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Executive Committee of
the Multilateral Fund for the
Implementation of the Montreal Protocol

Thirteenth Meeting
Montreal, 25-27 July 1994

WORLD BANK WORK PROGRAMME AMENDMENTS

This document includes:

- Comments and Recommendations from the Fund Secretariat
- 1994 Work Programme Amendments

COMMENTS AND RECOMMENDATIONS FROM THE FUND SECRETARIAT

1. The World Bank is requesting approval of the Executive Committee for US $2,940,562 for 11 amendments to its 1994 Work Programme, including eight investment projects under US $500,000, two project preparation activities and one institutional strengthening project as included in Table 1.

2. The total allocations recommended by the Fund Secretariat are US $2,294,700.

Table 1: 1994 World Bank Work Programme Amendments
Activities/Projects and Corresponding Funding Levels

No.	Activity/Project	Amount Requested (US $)	Amount Recommended (US $)
	Argentina		
1)	Institutional Strengthening	359,500	359,500
	Brazil		
2)	System for Storage and Charging of Ester Oils Used in Manufacture of HFC-134a Refrigerant Refrigerator Compressors at Empresa Brasileira de Compressors (EMBRACO)	280,000	221,200
	China		
3)	Conversion to CFC-free technology in manufacture of extruded polyethylene and polystyrene foam sheet at Shanghai No.18 Plastics Product Plant	450,000	450,000
4)	Fire Extinguisher Production Conversion from Halon 1211 to ABC Dry Chemical at Benxi Fire Equipment Factory, Liaoning	280,000	0
	India		
5)	Conversion of CFC-12 open-type compressor designs for use of HCFC-22 refrigerant at Freezeking Industries Pvt. Ltd.	240,500	240,500
	Indonesia		
6)	Elimination of CFC-11 in the manufacture of flexible polyurethane foam (slabstock) at P.T. Erlangga Trimanunggal Kusumah	379,000	379,000
7)	Elimination of CFC-11 in the manufacture of flexible polyurethane foam (slabstock) at P.T. Royal Abadi Sejahtera	237,500	237,500
8)	ODS Phase Out Investment Project Preparation	170,000	170,000
	Thailand		
9)	Production of HFC-134a mobile air conditioner parts at Nippondenso Thailand	155,000	137,000
10)	Conversion of Electronic Cleaning Process from CFC-113 to High-Purity Water Cleaning at Team Tronics Co., Ltd.	248,562	0
	Turkey		
11)	ODS Phase Out Investment Project Preparation	100,000	100,000
GRAND TOTAL		2,900,062	2,294,700

Specific Comments

4. The following comments relate to the activities listed in Table 1 above, where necessary.

Project Nº 1 : Argentina: Institutional Strengthening (US $359,500).

1. The objective of the project is the creation and strengthening of the Ozone Programme Office (OPROZ), whose activities will be to plan, organize, direct and coordinate all tasks required for the implementation of the country programme.

2. It is recommended to approve the requested funding at US $359,500.

Project Nº 2 : Brazil: System for Storage and Charging of Ester Oils Used in Manufacture of HFC-134a Refrigerant Refrigerator Compressors at Empresa Brasileira de Compressors (EMBRACO) (US $280,000). Cost effectiveness: cannot be meaningfully calculated.

1. The project covers the purchase and installation of the storage processing and charging equipment to handle the ester oil used for manufacturing of HFC-134a compressors at Empresa Brazileira de Compressors (Embraco). Phase I of the project covers conversion of three assembly lines to HFC-134a technology. Phase I is already completed and funding will be retroactive. Phase II is dealing with the conversion of four additional lines.

2. Embraco will present a second sub-project which will include all other incremental costs of the conversion from CFC-12 to HFC-134a compressors in February 1995.

3. Embraco is the second largest compressor manufacturer in the world, producing 9.2 million compressors per year. Embraco exports 70 per cent of its production, 30 per cent of its total exports are destined to developed countries.

4. The manufacturer of HFC-134a compressors does not phaseout ozone depleting substances directly. It happens only when non-CFC compressors are installed by the refrigerator manufacturer and the refrigerator system is filled with non-CFC refrigerant. When HFC-134a compressors produced in Article 5 countries are exported to non-Article 5 countries, it does not affect the ODS phaseout in Article 5 countries.

5. The Fund Secretariat recommends that US $221,200 should be approved which represent 79 per cent of the requested funding. It reflects the share of Embraco's production which is utilized in Article 5 countries.

Project Nº 3 : China: Conversion to CFC-free technology in the manufacture of extruded polyethylene and polystyrene at Shanghai No.18 Plastics Product Plant (US $450,000). Cost effectiveness: US $2.19/kg.

1. This project will phase-out 200 tons of CFC-12 in the production of extruded polystyrene and polyethylene by using pentane as a blowing agent.

2. The capital costs are related to foaming equipment modification, pentane tanks and safety systems such as fire safety and ventilation. The company plans to move from a residential area to an industrial one, the cost will be borne by the company's own expenses. Operational costs/savings are balanced since in China, compared to other countries, the price of CFC-12 is cheap but pentane is expensive and there are extra maintenance and insurance costs.

3. It is recommended to approve funding of US $450,000 for the company.

Project Nº 4 : China: Fire Extinguisher Production Conversion from Halon 1211 to ABC Dry Chemical at Benxi Fire Equipment Factory, Liaoning (US $280,000)

1. The objective of the project is to convert Benxi Fire Equipment Factory from halon 1211 to ABC dry powder portable extinguishers (25,000 extinguishers per year).

2. Additional capital equipment as well as rehabilitation of existing buildings constitute the capital costs of the project.

3. Conversion technology will be obtained from Zhejiang Fire Equipment Factory, whose own conversion was financed by the Multilateral Fund. Nevertheless, Benxi is requesting funding for design and prototyping.

4. Incremental operating costs (US $124,000) are calculated on the basis of the net profit loss over a period of four years. The project itself will realize operational savings.

5. The Fund Secretariat informed the Bank that both the cost of design and prototyping (US $11,305) and the cost of building rehabilitation (US $21,470) should not be included as incremental costs, since the first could be obtained from Zhejiang and the latter is not needed for conversion.

6. The Bank informed the Secretariat that both costs are considered to be incremental by the enterprise. It further stated that operational savings, if taken as the basis for calculating incremental operating costs, will perhaps render the project unfundable.

7. Given the fact that savings and benefits must be taken into consideration when determining the amount of the grant for the project, this project cannot be recommended for approval.

8. The Executive Committee may wish to consider this matter further.

Project Nº 5 : **India: Conversion of CFC-12 open-type compressor designs for use of HCFC-22 refrigerant at Freezeking Industries Pvt. Ltd. (US $240,500). Cost effectiveness: cannot be meaningfully calculated.**

1. The project covers redesigning, prototyping and manufacturing development of new open-type HCFC-22 compressors at Freezeking Industries Pvt. Ltd., which will replace CFC-12 compressors in commercial refrigeration and air-conditioning in end-user sectors by 1998.

2. Incremental capital costs cover engineering design, prototyping, testing, and retooling of the manufacturing facilities.

3. The Secretariat recommends final approval in the amount requested, i.e., US $240,500.

Project Nº 6 : **Indonesia: Elimination of CFC-11 in the manufacture of flexible polyurethane foam (slabstock and molded) at P.T. Erlangga Trimanunggal Kusumah (US $379,000). Cost effectiveness: US $3.71/kg.**

Project Nº 7 : **Indonesia: Elimination of CFC-11 in the manufacture of flexible polyurethane foam (slabstock) at P.T. Royal Abadi Sejahtera (US $237,500). Cost effectiveness: $1.98/kg.**

1. Erlangga is producing slabstock and molded flexible polyurethane foams; Royal Abadi, slabstock. Under these projects, Erlangga will eliminate 100 tons of CFC-11 by using methylene chloride technology and water-blown systems; Royal Abadi, 120 tons of CFC-11 by using methylene chloride technology.

2. Capital costs relate to safety equipment such as ventilation and fire safety and vacuum cooling systems for slabstock and high pressure foaming machines for molds. Incremental operational savings are generated because there is no use of CFC-11.

3. The project will realize operational savings which have been reflected in the net incremental costs requested.

4. It is recommended to approve funding of US $379,000 for Erlangga Trimanunggal Kusumah and US $237,500 for Royal Abadi Sejahtera.

Project Nº 9 : Thailand: Production of HFC-134a mobile air conditioners at Nippondenso Thailand (US $155,000). Cost effectiveness: cannot be meaningfully calculated.

1. This project covers part of the conversion of MAC's production facilities to HFC-134a technology at Nippondenso i.e., piping and hose caulking sections of the production process. It covers purchasing of equipment and training and engineering costs. This project proposal was submitted for between-meeting approval on 17 January 1994. the Secretariat sent their comments to the World Bank on 1 February 1994. The response was received on 24 June 1994. The World Bank has re-submitted the project for consideration at the present Executive Committee meeting.

2. The issue of high training and contingency costs has been raised in the Secretariat's comments which represent 30 per cent of the project costs. Training costs cover training of twelve Thai engineers during a five-year period. However, Nippondenso will start full production of new pipes and hoses in 1995. It seems that training of six engineers through 1995 to 1997 is not related to piping and hose caulking conversion.

3. It is recommended to approve funding at US $137,000.

Project Nº 10 : Thailand: Conversion of electronic cleaning process from CFC-113 (14.4 tonnes) to high-purity water cleaning at Team Tronics Co., Ltd. (US $248,562). Cost effectiveness: US $27.0/kg.

