th</sup> anniversary of the United Nations Industrial Development Organisation.



**TOGETHER**  
*for a sustainable future*

## DISCLAIMER

This document has been produced without formal United Nations editing. The designations employed and the presentation of the material in this document do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations Industrial Development Organization (UNIDO) concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries, or its economic system or degree of development. Designations such as “developed”, “industrialized” and “developing” are intended for statistical convenience and do not necessarily express a judgment about the stage reached by a particular country or area in the development process. Mention of firm names or commercial products does not constitute an endorsement by UNIDO.

## FAIR USE POLICY

Any part of this publication may be quoted and referenced for educational and research purposes without additional permission from UNIDO. However, those who make use of quoting and referencing this publication are requested to follow the Fair Use Policy of giving due credit to UNIDO.

## CONTACT

Please contact [publications@unido.org](mailto:publications@unido.org) for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at [www.unido.org](http://www.unido.org)

# 22290

## PROJECT COMPLETION REPORT

### SECTION 1: PROJECT DATA

1.1	Country:	Mexico
1.2	Project number: (as per inventory)	MEX/REF/23/INV/67 (MP/MEX/97/175)
1.3	Project title:	Phasing out CFC-11 and CFC-12 at Criotec S.A.
1.4	Date of approval of the project:	23th ExCom Meeting in Nov 1997
1.5	Percentage of national ownership:	100% private company
1.6	Implementing agency:	UNIDO
1.7	Local executing agency/ Financial intermediary:	N.A.
1.8	National coordinating agency:	Instituto Nacional de Ecologia
1.9	Scheduled date of completion:	September 1998
1.10	Actual date of completion:	December 1998
1.11	Date of project completion report:	October 1999
1.12	Completion report done by: (Implementing agency/National agency)	UNIDO

Prepared by: R. Serpa  
Revised by: E. Puerto-Ferre

Date: October 1999  
Date: October 1999

**SECTION 2: EXECUTIVE SUMMARY**

<b>Item</b>	<b>Plan/ Approved</b>	<b>Actual</b>	<b>National Sector Impact*</b>	<b>Comment</b>
ODS phase-out (in ODP tonnes)	16	16	0.41% Refrigeration 0.41% Foam	
Budget and expenditure (US\$)	240,794	240,794	N/A	
Cost-effectiveness (in US\$/kg)	15.0	15.0	N/A	
Project Implementation: (in months)	10	10	N/A	
Project duration	10	10	N/A	
Start up of project activities at country level as stated by Article 5 Party concerned	December 97	December 1, 1997	N/A	
Grant agreement submitted to beneficiary	-	May 14, 1998	N/A	
Grant agreement signature	-	May 14, 1998	N/A	
Inspection of new and modified equipment	May 98	May 14, 1998	N/A	
Funds transferred	August 98	August 98	N/A	
Submission of completion report	October 98	May 99	N/A	

\* *Expressed in percentage of National/Sector consumption.*

**Note:**

As this is a retroactive payment project, main activities in the project were devoted to checking and verification the equipment purchased by the company as well as the invoices of the suppliers.

Overall Assessment of the Project: *A brief description of no more than 300 words of the degree to which the project achieved its objective(s), major problems encountered and lessons learned.*

The project has been initiated and prepared in 1997 based on the Mexican Country Programme for the phase out of ozone depleting substances. The objective of this project was apply the criteria established at the 22nd meeting of the ExCom, referent to the retroactive funds.

Following approval by the Ex Com the project was carried out in four stages:

1. Inspection of the activities undertaken by the company and the new and modified equipment.
2. Inspection and verification of the invoices.
3. 3. Verification of the booking of entries (Recording of transactions)
4. Transfer of the retroactive funds for equipment and incremental operating costs.

Among the technological options presently available the counterpart chose to replace CFC-12 by HFC-134a. As for the replacement of CFC-11 as a blowing agent for polyurethane foam, the company decided to select HFC-141b.

The company had replaced the following machinery and equipment:

2 automatic production evacuation and charging boards have been replaced by boards suitable for HFC-134a, Galileo; 2 existing production leak detectors were replaced by 2 special leak detectors for HFC-134a, Inficon; The old vacuum pumps were replaced by 3 new Galileo and 3 new Robinair vacuum pumps; The performance test and cooling circuits redesign were carried out for each model.

