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EXECUTIVE COMMITTEE OF
THE MULTILATERAL FUND FOR THE
IMPLEMENTATION OF THE MONTREAL PROTOCOL
Thirty-second Meeting
Ouagadougou, 6-8 December 2000

PROJECT PROPOSAL: VENEZUELA

This document consist of the comments and recommendations of the Fund Secretariat on the following project proposal:

Refrigeration:

• Phasing out CFC-12 with HFC-134a and CFC-11 with HCFC-141b at seven commercial refrigeration companies (umbrella project)	UNIDO

PROJECT EVALUATION SHEET
VENEZUELA

SECTOR: Refrigeration ODS use in sector (1999): 1,992 ODP tonnes

Sub-sector cost-effectiveness thresholds: Commercial US $15.21/kg
Domestic US $13.76/kg

Project Titles:

(a) Phasing out CFC-12 with HFC-134a and CFC-11 with HCFC-141b at seven commercial refrigeration companies (umbrella project)

Project Data	**Multiple-subsectors**
	Seven companies
Enterprise consumption (ODP tonnes)	33.97
Project impact (ODP tonnes)	32.33
Project duration (months)	24
Initial amount requested (US $)	403,590
Final project cost (US $):	
Incremental capital cost (a)	367,582
Contingency cost (b)	36,008
Incremental operating cost (c)	
Total project cost (a+b+c)	403,590
Local ownership (%)	100%
Export component (%)	0%
Amount requested (US $)	403,590
Cost effectiveness (US $/kg.)	12.48
Counterpart funding confirmed?	
National coordinating agency	FONDOIN
Implementing agency	UNIDO

Secretariat's Recommendations	
Amount recommended (US $)	403,590
Project impact (ODP tonnes)	32.33
Cost effectiveness (US $/kg)	12.48
Implementing agency support cost (US $)	52,467
Total cost to Multilateral Fund (US $)	456,057

PROJECT DESCRIPTION

Sector Background

- Latest available total ODS consumption (1999)	5,316.60 ODP tonnes
- Baseline consumption of Annex A Group I substances (CFCs)	3,321.60 ODP tonnes
- Consumption of Annex A Group I substances for the year 1999	1,922.10 ODP tonnes
- Baseline consumption of CFCs in refrigeration sector	Not available ODP tonnes
- Consumption of CFCs in refrigeration sector in 1999	Not available ODP tonnes
- Funds approved for investment projects in refrigeration sector as of July 2000 (31st Meeting)	US$13,667,583.00
- Quantity of CFC to be phased out in investment projects in refrigeration sector as of end of 1999	560.00 ODP tonnes

1. Based on data reported by Venezuela to the Ozone Secretariat, 1999 ODS consumption includes 3,321.5 ODP tonnes of CTC.

2. The Executive Committee has approved US $13,667,583 for 24 projects to phase out 560 ODP tonnes of CFC for enterprises manufacturing refrigeration equipment.

3. The major manufacturers in the domestic and commercial refrigeration sector have been converted to non-ODS technology. The project covers the ODS phase out at seven small-scale enterprises in the commercial refrigeration sub-sector in Venezuela.

Umbrella project

4. The seven enterprises (Vikingo, Eterna, Indarelca, J.R. Refrigeracion, Inelmem, Couttenye and Refrinaza) consumed 28.05 ODP tonnes of CFC-11 and 5.92 ODP tonnes of CFC-12 (average of 1997-1999) in the manufacture of various types of commercial refrigeration equipment; air-conditioners, display cabinets, cooling compartments and commercial freezers.

5. The current project will phase out 28.05 ODP tonnes of CFC-11 and 5.8 ODP tonnes of CFC-12 at the seven enterprises by converting CFC-11 to HCFC-141b as the foam blowing agent, and CFC-12 to HFC-134a as the refrigerant. At Inelmen and Couttenye the low-pressure foaming machines will be scrapped and replaced with high-pressure machines for US $85,000 each. In addition mould heating will be purchased at a unit price of US $14,000. J.R. Refrigeracion and Refrinaza will modify the existing manual foaming technology and each will receive a low-pressure foaming machine for US $36,000 per piece. All companies except Refrinaza will receive various charging, leak detection and evacuation equipment for a total amount of US $55,700. The redesign and trial production costs will be borne by the companies.

The training and consultancy component in total is US $7,500. Incremental operating cost is not claimed due to the cost effectiveness threshold limitations.

Justification for the use of HCFC-141b

6. The enterprise has selected HCFC-141b technology to replace CFC-11 in its foam blowing operations. It is an interim solution until non-CFC systems (different from hydrocarbons) are commercially available. A letter advising the Government decision to use HCFC technology has been received by the Secretariat in accordance with the Executive Committee Decision 27/13 and is attached to this evaluation together with a justification from the implementing agency.