1. This project proposal was submitted for between-meeting approval on 17 January 1994. The Secretariat sent comments on 2 February 1994; however, no response was received from the World Bank.

2. The World Bank re-submitted the same document for consideration at the 13th Meeting of the Executive Committee without any change or the response to the Secretariat's comments. The Secretariat cannot therefore recommend any action on this project.

MULTILATERAL FUND FOR THE IMPLEMENTATION OF THE MONTREAL PROTOCOL

EXECUTIVE SUMMARY

Country:	**ARGENTINA**
Sector:	**Institutional Strengthening**
Country ODS Consumption:	**6583.4 T of ODS** **4438.6 T of ODP (1992)**
Project Duration:	**3 years**
Project Impact:	**Not applicable**
	The country program provides for the elimination of: 1217 T of ODS (1240 T of ODP) in Phase one 5378 T of ODS (5378 T of ODP) in Phase two 663 T of ODS (636 T of ODP) in Phase three
Total Project Cost:	**US$ 859,500**
Fund Contribution:	**US$ 359,500**
Implementing Agency:	**World Bank**
Executing Agencies:	**Secretary of Natural Resources and Human Environment - Secretary of Industry**

PROJECT SUMMARY

The object of the project is the creation and strengthening of the Ozone Program Office (OPROZ), whose primary activities will be to plan, organize, direct and coordinate all tasks required for the implementation of the country program.

Upon completion of the three-year period of the proposed project, OPROZ will continue to carry out the work under the country program until ODS consumption has been eliminated.

INSTITUTIONAL STRENGTHENING PROJECT

ARGENTINE REPUBLIC

I. GENERAL

The Argentine Republic is a party to the Vienna Convention for the Protection of the Ozone Layer and the Montreal Protocol on Substances that Deplete the Ozone Layer. It has ratified the London Amendment of 1990, and the Argentine Legislature is in the process of passing the Copenhagen Amendment.

Since the country's level of consumption of ozone-depleting substances (ODS) is 6583.4 t, equivalent to 4438.6 t of ozone-depleting potential (ODP) (1992), i.e. less than 0.3 kg per capita, Argentina falls under Article 5, paragraph 1, of the Protocol.

The country program to reduce and eliminate the consumption of ODS is being presented for approval to the July 1994 meeting of the Executive Committee of the Multilateral Fund.

1.	**Title of Request:**	**Institutional Strengthening**
2.	**Country:**	**Argentina**
3.	**Executing Agency:**	Pursuant to Decree 177/92, the Secretary of Natural Resources and the Environment is the authority empowered to enforce the Montreal Protocol. In order to facilitate the coordination and functioning of the government's action plan for compliance with the Montreal Protocol, the **Ozone Program Office (OPROZ)** has been created.
4.	**Implementing Agency:**	**World Bank**
5.	**Gross Domestic Product:**	**Gross domestic product per capita** in the Argentine Republic is **US$ 1,990** for 1992.
6.	**Consumption of Controlled Substances:**	Of the controlled substances covered by the Montreal Protocol, Argentina customarily consumes the following: CFC-11, CFC-12, CFC-113, CFC-114, CFC-115, Halon-1211, Halon-1301, CFC-13, Carbon Tetrachloride,

Methyl Chloroform, HCFC-22, and Methyl Bromide.

Consumption of Controlled Substances- 1992

		ODS	ODP
ANNEX A, GROUP I		3.913,4	3.859
ANNEX A, GROUP II	Halon 1211	75,9	227,7
	Halon 1301	11,1	111
	Total	**87,0**	**338,7**
ANNEX B, GROUP I	CCl4	**2039**	**Raw Material**
ANNEX B, GROUP II	CFC-113	0,5	0,5
ANNEX B, GROUP III	MCF	2040	204
ANNEX C,	HCFC22	528,2	26,4
METHYL BROMIDE		14,3	10
TOTAL CONSUMPTION		**6.583,4**	**4.438,6**

7. Consumption of Controlled Substances by Sector

The use of ODSs is concentrated in six industrial sectors, i.e. refrigeration, air conditioning, foams, aerosols, solvents and fire extinguishing agents, with a small balance for other unidentified sectors.

CFCs are used mainly in refrigeration, air conditioning and foams. A relatively small quantity is used in manufacturing aerosols for mouth and throat medicines. HCFC-22 is consumed in refrigeration and air conditioning as well.

Methyl chloroform is used exclusively as a solvent, while halons are used as fire extinguishing agents. Methyl bromide is used as a fumigating agent.

Sector Distribution

Refrigeration	1441 T of CFC-12 333 T of HCFC-22
Foams (includes household and commercial refrigerators)	1275 T of CFC-11 209 T of CFC-12
Air conditioning	637 T of CFC-12 184 T of HCFC-22
Extinguishers	75.9 T of H-1211 11.1 T of H-1301
Aerosols	48 T of CFC-11 48 T of CFC-12
Solvents	63.4 T of CFC-113 2040 T of MCF
Others, unidentified	11 T of CFC-11 104.2 T of CFC-115 0.5 T of CFC-13 11 T of HCFC-22

8. Objectives

8.1 Short-term Objectives

The main objective of the project is the creation and strengthening of OPROZ to implement the country program to reduce and eliminate the consumption of ODSs and to convert the industries producing and consuming such substances.

In this context, plans call for the following actions to be carried out:

A. **Set up the Ozone Program Office (OPROZ)** to implement the action plan. Activities, responsibilities, composition and interaction under the plan are described in section II on structure and management.

B. **Set up a Consultative Group on the Ozone Layer (GRUCO)** by sector — halons, refrigeration, foams and solvents — with representatives of producers, importers, user associations and government agencies, academic institutions and nongovernmental organizations, forming a consultative body in this way.

C. Organize, expand and give continuity to a centralized **system to evaluate ODS consumption**, imports and exports through OPROZ.

D. Generate and complete the **regulatory system for ODSs** for production, imports, consumption, recovery, recycling, and international trade.

E. Disseminate information and promote **public awareness** of issues related to controlled substances and the Montreal Protocol.

8.2 Long-term Objectives

The capacity developed during the first phase of the country program (1994-1997), in parallel to the implementation of the proposed project, will lay the groundwork for the tasks to be carried out during the second phase (1998-1000) and third phase (2001-2005) of the country program. OPROZ will continue to carry out its activities until the consumption of ODSs has been eliminated completely, which is expected to occur by the year 2005.

9. Project Scope

Argentina has a continental territory of approximately 28 million square kilometers, having a maximum width of 3700 km. The industries that consume ODSs are located along the entire width and length of the country.

OPROZ, through the National Institute of Industrial Technologies INTI, will extend its operations and activities to assist industry and users in general, using its regional structure through centers located throughout the country, for the presentation and execution of projects and for the timely dissemination of information.

10. Project Rationale

The Secretary of Natural Resources and the Environment is the enforcing authority for the Montreal Protocol. The Secretary of Industry is in charge of all matters relating to industrial policy, and for the industrial reconversion processes deriving from implementation of the country program pursuant to the Montreal Protocol.

This institutional strengthening project coincides with the first phase of the timetable for reduction under the country program. During this phase, national programs for the various sectors — halons, refrigeration, foams and solvents — will be prepared and forwarded to the Executive Committee of the Fund for approval, most of the industrial reconversion projects for the priority sectors.

The industrial reconversion will be initiated, to this end, plans call for the National Industrial Technology Institute (INTI) to take charge of the analysis and follow-up of the sector and industrial projects, and of technical assistance.

Eliminating the consumption of ODSs requires an effective institutional framework that will facilitate and streamline the tasks planned and the industry's access to funds under the Montreal Protocol. Accordingly, OPROZ has been created as a focal point to coordinate all activities related to the implementation of the country program. OPROZ has representatives of the Secretary of Natural Resources and the Environment, the Secretary of Industry, and the Ministry of External Relations. OPROZ will delegate to INTI those technical matters which fall under its sphere of competence.

The aforesaid organizations currently have a representative for the implementation of the country program, but this infrastructure is insufficient to carry out the proposed programs. Accordingly, OPROZ is being created and will require consulting services for the monitoring and information systems, the public awareness campaigns, and for the drafting of appropriate legislation.

11. Project Beneficiaries

The primary direct beneficiary will be OPROZ and, within their spheres of competence, the Secretary of Natural Resources and the Environment, the Secretary of Industry and the National Industrial Technology Institute, since they will receive the necessary support to perform the role assigned to them under the country program and the activities described herein for the effective elimination of ODSs.

The indirect immediate beneficiaries will be the industrial sector currently producing and consuming ODSs. This sector encompasses small and medium-sized private companies, which will be required to convert their production to different technologies or alternative substances, since the effective functioning of the organizations in charge of presenting and following up on the projects will contribute to the reconversion process.

12. Capacity of the Beneficiaries

The Secretary of Natural Resources and the Environment and the Secretary of Industry have the basic infrastructure. The two secretaries are responsible for environmental and industrial policy, respectively. For the presentation and follow-up of sector and industrial reconversion projects, the secretaries have entered into an agreement which provides for the National Industrial Technology Institute to act as technical coordinating agency.

Although this basic structure exists and work is being done on the country program and the sector projects, lacking at the present time are systems for gathering information, an easily enforceable legal system, systems of technological information available to all industrial sectors, and public information and awareness as to the effects of the depletion of the ozone layer, as well as sufficient personnel to achieve the objectives of the country program properly and in a timely manner.

In order to address these constraints, the following Institutional Strengthening Project has been drawn up:

II. STRUCTURE AND MANAGEMENT

Several organizations will take part in the implementation of the country program, and their functions are as described below:

Ministry of External Relations and International Trade

This Ministry is responsible for overseeing faithful compliance with the international commitments undertaken by the Argentine government, and the transmittal of the reports provided for under Article 7 of the Protocol.