Therefore, new performance testing equipment and materials were purchased by the counterpart.

**SECTION 3(A): ODS PHASE OUT****Pre-Conversion****3.1 Main Lines of Products Manufactured:**

Production of refrigerators units. (Displays, refrigerators, bottle coolers, freezers, etc)

**3.2 Annual Production Level:**

25.7 MT average (18.3 tons CFC-11 and 7.4 CFC-12) were used in 1994 to manufacture 21,200 units.

26.4 MT average (18.8 tons CFC-11 and 7.6 CFC-12) were used in 1995 to manufacture 21,800 units.

0 MT average (0 tons CFC-11 and 0 CFC-12) were used in 1996 to manufacture 22,619 units.

**3.3 ODS Consumed: Average years 1,994 to 1,996**

ODS (1):	<b>CFC-11</b>	Quantity (ODP tonnes):	<b>12.37 MT</b>
ODS (2):	<b>CFC-12</b>	Quantity (ODP tonnes):	<b>5.03 MT</b>
Total:	<b>average</b>	Quantity (ODP tonnes):	<b>17.4 MT</b>
National/Sector Impact:			<b>3.82%</b>

**Post-Conversion**

**3.4 Year of project commissioned: End of 1995. Retroactive funding**

**3.5 Year of commencement of new production: 1996**

**3.6 The transition of ODS-based to non-ODS-based production**

Year	Units Produced with ODSs	ODSs Consumed (ODP tonnes)	Units Produced with Substitutes	Substitutes Consumed (tonnes)
1994	21,200 units	25.75 MT	-	-
1995	21,800 units	26.48 MT	-	-
1996	0 units	0 MT	22,619 units	11.5 MT
1997*	0 units	0 MT	29,405 units	15 MT
1998	0 units	0 MT	38,226 units	19.5 MT
Total	43,000 units	52,228 MT	90,250 units	46,0 MT

\* Year of project approval

**3.7 If there is a variance between the ODS phase-out target in the project document and the actual ODS phase-out, please explain.**

N.A.

**SECTION 4: TECHNOLOGY CHOICE**

ITEM	PRE-CONVERSION	POST-CONVERSION
<p>4.1 <u>Technology Choice</u></p> <p>Technology employed</p> <p>Environmental impact</p> <p>Determining factor for choice</p> <p>Technology change after approval and reason for change</p>	<p>CFC-11&amp; CFC-12</p> <p>ODP = 1</p> <p>The company chose to replace CFC-12 by HFC-134a and decided to select HFC-141b as an intermediate substitute for CFC-11</p> <p>N.A.</p>	<p>HFC-141b &amp; HFC-134a</p> <p>ODP = 0.11 &amp; 0.00</p> <p>The choice was suitable</p> <p>N.A.</p>
<p>4.2 <u>Availability</u></p> <p>No. of months spent in acquiring the technology</p> <p>Reason for delay (if any)</p>	<p>Commercially available</p> <p>N.A.</p> <p>N.A.</p>	<p>Commercially available</p> <p>N.A.</p> <p>N.A.</p>
<p>4.3 <u>Safety</u> (where applicable)</p> <p>Main safety hazard</p> <p>Standard applied</p> <p>Certification by*</p>		<p>International standards were applied.</p> <p>Instituto Nacional de Ecologia</p>

\* *Please attach copies of certification*

4.4 Is there any problem encountered in the implementation of the replacement technology? If yes, please elaborate briefly.

## SECTION 5: BUDGET AND EXPENDITURES

This is a status report on project expenditures at the time of preparing the project completion report with the understanding that a full financial completion report will be prepared as a supplement once the accounts of the project are closed.