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

1. All the incremental capital and operating costs have been agreed between the Secretariat and UNIDO.

RECOMMENDATIONS

1. The Fund Secretariat recommends blanket approval of the umbrella project from UNIDO with the level of funding and associated support costs as indicated below.

	Project Title	Project Funding (US$)	Support Cost (US$)	Implementing Agency
(a)	Phasing out CFC-12 with HFC-134a and CFC-11 with HCFC-141b at seven commercial refrigeration companies (umbrella project)	403,590	52,467	UNIDO

Annex

Justification for the Use of HCFC Technology

Foam Blowing Agent

Table 2. shows the CFC-11 various alternatives for foam blowing and their ozone depleting potentials.

Table 2. Alternative blowing agents to replace CFC-11

Foaming Agent	***Ozone Depleting Potential (ODP)***
HCFC-141b	0.11
HCFC-142b	0.065
HCFC-142b + HCFC-22	0.06
HFC-134a	0
Cyclopentane	0

It can be seen that HCFC-141b, HCFC-142b and the blend of HCFC-142b/HCFC-22 all have some ODP and are therefore accepted only as transitional substances.

When considering the currently available long-term replacements the field is narrowed to HFC-134a and cyclopentane. In Europe, HFC-134a was used as a blowing agent for a short time, but it was abandoned because it is very expensive compared to CFC-11 and cyclopentane. It is very unlikely that HFC-134a will become a widely used ultimate blowing agent for polyurethane foam in the refrigeration sector.

Lately, all major European manufacturers have already started using cyclopentane to produce polyurethane foam and similar trend is seen in many other parts of the world except North America. However, cyclopentane is an explosive chemical and its application would require, *inter alia,* the installation of the following new equipment:

> Since cyclopentane and polyol cannot be delivered premixed in drums or tanks, as is the case with polyol and CFC-11, it is necessary to provide an expensive explosion proof mixing station. The same applies for the foaming machine.
>
> In order to ensure operational safety when using the highly flammable and explosive cyclopentane and to meet the relevant requirements of the local authorities, it is necessary to install a gas detector system in the foaming department around the foaming machine.
>
> Due to the current layout of the plants where several machines are installed next to each other installation of comprehensive automatic sprinkler fire protection systems is inevitable.

In order to prevent hazards and achieve compliance with established safety rules for the machinery and the plant, a safety exhaust system is also necessary in the foaming department in all areas where cyclopentane is in use and could escape.

All machinery and equipment which may come into contact with pure cyclopentane or cyclopentane/polyol must be explosion-proof and/or encapsulated.

To make the foaming jigs explosion-proof, it is necessary to replace electrical contacts, switches, motors etc. with specially designed explosion-proof ones. All foaming jigs and plugs must be fitted with a good earth connection to avoid sparks generated by static electricity. The workers' clothes and shoes must be made of antistatic material and the floor must be covered with antistatic paint.

As a precaution against static induced explosions, it is also necessary to inject nitrogen into the foaming cavity, immediately prior to the injection of the polyurethane material into the cabinet. This requires installation of N_2 tank, ring line and injection nozzles.

An emergency motor-generator must be provided to supply electric energy for the safety system even in case of black-outs.

Following completion of the installation an international institution in cooperation with local authorities must certify the safe operation of the foaming installation.

These safety measures and new equipment would increase the cost of the project by at least US $300,000 by company which would make the cost effectiveness of the project unacceptably high. The recipient enterprises have no financial means to complement the Multilateral Fund grant with the additional funds required for the implementation of the project with cyclopentane technology.

Moreover, the recipient companies are very small enterprises with weak technical support staff especially in the field of maintenance and the present staff would be not able to run the plant and carry out the required maintenance procedures.

On the other hand, formulations with HCFC-141b are already in common use in Venezuela, so various system houses can supply the necessary chemicals and also the recipient companies can receive day to day technical support from their local raw material suppliers. It is also known, that several multinational chemical companies are developing new non-hazardous substances for the “drop-in” replacement of HCFC-141b commonly used in North America and many other parts of the world. It is foreseen that introduction of such new blowing agents would not require major changes of the manufacturing equipment. These new chemicals are anticipated to be on market in the first half of the next decade.

In the course of the project formulation the companies were made aware of all currently available technical solutions for the phase out of CFC-11. The transitional nature of HCFC-141b and its ODP was introduced to them. Moreover, it was underlined that no additional assistance will be available from the Multilateral Fund in case the local regulations will require phase out of HCFC-141b in the later future. Despite of all this and on the basis of the aforementioned technical and financial considerations the recipient companies decided to adopt HCFC-141b as a replacement for CFC-11 for foam blowing. This is a justified decision in the said circumstances.