Secretary of Natural Resources and the Environment

The Secretary of Natural Resources and the Environment, which reports to the Office of the President, is the enforcing authority for the Montreal Protocol, and is responsible for the following:

- Implementing environmental policy
- Framing environmental guidelines
- Establishing the timetable for reducing the consumption of controlled substances
- Evaluating and approving projects
- Public awareness and publicity programs
- Technical assistance on the environment
- Evaluating data on consumption to verify compliance with reduction programs

Secretary of Industry:

- Industrial policy for implementation, instruments, incentives, restrictions and sector structure
- Designing projects for industrial reconversion or investment

- Evaluating and approving projects
- Training programs for industry

National Institute for Industrial Technology

The Secretary of Natural Resources and the Environment and the Secretary of Industry have signed an agreement whereby INTI is to act as technical agency, with the following responsibilities:

- Identify, prepare and follow up on sector projects in the areas of halons, refrigeration, foams and solvents.
- Identify, prepare and analyze projects for industrial reconversion, with subsequent follow-up.

Ozone Program Office (OPROZ):

The Ozone Program Office (OPROZ) will be created under the direction of representatives of the Ministry of External Relations and International Trade, the Secretary of Natural Resources and the Environment, and the Secretary of Industry. OPROZ will be responsible for tasks related to the implementation of the country program.

The responsibilities of OPROZ will be as follows:

- Issue reports evaluating compliance with the country program and monitoring changes in data on ODS consumption.
- Propose criteria to be followed in granting permits for ODS production, imports and exports.
- Suggest mechanisms for setting ODS production and import quotas.
- Assist secretary in formulating regulatory measures.
- Survey ODS production, imports, exports, and uses.
- Evaluate implementation projects in accordance with the priorities set in this program, and monitor the execution thereof.
- Perform coordination and executive secretariat tasks in connection with the program.
- Coordinate with INTI on activities related to sector programs for halons, refrigeration, foams and solvents.
- Organize and coordinate tasks for technical training, dissemination of information and public awareness in relation to the ozone layer.
- Call and coordinate meetings of the Consultative Group on the Ozone Layer (GRUCO).

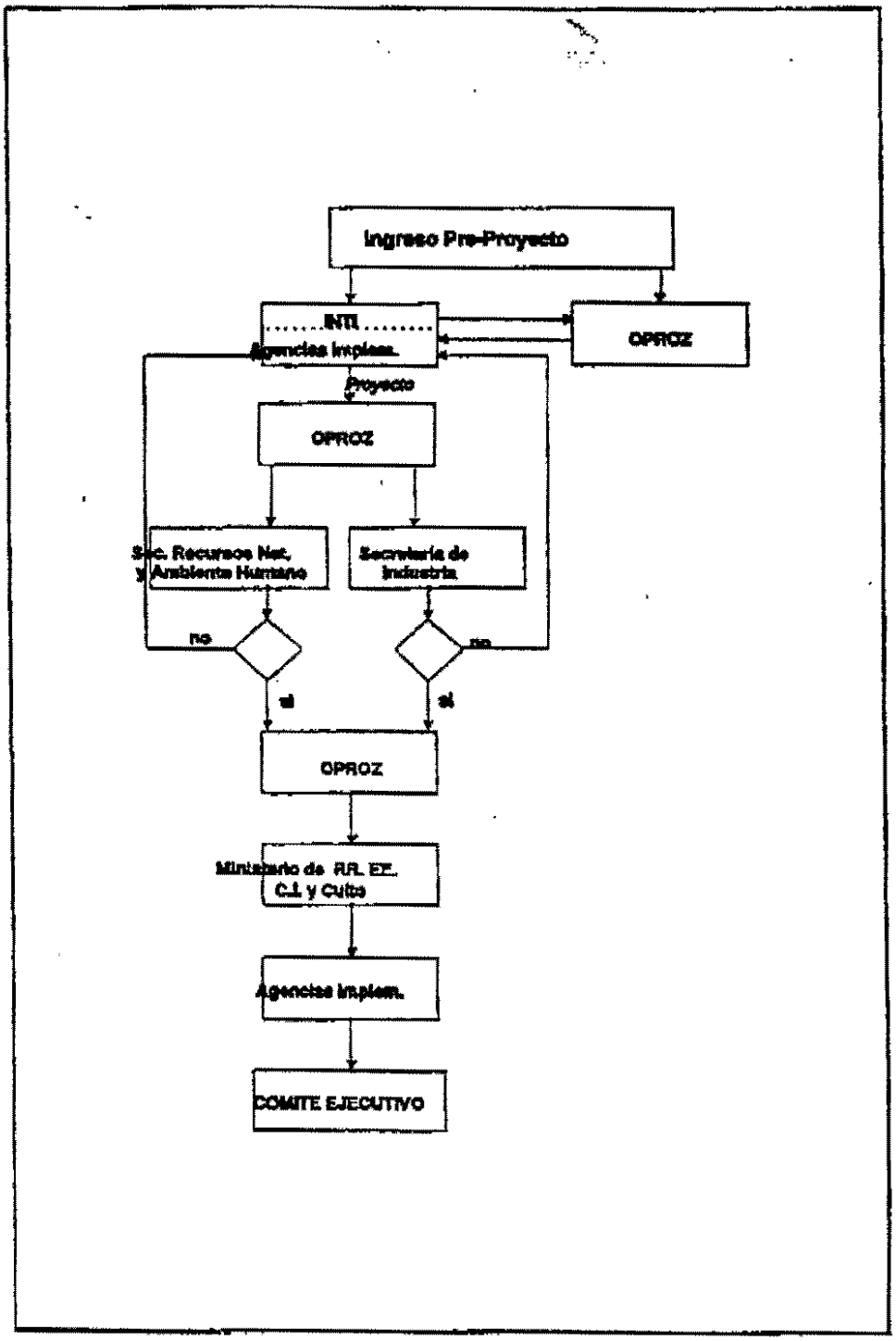
Consultative Group on the Ozone Layer

A Consultative Group on the Ozone Layer (GRUCO) will be set up by sector — halons, refrigeration, foams and solvents — to include representatives of the national government, the Federal Environmental Council (COFEMA), business associations, producer industries, corporate consumers, members of official agencies, fire corps, professional associations, NGOs and other nongovernmental organizations working in environmental matters.

GRUCO will be the forum for consultation and advisory assistance on strategies to reduce consumption, and for the analysis of the commitments made possible by technological change and the availability of substitutes, in implementation of the program.

Conduct of the affairs of this office will be supervised by the Secretary of Natural Resources and the Environment and the Secretary of Industry. The office will be located physically within the Secretary of Natural Resources and the Environment, whose representative will act as Executive Director. Resolutions will be taken jointly with the representative of the Secretary of Industry.

ORGANIZATION CHART FOR THE IMPLEMENTATION OF THE COUNTRY PROGRAM



The assistance is required for OPROZ, whose sole responsibility is the implementation of the Montreal Protocol.

III. ACTIVITIES

OPROZ will receive assistance from GRUCO, and will be in charge of the following activities:

(a) System to evaluate ODS Production, Consumption and Trade

The following activities are planned:

- Organize a centralized system to evaluate ODS consumption, imports and exports to monitor compliance with the Montreal Protocol.
- Design a way to assess the efficiency of policy on action and adjust the action plan according to the results.
- Set up a system of surveys to be conducted every four months, addressed to users, producers and imports, and containing, in addition to information on imports, exports and consumption, the following data:
  - Trends in prices to end users
  - Controlled substances under the Protocol, transitional substances, and related substances such as HCFC-22, methyl bromide, and others
  - Volumes and statistics on the production of goods with ODSs
  - Imports and exports of products containing or manufactured with ODSs
  - Equipment, parts and components for transitional technologies, such as motor-driven compressors for household refrigerators

This information is to be provided on the basis of international systems of classification, such as the harmonized customs classification system or another similar one.

(b) Regulatory Measures and Environmental Economic Policy Measures

The following activities are planned:

- Prepare proposals on economic policy instruments.
- Draw up ODS standards consistent with international regulations that will ensure the quality of the ODSs concerned and the use thereof in repair and service. These standards are to be communicated to companies and users.
- Create and refine a system of incentives designed to promote the reduction of emissions, the recycling or destruction of refrigeration, air conditioning and fire extinguishing equipment containing ODSs while preventing emissions.

(c) Distribution of Information and Public Awareness

The halons, refrigeration, foams and solvents sectors require greater effort in terms of public awareness. The actions proposed to disseminate information are as follows:

- Awareness in the halons, solvents and refrigeration service sectors, as included in the respective sector projects.
- Awareness among consumers and the general to generate changes in demand for products, as for instance in servicing household refrigeration appliances.
- Information for distribution within the industry using ODSs, on chemical substitutes and new technologies, including the results of demonstration projects.
- Ongoing and effective communication of government policies to industry and the general public.

Written material will be prepared with information on new technological advances made both nationally and internationally.

(d) Project Coordination and Follow-up

Coordinate and supervise the tasks to be undertaken by INTI in the preparation and design of sector projects and industrial reconversion projects, and follow-up thereon, in order to comply with the timetable set for reduction.