### 5.1 Summary

ITEM	PLAN/APPROVED (US\$)	EXPENDITURE (TO-DATE) (US\$)	DIFFERENCE/ COMMENT (US\$)
Incremental capital cost	98,200	98,200	0
Incremental operating cost	142,594	142,594	0
Contingency cost	0	0	0
Total	240,794	240,794	0
ODS phase-out (kg/ODP)	16,000	16,000	
Cost-effectiveness (\$/kg.)	15	15	

### 5.2 Budget and Expenditure on Incremental Capital Cost

ITEM*	APPROVED	EXPENDITURE	DIFFERENCE	REASON
General consultancy services & technology transfer	0	0	0	
Equipment	98,200	98,200	0	
Contingencies	0	0	0	
Incremental operating cost, two years	142,594	142,594	0	
<b>Total Investment</b>	240,794	240,794	0	Retroactive Payment

\*List of equipment approved in the project document (additional equipment should be so indicated).

5.3 Budget and Expenditure on Incremental Operating Cost

CFC-11 PHASE OUT						
Production using CFC				Production using HFC-141b		
	%	Price US\$/kg	Cost US\$/kg	%	Price US\$/kg	Cost US\$/kg
Polyol	37	2.25	0.8325	38	2.25	0.855
MDI	49	3.1	1.519	56	3.1	1.736
ABA	14	4.2	0.588	6	5.5	0.33
Total	100	\$/kg	2.940	100	\$/kg	2.92
Average consume. of foam per unit			4.9			5.39
Total cost US\$/unit			14.4			15.74
Incremental cost difference US\$			1.34	per unit		
CFC-12 PHASE OUT						
				kg	US\$/kg	Total
Average charge CFC-12				0.33	4.40	1.47
HFC-134 a charge				0.30	5.30	1.6
Difference					0.12	
Incremental cost difference US\$				0.12	per unit	
Modification				Incremental Cost (US\$)		
HCF-134a compressor					3	
Capillary tube modification					0.2	
Evaporator and condenser modification					0.5	
3 AA drier					0.2	
HFC-134a refrigerant					0.12	
Extra polyurethane foam because of higher density (+10%) (CFC-11 phase out)					1.34	
TOTAL					5.36	US\$per unit
INCREMENTAL OPERATING COSTS						
Number of units (average per year during period 94 to 96)					39,465	units
Incremental operating costs one year operation					121,565	US\$
Coefficient for N.P.V.					1.74	
Incremental operating costs two years operation					211,524	US\$

5.4 Budget and Expenditure on Contingency Cost

CONTINGENCY FUNDS	ITEM(s)	EXPENDITURE
	Total	0
	Approved	0
	Difference	0



**SECTION 6: IMPLEMENTATION EFFICIENCY**

ITEM	AS PLANNED		DELAY/COMMENT
	YES	NO	
<u>6.1 Project Schedule</u>	X		
Project duration	X		
Start of project activities at country level as stated by Article 5 Party concerned	X		
Grant agreement submitted to beneficiary	X		
Grant agreement signature	X		
Inspection of new and modified equipment	X		
Funds transferred		X	
Submission of completion report	X		

6.4 Please describe any major problems encountered in project implementation and what was the major cause of delay.

No delays in project implementation.

## SECTION 7: DISPOSAL OF ODS-BASED PRODUCTION EQUIPMENT

### 7.1 List of equipment rendered unusable

LIST OF EQUIPMENT RENDERED UNUSABLE (The Baseline)*		DISPOSAL IMPLEMENTED			
Name of Equipment	Description **	Method of Disposal	Date of Disposal	Implementer	Certified By
N.A.	N.A.	-	-	-	-

\* *List of equipment rendered unusable in the project document*

\*\* *Description should include Model No. And Serial No.*

### 7.2 Describe briefly the process of destruction and attach copies of certification of destruction.

## SECTION 8: OVERALL ASSESSMENT OF PROJECT

Using three quantifiable indicators, namely ODS phase-out (plan v. actual) cost and speed of completion (plan v. actual), give an overall assessment of the project in the scale below.

- { } Highly satisfactory, more than planned
- {X} Satisfactory, as planned
- { } Satisfactory, though not as planned
- { } Unsatisfactory, less than planned
- { } Unacceptable

Comments from Government:

## SECTION 9: LESSONS LEARNT

State any lessons that can be drawn from this project that will benefit future projects.

Verification of equipment invoices and the recording of transactions in company's books is a very consuming time task. A lot of attention has to be paid in order to avoid mistakes. Excellent cooperation from the company's side is requested.