IV INPUTS

IV.1 The Government of Argentina will provide the following inputs:

(a) Infrastructure

- Physical premises for the operation of OPROZ with the necessary furnishings, services and telephone facilities, within the Secretary of Natural Resources and the Environment
- Physical premises for the operation of OPROZ with the necessary furnishings, services and telephone facilities, within the Secretary of Industry.
- Physical premises for the operation and coordination of industrial projects at the National Industrial Technology Institute, with the necessary furnishings, services and telephone facilities

Cost US$ 72,000 per year, for three years US$ 216,000

(b) Personnel

- 1 senior professional with experience in environmental issues and project management
- 1 senior professional with experience in industrial policy, standards and regulations in connection with protection of the ozone layer
- 1 senior professional with experience in designing industrial projects and ODS substitution technologies and processes within INTI
- 1 senior professional with experience in the presentation of international projects

Cost US$ 104,000 per year, for three years US$ 312,000

(c) Operational Costs

Cost US$ 10,000 per year, for three years US$ 30,000

IV.II The Multilateral Fund for the Montreal Protocol will be requested to provide the following inputs:

(a) Creation of OPROZ

- Personnel: 1 project leader and 1 assistant: A university professional with experience in project management and management control, assisted by a bilingual (Spanish-English) accounting expert

  Yearly cost US$ 48,000, for three years US$ 144,000

- Office equipment: fax machines, computers with printers and photocopiers

  One-time cost US$ 14,000

- Travel: Cost of travel within the country and participation in conferences, workshops and technical visits. Travel expenses

  Yearly cost US$ 6,000, for three years US$ 18,000

- Operating costs

  Yearly cost US$ 12,000, for three years US$ 36,000

(b) System of Evaluation of ODS Use in Production, Consumption and Trade

- Consulting: Design of a system for records, follow-up and data base, including segmented mailing

  One-time cost US$ 20,000

- Operating costs for ODS surveys to be conducted every 6 months for 3 years in the various sectors

  Unit cost US$ 3,500, by 5 US$ 17,500

(c) Regulatory Measures and Environmental Policy Instruments

- Consulting: Creation of systems, instruments, regulations, permits and/or incentives as deemed necessary

  One-time cost: US$ 20,000

(d) Public Awareness and Information Campaign

- Public awareness and information campaign provision of technical information to industry on substitution technology;

  Yearly cost US$ 30,000, for 3 years US$ 90,000

V. ANTICIPATED RESULTS

The proper functioning of OPROZ will make it possible to perform the following:

(a) Elaborate the legal, political and administrative framework for the elimination of ODSs.

(b) Respond rapidly to industry to accelerate reconversion.
(c) Eliminate ODS consumption in accordance with the timetable provided for.

(d) Improve institutional capacity to continue working, without support from the Multilateral Fund, until ODS consumption has been completely eliminated.

(e) Assemble a professional staff capable of solving similar problems related to the environment.

WORK PROGRAM AMENDMENTS

FOR CONSIDERATIONS AT THE

13TH MEETING OF THE EXECUTIVE COMMITTEE

OF THE MULTILATERAL FUND

JUNE 10, 1994

WORLD BANK

MULTILATERAL FUND FOR THE IMPLEMENTATION OF THE MONTREAL PROTOCOL

EXECUTIVE SUMMARY

Country:	**ARGENTINA**
Sector:	**Institutional Strengthening**
Country ODS Consumption:	**6583.4 T of ODS** **4438.6 T of ODP (1992)**
Project Duration:	**3 years**
Project Impact:	**Not applicable**
	The country program provides for the elimination of: 1217 T of ODS (1240 T of ODP) in Phase one 5378 T of ODS (5378 T of ODP) in Phase two 663 T of ODS (636 T of ODP) in Phase three
Total Project Cost:	**US$ 859,500**
Fund Contribution:	**US$ 359,500**
Implementing Agency:	**World Bank**
Executing Agencies:	**Secretary of Natural Resources and Human Environment - Secretary of Industry**

PROJECT SUMMARY

The object of the project is the creation and strengthening of the Ozone Program Office (OPROZ), whose primary activities will be to plan, organize, direct and coordinate all tasks required for the implementation of the country program.

Upon completion of the three-year period of the proposed project, OPROZ will continue to carry out the work under the country program until ODS consumption has been eliminated.

INSTITUTIONAL STRENGTHENING PROJECT

ARGENTINE REPUBLIC

I. GENERAL

The Argentine Republic is a party to the Vienna Convention for the Protection of the Ozone Layer and the Montreal Protocol on Substances that Deplete the Ozone Layer. It has ratified the London Amendment of 1990, and the Argentine Legislature is in the process of passing the Copenhagen Amendment.

Since the country's level of consumption of ozone-depleting substances (ODS) is 6583.4 t, equivalent to 4438.6 t of ozone-depleting potential (ODP) (1992), i.e. less than 0.3 kg per capita, Argentina falls under Article 5, paragraph 1, of the Protocol.

The country program to reduce and eliminate the consumption of ODS is being presented for approval to the July 1994 meeting of the Executive Committee of the Multilateral Fund.

1.	**Title of Request:**	**Institutional Strengthening**
2.	**Country:**	**Argentina**
3.	**Executing Agency:**	Pursuant to Decree 177/92, the Secretary of Natural Resources and the Environment is the authority empowered to enforce the Montreal Protocol. In order to facilitate the coordination and functioning of the government's action plan for compliance with the Montreal Protocol, the **Ozone Program Office (OPROZ)** has been created.
4.	**Implementing Agency:**	**World Bank**
5.	**Gross Domestic Product:**	**Gross domestic product per capita** in the Argentine Republic is **US$ 1,990** for 1992.
6.	**Consumption of Controlled Substances:**	Of the controlled substances covered by the Montreal Protocol, Argentina customarily consumes the following: CFC-11, CFC-12, CFC-113, CFC-114, CFC-115, Halon-1211, Halon-1301, CFC-13, Carbon Tetrachloride,

Methyl Chloroform, HCFC-22, and Methyl Bromide.

Consumption of Controlled Substances- 1992

		ODS	ODP
ANNEX A, GROUP I		3.913,4	3.859
ANNEX A, GROUP II	Halon 1211	75,9	227,7
	Halon 1301	11,1	111
	Total	**87,0**	**338,7**
ANNEX B, GROUP I	CCl4	**2039**	**Raw Material**
ANNEX B, GROUP II	CFC-113	0,5	0,5
ANNEX B, GROUP III	MCF	2040	204
ANNEX C,	HCFC22	528,2	26,4
METHYL BROMIDE		14,3	10
TOTAL CONSUMPTION		**6.583,4**	**4.438,6**

7. Consumption of Controlled Substances by Sector

The use of ODSs is concentrated in six industrial sectors, i.e. refrigeration, air conditioning, foams, aerosols, solvents and fire extinguishing agents, with a small balance for other unidentified sectors.

CFCs are used mainly in refrigeration, air conditioning and foams. A relatively small quantity is used in manufacturing aerosols for mouth and throat medicines. HCFC-22 is consumed in refrigeration and air conditioning as well.

Methyl chloroform is used exclusively as a solvent, while halons are used as fire extinguishing agents. Methyl bromide is used as a fumigating agent.

Sector Distribution

Refrigeration	1441 T of CFC-12 333 T of HCFC-22
Foams (includes household and commercial refrigerators)	1275 T of CFC-11 209 T of CFC-12
Air conditioning	637 T of CFC-12 184 T of HCFC-22
Extinguishers	75.9 T of H-1211 11.1 T of H-1301
Aerosols	48 T of CFC-11 48 T of CFC-12
Solvents	63.4 T of CFC-113 2040 T of MCF
Others, unidentified	11 T of CFC-11 104.2 T of CFC-115 0.5 T of CFC-13 11 T of HCFC-22

8. Objectives

8.1 Short-term Objectives

The main objective of the project is the creation and strengthening of OPROZ to implement the country program to reduce and eliminate the consumption of ODSs and to convert the industries producing and consuming such substances.

In this context, plans call for the following actions to be carried out:

A. **Set up the Ozone Program Office (OPROZ)** to implement the action plan. Activities, responsibilities, composition and interaction under the plan are described in section II on structure and management.

B. **Set up a Consultative Group on the Ozone Layer (GRUCO)** by sector — halons, refrigeration, foams and solvents — with representatives of producers, importers, user associations and government agencies, academic institutions and nongovernmental organizations, forming a consultative body in this way.

C. Organize, expand and give continuity to a centralized system to evaluate ODS consumption, imports and exports through OPROZ.

D. Generate and complete the regulatory system for ODSs for production, imports, consumption, recovery, recycling, and international trade.

E. Disseminate information and promote public awareness of issues related to controlled substances and the Montreal Protocol.

8.2 Long-term Objectives

The capacity developed during the first phase of the country program (1994-1997), in parallel to the implementation of the proposed project, will lay the groundwork for the tasks to be carried out during the second phase (1998-1000) and third phase (2001-2005) of the country program. OPROZ will continue to carry out its activities until the consumption of ODSs has been eliminated completely, which is expected to occur by the year 2005.

9. Project Scope

Argentina has a continental territory of approximately 28 million square kilometers, having a maximum width of 3700 km. The industries that consume ODSs are located along the entire width and length of the country.

OPROZ, through the National Institute of Industrial Technologies INTI, will extend its operations and activities to assist industry and users in general, using its regional structure through centers located throughout the country, for the presentation and execution of projects and for the timely dissemination of information.

10. Project Rationale

The Secretary of Natural Resources and the Environment is the enforcing authority for the Montreal Protocol. The Secretary of Industry is in charge of all matters relating to industrial policy, and for the industrial reconversion processes deriving from implementation of the country program pursuant to the Montreal Protocol.

This institutional strengthening project coincides with the first phase of the timetable for reduction under the country program. During this phase, national programs for the various sectors — halons, refrigeration, foams and solvents — will be prepared and forwarded to the Executive Committee of the Fund for approval, most of the industrial reconversion projects for the priority sectors.

The industrial reconversion will be initiated, to this end, plans call for the National Industrial Technology Institute (INTI) to take charge of the analysis and follow-up of the sector and industrial projects, and of technical assistance.

Eliminating the consumption of ODSs requires an effective institutional framework that will facilitate and streamline the tasks planned and the industry's access to funds under the Montreal Protocol. Accordingly, OPROZ has been created as a focal point to coordinate all activities related to the implementation of the country program. OPROZ has representatives of the Secretary of Natural Resources and the Environment, the Secretary of Industry, and the Ministry of External Relations. OPROZ will delegate to INTI those technical matters which fall under its sphere of competence.

The aforesaid organizations currently have a representative for the implementation of the country program, but this infrastructure is insufficient to carry out the proposed programs. Accordingly, OPROZ is being created and will require consulting services for the monitoring and information systems, the public awareness campaigns, and for the drafting of appropriate legislation.

11. Project Beneficiaries

The primary direct beneficiary will be OPROZ and, within their spheres of competence, the Secretary of Natural Resources and the Environment, the Secretary of Industry and the National Industrial Technology Institute, since they will receive the necessary support to perform the role assigned to them under the country program and the activities described herein for the effective elimination of ODSs.

The indirect immediate beneficiaries will be the industrial sector currently producing and consuming ODSs. This sector encompasses small and medium-sized private companies, which will be required to convert their production to different technologies or alternative substances, since the effective functioning of the organizations in charge of presenting and following up on the projects will contribute to the reconversion process.

12. Capacity of the Beneficiaries

The Secretary of Natural Resources and the Environment and the Secretary of Industry have the basic infrastructure. The two secretaries are responsible for environmental and industrial policy, respectively. For the presentation and follow-up of sector and industrial reconversion projects, the secretaries have entered into an agreement which provides for the National Industrial Technology Institute to act as technical coordinating agency.

Although this basic structure exists and work is being done on the country program and the sector projects, lacking at the present time are systems for gathering information, an easily enforceable legal system, systems of technological information available to all industrial sectors, and public information and awareness as to the effects of the depletion of the ozone layer, as well as sufficient personnel to achieve the objectives of the country program properly and in a timely manner.

In order to address these constraints, the following Institutional Strengthening Project has been drawn up:

II. STRUCTURE AND MANAGEMENT

Several organizations will take part in the implementation of the country program, and their functions are as described below:

Ministry of External Relations and International Trade

This Ministry is responsible for overseeing faithful compliance with the international commitments undertaken by the Argentine government, and the transmittal of the reports provided for under Article 7 of the Protocol.

Secretary of Natural Resources and the Environment

The Secretary of Natural Resources and the Environment, which reports to the Office of the President, is the enforcing authority for the Montreal Protocol, and is responsible for the following:

- Implementing environmental policy
- Framing environmental guidelines
- Establishing the timetable for reducing the consumption of controlled substances
- Evaluating and approving projects
- Public awareness and publicity programs
- Technical assistance on the environment
- Evaluating data on consumption to verify compliance with reduction programs

Secretary of Industry:

- Industrial policy for implementation, instruments, incentives, restrictions and sector structure
- Designing projects for industrial reconversion or investment

- Evaluating and approving projects
- Training programs for industry

National Institute for Industrial Technology

The Secretary of Natural Resources and the Environment and the Secretary of Industry have signed an agreement whereby INTI is to act as technical agency, with the following responsibilities:

- Identify, prepare and follow up on sector projects in the areas of halons, refrigeration, foams and solvents.
- Identify, prepare and analyze projects for industrial reconversion, with subsequent follow-up.

Ozone Program Office (OPROZ):

The Ozone Program Office (OPROZ) will be created under the direction of representatives of the Ministry of External Relations and International Trade, the Secretary of Natural Resources and the Environment, and the Secretary of Industry. OPROZ will be responsible for tasks related to the implementation of the country program.

The responsibilities of OPROZ will be as follows:

- Issue reports evaluating compliance with the country program and monitoring changes in data on ODS consumption.
- Propose criteria to be followed in granting permits for ODS production, imports and exports.
- Suggest mechanisms for setting ODS production and import quotas.
- Assist secretary in formulating regulatory measures.
- Survey ODS production, imports, exports, and uses.
- Evaluate implementation projects in accordance with the priorities set in this program, and monitor the execution thereof.
- Perform coordination and executive secretariat tasks in connection with the program.
- Coordinate with INTI on activities related to sector programs for halons, refrigeration, foams and solvents.
- Organize and coordinate tasks for technical training, dissemination of information and public awareness in relation to the ozone layer.
- Call and coordinate meetings of the Consultative Group on the Ozone Layer (GRUCO).

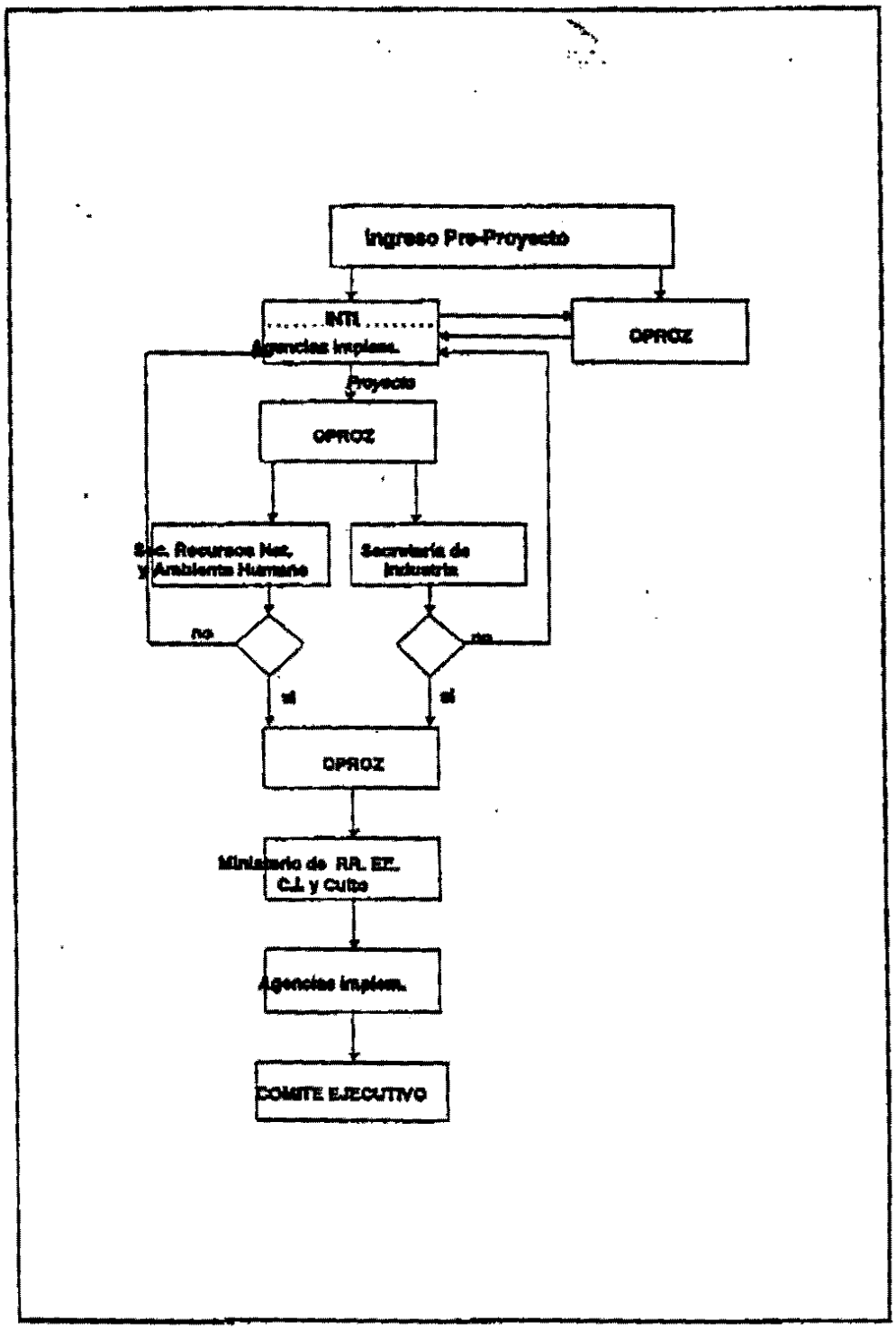
Consultative Group on the Ozone Layer

A Consultative Group on the Ozone Layer (GRUCO) will be set up by sector — halons, refrigeration, foams and solvents — to include representatives of the national government, the Federal Environmental Council (COFEMA), business associations, producer industries, corporate consumers, members of official agencies, fire corps, professional associations, NGOs and other nongovernmental organizations working in environmental matters.

GRUCO will be the forum for consultation and advisory assistance on strategies to reduce consumption, and for the analysis of the commitments made possible by technological change and the availability of substitutes, in implementation of the program.

Conduct of the affairs of this office will be supervised by the Secretary of Natural Resources and the Environment and the Secretary of Industry. The office will be located physically within the Secretary of Natural Resources and the Environment, whose representative will act as Executive Director. Resolutions will be taken jointly with the representative of the Secretary of Industry.

ORGANIZATION CHART FOR THE IMPLEMENTATION OF THE COUNTRY PROGRAM



The assistance is required for OPROZ, whose sole responsibility is the implementation of the Montreal Protocol.

III. ACTIVITIES

OPROZ will receive assistance from GRUCO, and will be in charge of the following activities:

(a) System to evaluate ODS Production, Consumption and Trade

The following activities are planned:

- Organize a centralized system to evaluate ODS consumption, imports and exports to monitor compliance with the Montreal Protocol.
- Design a way to assess the efficiency of policy on action and adjust the action plan according to the results.
- Set up a system of surveys to be conducted every four months, addressed to users, producers and imports, and containing, in addition to information on imports, exports and consumption, the following data:
  - Trends in prices to end users
  - Controlled substances under the Protocol, transitional substances, and related substances such as HCFC-22, methyl bromide, and others
  - Volumes and statistics on the production of goods with ODSs
  - Imports and exports of products containing or manufactured with ODSs
  - Equipment, parts and components for transitional technologies, such as motor-driven compressors for household refrigerators

This information is to be provided on the basis of international systems of classification, such as the harmonized customs classification system or another similar one.

(b) Regulatory Measures and Environmental Economic Policy Measures

The following activities are planned:

- Prepare proposals on economic policy instruments.
- Draw up ODS standards consistent with international regulations that will ensure the quality of the ODSs concerned and the use thereof in repair and service. These standards are to be communicated to companies and users.
- Create and refine a system of incentives designed to promote the reduction of emissions, the recycling or destruction of refrigeration, air conditioning and fire extinguishing equipment containing ODSs while preventing emissions.

(c) Distribution of Information and Public Awareness

The halons, refrigeration, foams and solvents sectors require greater effort in terms of public awareness. The actions proposed to disseminate information are as follows:

- Awareness in the halons, solvents and refrigeration service sectors, as included in the respective sector projects.
- Awareness among consumers and the general to generate changes in demand for products, as for instance in servicing household refrigeration appliances.
- Information for distribution within the industry using ODSs, on chemical substitutes and new technologies, including the results of demonstration projects.
- Ongoing and effective communication of government policies to industry and the general public.

Written material will be prepared with information on new technological advances made both nationally and internationally.

(d) Project Coordination and Follow-up

Coordinate and supervise the tasks to be undertaken by INTI in the preparation and design of sector projects and industrial reconversion projects, and follow-up thereon, in order to comply with the timetable set for reduction.

IV INPUTS

IV.1 The Government of Argentina will provide the following inputs:

(a) Infrastructure

- Physical premises for the operation of OPROZ with the necessary furnishings, services and telephone facilities, within the Secretary of Natural Resources and the Environment
- Physical premises for the operation of OPROZ with the necessary furnishings, services and telephone facilities, within the Secretary of Industry.
- Physical premises for the operation and coordination of industrial projects at the National Industrial Technology Institute, with the necessary furnishings, services and telephone facilities

Cost US$ 72,000 per year, for three years US$ 216,000

(b) Personnel

- 1 senior professional with experience in environmental issues and project management
- 1 senior professional with experience in industrial policy, standards and regulations in connection with protection of the ozone layer
- 1 senior professional with experience in designing industrial projects and ODS substitution technologies and processes within INTI
- 1 senior professional with experience in the presentation of international projects

Cost US$ 104,000 per year, for three years US$ 312,000

(c) Operational Costs

Cost US$ 10,000 per year, for three years US$ 30,000

IV.II The Multilateral Fund for the Montreal Protocol will be requested to provide the following inputs:

(a) Creation of OPROZ

- Personnel: 1 project leader and 1 assistant: A university professional with experience in project management and management control, assisted by a bilingual (Spanish-English) accounting expert

  Yearly cost US$ 48,000, for three years US$ 144,000

- Office equipment: fax machines, computers with printers and photocopiers

  One-time cost US$ 14,000

- Travel: Cost of travel within the country and participation in conferences, workshops and technical visits. Travel expenses

  Yearly cost US$ 6,000, for three years US$ 18,000

- Operating costs

  Yearly cost US$ 12,000, for three years US$ 36,000

(b) System of Evaluation of ODS Use in Production, Consumption and Trade

- Consulting: Design of a system for records, follow-up and data base, including segmented mailing

  One-time cost US$ 20,000

- Operating costs for ODS surveys to be conducted every 6 months for 3 years in the various sectors

  Unit cost US$ 3,500, by 5 US$ 17,500

(c) Regulatory Measures and Environmental Policy Instruments

- Consulting: Creation of systems, instruments, regulations, permits and/or incentives as deemed necessary

  One-time cost: US$ 20,000

(d) Public Awareness and Information Campaign

- Public awareness and information campaign provision of technical information to industry on substitution technology;

  Yearly cost US$ 30,000, for 3 years US$ 90,000

V. ANTICIPATED RESULTS

The proper functioning of OPROZ will make it possible to perform the following:

(a) Elaborate the legal, political and administrative framework for the elimination of ODSs.

(b) Respond rapidly to industry to accelerate reconversion.

(c) Eliminate ODS consumption in accordance with the timetable provided for.

(d) Improve institutional capacity to continue working, without support from the Multilateral Fund, until ODS consumption has been completely eliminated.

(e) Assemble a professional staff capable of solving similar problems related to the environment.

THE MONTREAL PROTOCOL ON
SUBSTANCES THAT DEPLETE THE OZONE LAYER
PROJECT COVER SHEET

COUNTRY:	Brazil
SECTOR COVERED:	Refrigeration
ODS CONSUMPTION IN AFFECTED SECTOR:	1800 metric tons/yr (based on 9.2 million units produced with average refrigerant circuit charge of 200 grams).
PROJECT TITLE:	System for Storage and Charging of Ester Oils Used in Manufacture of HFC-134a Refrigerant Refrigerator Compressors.
PROJECT DURATION:	Phase I - In Use. Completed September 1993 Phase II - Completion September 1994
PROJECT ECONOMIC LIFE:	Estimated 10 years.
PROJECT IMPACT:	Indirect - 270 MT ODS/YR eliminated (prorating compressors as 15% of refrigerator cost)
UNIT ABATEMENT COST:	Can not be meaningfully calculated (see para. 8).
TOTAL PROJECT COST:	US$825,000 Stage I: US$300,000 Incremental: US$300,000 Stage II: US$525,000 Incremental: US$230,000
PROPOSED OTF FINANCING:	US$280,000 (53% of incurred incremental costs, corresponding to Brazilian participation in ownership)
IMPLEMENTING ENTERPRISE:	Empresa Brasileira de Compressors (EMBRACO).
IMPLEMENTING AGENCY:	The World Bank/Financiadora de Estudos e Projetos (FINEP)
NATIONAL COORDINATING AGENCY:	Interministerial Ozone Technical Group (GTO)

PROJECT SUMMARY

1. The OTF request is to finance the purchase and installation of the ester oil storage, dehumidification and charging system for use on seven existing assembly lines. The alteration is required to permit lubricant oil charging for refrigerator compressors which will use HFC-134a refrigerant, as the existing mineral oil charging system used for CFC-12 is incompatible for use with the ester oils used in HFC-134a compressors. Phase I of the Project (three lines) is already complete and funding will be retroactive. Phase II will consist of installations for six additional lines. Two of these lines will not be eligible as they are for expanded capacity. Total project cost, including the capacity expansion is US$825,000. Cost of the conversion of existing project capacity is US$530,000, of which only the 53% corresponding to Brazilian ownership of the company is eligible, i.e. US$280,000. Project implementation will add capability for assembly of HFC-134a compressors on the seven existing assembly lines formerly used only for CFC-12 compressor assembly. Such flexibility is required to permit swing assembly of both HFC-134a and CFC-12 compressors, due to the still significant market demand for CFC-12 compressors. The two new assembly lines not included in the project scope will be entirely for HFC-134a compressors. This will be the first subproject from Brazil submitted for final approval under the December 17, 1993, Ozone Trust Fund Grant Agreement signed by FINEP and the World Bank.

PROJECT OBJECTIVE

2. The objective of the project is contribute to the overall phase out of CFC-12 through production of compressors for use with HFC-134a refrigerant. These will increasingly substitute for currently used CFC-12 compressors as refrigerator producers switch to non-ODS technology.

SECTOR BACKGROUND

3. EMBRACO exports 70% of its production, while 30% is used by domestic refrigerator manufacturers, most prominently its sister company CONSUL. Early development of HFC-134a technology was necessitated by the requirements of the 1996 ban on CFC use in its European and American export markets. At the same time, EMBRACO must maintain CFC-12 compressor production capability until such time as its refrigerator producer clients in Brazil and other Article 5 countries convert to non-CFC refrigerator technology.

ENTERPRISE BACKGROUND

4. EMBRACO was founded in 1971 to fabricate compressors for the commercial and domestic refrigeration sector. The company is 51% owned by CONSUL S.A., 30% owned by Whirlpool do Brasil and 19% by BRASMOTOR and others. The company of 5,800 employees is the second largest compressor manufacturer in the world and produces approximately 9.2 million compressors per year for the domestic Brazilian market, the US market (the largest export market) Latin America, Africa, Europe and Australia. EMBRACO is a recognized world leader in refrigerator compressor technology. It was one of the first to develop HFC-134a compressor designs, and the demanding materials handling and production quality control procedures required due to the hygroscopic properties and relative instability of ester oils. Such difficulties do not exist with the mineral oils used with CFC-12 compressors.

PROJECT DESCRIPTION

5. The project has been divided into two phases:

Phase I: The ester oil storage treatment and charging system for three assembly lines has already been completed, and is in use as HFC-134a compressors are now being produced for export clients.

Project scope includes: 1) Installation of an ester oil storage tank; 2) ester oil dehumidification system; and 3) oil distribution and charging system for the assembly lines.

Phase II: Similar to Phase I, but involving both conversion and expansion. Implementation of this phase includes: 1) two dehumidification units; 2) installation of six distribution lines; and 3) additional storage facilities. Only one dehumidification unit and four distribution lines of this phase are considered eligible for incremental cost consideration as the additional dehumidification unit and two distribution lines are considered to be a plant expansion. The process description, equipment specifications and schematic layout are shown in Annex 1.

PROJECT TOTAL AND INCREMENTAL COSTS

6. The total installed cost for ester oil storage, two dehumidification and distribution systems and charging systems for the seven current and two new assembly lines is US$825,000 (See Annex 2 for price list). Of these, ester oil storage tanks, two dehumidification and distribution systems, and distribution and charging for seven assembly lines are considered to be conversion of existing production capacity. The installed cost, excluding the expansion component, is US$530,000 including 15% contingency. Since this is a straight conversion operation, all of this US$530,000 capital cost is incremental. Only US$280,000, corresponding to 53% national share ownership is eligible for financing. The Whirlpool corporation (USA) owns 30% of EMBRACO's stock directly, and 15% indirectly through its participation in CONSUL, EMBRACO's majority shareholder. Whirlpool USA owns another 1.25% indirectly through its shares in BRASTEMP and BRASMOTOR. EMBRACO will finance the difference between total cost and incremental cost from its own resources.

JUSTIFICATION FOR SELECTION OF ALTERNATIVE TECHNOLOGY

7. Non-flammable HFC-134a is generally acknowledged to be the most suitable non-ODS alternative to CFC-12 for refrigeration applications. It is not only a non-ODS substance, but has similar thermodynamic properties as CFC-12. The installation of the compressor ester oil charging system is necessary due to the incompatibility of the ester oil with the mineral oil used for lubrication of/ CFC-12 compressors. Phase I was designed after extensive testing of many ester oils and is now functioning successfully. A similar design will be used for Phase II. Other quality control investments, which may be included in a future project are now being developed by EMBRACO.

UNIT ABATEMENT COST

8. The project scope makes it is impossible to determine a meaningful unit abatement cost figure. Total ODS reduction can only be calculated for the complete vertically integrated compressor and refrigerator fabrication. Therefore, any estimation of a UAC would be indirectly determined using arbitrary assumptions of ODS reduction attributable to the project as a percentage of unit compressor cost to total refrigerator cost, and of all incremental costs of HFC-134a compressor manufacture. The project files contain a unit abatement cost figure of $0.32/kg/year estimated using the methodology described above, however it is understated and appears to be not meaningful.

OZONE OPERATIONS RESOURCE GROUP (OORG) TECHNICAL REVIEW

9. The project has been reviewed and given technical approval by the World Bank's OORG. The OORG reviewer's comments are shown in Annex 3. FINEP's approval of the project is shown in Annex 4.

OZONE OPERATIONS RESOURCE GROUP (OORG) REVIEW

Brazil

REVIEW OF HFC-134a CONVERSION PROJECT

Installation of Lubricant Charging System

Project Proposal by The World Bank, April 1993

RTU-UNWB-LK-94279 -lk

Scope

The project consists of the purchase and installation of polyolester oil storage, the dehumidification and charging system. It is (only) part of the equipment needed for the conversion of hermetic compressor manufacturing lines to HFC-134a.

Recommendation

The project is supported, provided that a price list of the equipment (to be) purchased is added.
The financing proposed (two confusing different figures in the project summary and project costs) occurs for the 53% (Brazilean) part of the incremental cost, which is in order.
The fact that 70% of the production of the company is exported (large part to the developed countries) leads to an underscoring of the relative value of the rule that costs incurring to the domestic part are eligible (in case of exports where cost increases can be passed on to the customer, without influencing competitive relationships).

Relevancy of the Information

The project proposal gives all relevant information, technically spoken. However, an annex containing the prices of the components to be purchased is missing.

Technical Soundness

The installation proposed here seems to be an adequate one for charging the HFC-134a compressors with polyolester lubricant.
Costs seem to be substantial, but one should take into account the hugh production of about 10 million compressors per year (compare costs of USD 40,000 for oil charging machines in other proposals, production levels 200-700,000 pieces per annum).

Environmental and Safety Issue

The use of HFC-134a is an environmentally accepatble way to phase out CFCs.

Cost effectiveness

Cost effectiveness cannot be discussed.
The project proposal mentions an UAC of USD 0.32/ kg/ year. This figure does not make much sense since funding is requested for only part of the conversion to HFC-134a, so the UAC value for the total conversion would be completely different.
The proposal correctly mentions that this is indirect. Compressors only yield the possibility to phaseout CFCs in refrigerator manufacturing.

Eindhoven, 28 February 1993

L J M Kuijpers (OORG)

OFFICIAL FINEP NOTICE OF PROJECT APPROVAL

FINEP
FINANCIADORA DE ESTUDOS E PROJETOS

FORMULÁRIO P/ TELECOMUNICAÇÕES

☐ TELEX ☒ FAX ☐ TELEGRAMA

MSG.nº 1247/94

Data 17/03/94

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C/Cópia :

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Nº de Páginas 1

Emitente : PAULO FETAL

Departamento DCBS/CMA

Assunto :

MENSAGEM :

Com referência ao seu fax de 03/03, devo informar que:

a) o projeto da EMBRACO foi aprovado pela Diretoria da FINEP em 21/02/94, com valor de até US$ 281.000 dólares, que concorda com o Sumário aprovado pelo COORG;

b) verificou-se discrepâncias quanto à parte a ser custeada pela EMBRACO e, portanto, ao valor total do projeto (FINEP US$ 815.000 dólares, Banco Mundial US$ 825.000 dólares, empresa US$ 826.480 dólares). Tais discrepâncias no entanto, não seriam relevantes em termos de acompanhamento do projeto e poderiam ser corrigidas posteriormente com base no valor informado pela empresa.

FERNANDO NIELANDER RIBEIRO
Chefe do DCBS

Atenciosamente

PAULO R. DA SILVEIRA FETAL
Tec. Projetos e Programas IV
DCBS/CMA - DO/II

THE MONTREAL PROTOCOL ON
SUBSTANCES THAT DEPLETE THE OZONE LAYER

PROJECT COVER SHEET

COUNTRY:	The People's Republic of China
PROJECT TITLE:	Conversion to CFC-free technology in manufacture of extruded polyethylene and polystyrene foam sheet
SECTOR COVERED:	Foamed Plastics
ODS USE IN SECTOR:	17,770 tons CFCs (ODS) in 1991
PROJECT IMPACT:	Phase-out 200 tons CFC-12 per year (base year: 1993)
PROJECT DURATION:	One year
PROJECT ECONOMIC LIFE:	10 years
TOTAL PROJECT COST:	Incremental Investment Cost: US$380,000 Contingency: US$ 57,000 Financial Agent Fee: US$ 13,000
PROPOSED OTF FINANCING:1/	US$ 450,000
IMPLEMENTING ENTERPRISE:	Shanghai No.18 Plastics Product Plant
COORDINATING NATIONAL BODY:	National Environmental Protection Agency
IMPLEMENTING AGENCY:	The World Bank

PROJECT SUMMARY

This project will phase-out CFC-12 consumption in production of EPE/EPS foam sheet by using pentane as a blowing agent. The plant is contacting the original equipment manufacturers and companies specialized in retro-fitting for available pentane technology. As pentane is flammable, the plant will be moved from the current residential area to an industrial zone at the enterprise's own expense. Butane will be used as a back-up blowing agent if supply of pentane is interrupted. The plant also has close relation with companies that have adopted butane technology. It is estimated that the cost will not increase if butane is substituted for pentane, because similar equipment will be used. The project employs commercially available technology. Previous country study investigations have identified it as a high priority project. It will result in a reduction of 200 tons of CFC-12 annually when new line is producing at full capacity.

TECHNICAL ASSESSMENT: This project has been reviewed and supported by the OORG technical reviewer, Dr. Mike Jeffs. His comments are attached.

1/ The OTF grant is based on 100% Chinese ownership and includes a 3% financial agent fee. A 15% contingency is included in the estimates of incremental capital costs.

PROJECT OBJECTIVES

The objective of this project is to phase-out the use of CFCs in the production of extruded polyethylene/polystyrene foam sheet at Shanghai No.18 Plastics Products Plant (Shanghai No.18).

SECTOR BACKGROUND

The Chinese foam industry consumed about 17,800 tons of CFCs in 1991, including 15,600 tons of CFC-11 (PUF) and 2,200 tons of CFC-12 (EPE/EPS). The country has more than 30 EPE/EPS foam sheet manufacturers, with a total production of capacity over 20,000 tons. The National Council of Light Industry (NCLI) is responsible for coordinating the phase-out in all foam applications. Complete phaseout of non-refrigeration foams is targeted for the year 2000. From 1994 to 2000, the consumption of CFC-12 in EPE/EPS foam sheet sector is expected to increase by 6-8% annually, if local use of CFCs is not inhibited.

ENTERPRISE BACKGROUND

Shanghai No.18 is a part of the Shanghai Plastics Products Co. which in turn belongs to the Shanghai Second Light Industry Bureau. Shanghai No.18 was the first plant in China to produce EPE/EPS foam sheets. It has two production lines. One was imported from GLOEMCO/USA; the other was manufactured by the plant itself. Production capacity is 1,000 tons resin and the consumption of CFC-12 is about 200 tons. All products are sold on the domestic market. The sale in 1992 was 31 million RMB (3.6 million USD). The market share in EPE/EPS sector was about 10%.

PROJECT DESCRIPTION

Pentane was selected as the preferred replacement in this project. Shanghai No.18 will be moved from a residential to an industrial area to allow use of a highly flammable substance. Applicable technologies are available from original equipment manufacturers and companies specialized in retro-fitting. In addition to equipment retro-fitting, safety related modifications in the production environment will be implemented to mitigate fire and exposure hazards. Finally, extensive production and safety training will be undertaken to guarantee smooth and safe operations and to conform to the fire safety standards in China.

Butane will be used as a back-up blowing agent. However, butane has a higher diffusion rate which might cause shrinkage of PE foams and influence quality of PS food packaging products. Therefore, butane will be used only when supply of pentane is interrupted. In that case, the plant will use a higher level of additives to prevent shrinkage in PE foam making and accurately control the aging time in PS food packaging material production. The investment cost will not be affected by the possible use of butane because equipment retro-fitting, safety modification and training for using pentane and butane are similar.

JUSTIFICATION FOR ALTERNATIVE TECHNOLOGY SELECTION

There are several options to replace CFCs in production of EPE/EPS foams:

* Atmospheric gases (Nitrogen; Carbon Dioxide),
* Hydrocarbons (LPG; butanes; pentanes),
* "Berstorff" technology (nitrogen and alcohol),
* HCFCs (-22; -142b),
* HFCs (-134a; -152a),

Pentane was selected by the company as an alternative because of its:

* Proven technology in processing and product performance,
* Environmental acceptability,
* Low toxicity
* Adaptability to existing equipment,
* Cost effectiveness.

Users of hydrocarbons are subject to stringent fire regulations in China. The emission of hydrocarbons is currently not regulated in China, nor are restrictions expected in the foreseeable future.

PROJECT COST

The total project cost is estimated at US$437,000 to be used for equipment retrofitting, safety modification, trial, production and safety training, and a 15% contingency. Incremental operating costs/benefits are zero, based on the assumptions given in Annex 2. Material cost savings were offset by higher costs of training, insurance, safety and maintenance (Annex 2). The 3% financial agency fee brings the OTF financing request to $450,000.

Investment costs of US$380,000 include capital investment in replacing high pressure pumps, installation of two pentane/butane tanks, construction safety modification and in service training. See breakdown in Annex 1.

Other costs. A 15% contingency (US$ 57,000) was included to ensure adequate funding of project costs following appraisal. An additional US$13,000 (3%) was added to the grant request to cover the fee for the financial agent that will appraise the project and oversee procurement, disbursement and audits.

Requested Funding. The proposed OTF grant for Shanghai #18 is US$450,000 and was calculated as follows: investment costs, 15% contingency and 3% financial agent fee.

FINANCING PLAN

100% of project cost is to be covered by the grant.

PROJECT IMPLEMENTATION

Management: The National Environmental Protection Agency will oversee the successful implementation of this project. The project will be carried out at the Shanghai No.18.

Schedule

Task	Q1 1 2 3	Q2 4 5 6	Q3 7 8 9	Q4 10 11 12
Project preparation				
Specifications	X			
Tenders, Selection	X			
Purchase Orders	X			
Site preparation				
Building adaptations		X X		
Civil works		X X		
Tanks installation		X X		
Equipment modifications			X X	
Start-up, trial, training			X X X	
Commissioning				X

REQUIRED REGULATORY ACTIONS: The company will comply with all local regulations on fire safety and volatile organic compound (VOC) emissions.

RESULTS:

Direct Project Impacts: This project will eliminate the use of at least 200 tons of CFC-12 in the first year of implementation. Market and company growth indicates that this may increase by 8-10% annually in subsequent years. The project employs commercially viable and environmentally acceptable technology.

Indirect Project Impact: The project will not influence quality and price of the products.

ANNEX 1

BREAKDOWN OF CAPITAL COSTS

	Project Capital Cost (US Dollars)
Technology transfer and all auxiliary equipment related to the conversion	
2 pumps	60,000
2 invertors	40,000
Drawing, piping and lay out	10,000
Installation 2 persons, 2 weeks	14,000
Start up assistance 2 persons, 2 weeks	14,000
Travel and lodging	12,000
Know-how	20,000
Building modifications	
Fire safety & alarm system	30,000
Ventilation system	25,000
Civil works (includes moving of machines)	40,000
Fire safety walls	25,000
Supply & installation of industrial blow-down fans	10,000
In service training	10,000
Equipment	
2 Butane/Pentane gas tanks	40,000
Safety equipment / gas detectors	30,000
Subtotal	380,000
Contingency (15%)	57,000
TOTAL CAPITAL COST:	437,000

ANNEX 2

SHANGHAI # 18
INCREMENTAL OPERATING COSTS

ASSUMPTIONS

- Prices for CFC12/Pentane (CFC-12: RMB 14,000/t; Pentane: RMB 10,440/t)
- Pentane use identical to CFC-12
- Required extra additives: USD 30/t of resin
- Required maintenance: 5% of equipment related project costs: $22,000
- 1 US$ = 8.70 RMB

1. **Material Costs**

• Before Project:	200t CFC-12 @US$1,600/t		US$320,000
• After Project:	200t Pentane2/ @ US$1,200/t.	US$240,000	
	additives	US$ 30,000	US$270,000
	Net Benefit		US$50,000

2. **Other Incremental Operating Costs (exclusive of Materials)**

• Recurrent training/monitoring costs	US$ 10,000
• Extra maintenance and utility	US$ 22,000
• Extra insurance	US$ 18,000
Net Cost	US$ 50,000

3. **Net Incremental Operating Cost/Benefit3/** 0

2/ A conservative price estimate for pentane relative to CFC12 has been used as pentane is a valuable hydrocarbon in short supply and the price is likely to rise faster than the CFC12 price as a result of a 1994 RMB devaluation.

3/ Incremental operating cost/benefit depends on relative price assumptions for CFC-12 (local supply) and pentane (imported supply). Above assumptions show zero incremental operating cost/benefit. If price changes subsequently which results in incremental operating cost, the enterprise has agreed to not request any funding.

ANNEX 3

CALCULATION OF UNIT ABATEMENT COST

$$A = \frac{C(F) + (OC - OS/R)}{ODP}$$

Where: C = ODS reduction investment cost, including all initial one time costs such as technology and training.

F = Capital recovery factor; the annualized capital cost charges, discounted at a standard rate of 10% per year over the economic life of the investment.

OC = The annual incremental operating costs in the first year of full operation.

OS/R = The annual incremental operating savings or revenues in the first year of full operation.

ODP = The annual ODS reduction at the first year of full operation expressed in ODP units.

In this project:

C(F) = $71,000

OC = $0

OS/R = $0

ODP = 200,000 t

A = $0.36 per kg CFC

SHANGHAI NO 1A

SCOPE

The project is concerned with the replacement of CFC 12 in the production of extruded polyethylene and extruded polystyrene foam sheet by pentane - with butane as a back-up blowing agent.

RECOMMENDATION

The project is approved.

RELEVANCE AND ADEQUACY OF INFORMATION PROVIDED

This review procedure has benefited from several exchanges during the project concept stage. Detailed quotations have not been made available and the capital item should be closely monitored during the purchase / implementation stages. The source of "know-how" should be included.

TECHNICAL SOUNDNESS

The technology(ies) chosen are well proven and in wide scale use. The equipment listed for purchase is necessary and there is rightly an emphasis on safety requirements for these flammable blowing agents. These include relocation of the plant.

LESSON FROM EXPERIENCE

This is a good model for this particular technology change - except for the clearly identified items associated with the relocation of the plant.

ENVIRONMENTAL ISSUES

The technology chosen is of a zero ODP type and will not require replacing. There is no Global Warming issue. The enterprise undertakes to comply with relevant VOC regulations.

THE MONTREAL PROTOCOL ON SUBSTANCES THAT DEPLETE THE OZONE LAYER CHINA ODS PHASE OUT PROJECT

PROJECT COVER SHEET

COUNTRY:	The People's Republic of China
PROJECT TITLE:	Fire Extinguisher Production Conversion from Halon 1211 to ABC Dry Chemical
SECTOR COVERED:	Fire Fighting Industry
ODS USE IN SECTOR (1992):	12,500 MT ODP (4,000 MT Halon 1211 & 50 MT 1301)
PROJECT IMPACT:	Phase out 150 MT ODP per year (50 MT Halon 1211)
PROJECT DURATION:	One Year
PROJECT COST:	Incremental Investment Cost: US$ 128,000 Contingency:1/ US$ 19,000 Incremental Operating Cost: US$ 124,000 Financial Agent Fee:2/ US$ 8,000
PROPOSED OTF GRANT:	US$ 280,000
COST EFFECTIVENESS (UAC):	US$0.34/kg ODP/year
IMPLEMENTING ENTERPRISE:	Benxi Fire Equipment Factory, Liaoning, China
COORDINATING MINISTRY:	Ministry of Public Security
IMPLEMENTING AGENCY:	The World Bank

PROJECT SUMMARY

This project will eliminate the use of 150 MT ODP per year (50 MT Halon 1211 in China. Halon 1211 extinguisher production line will be replaced by ABC dry chemical powder (ABC) fire extinguisher production. Redesign and additional equipment for the factory is required. After new production line is completed, 50 MT Halon 1211 use can be eliminated annually. The project will set up an example for production conversion from halon extinguisher to non-halon ones for the smaller sized halon extinguisher factory in China.

Technical Assessment: The project has been reviewed and supported by the OORG technical reviewer, Phil DiNenno. His comments are attached.

1/ 15 percent investment cost.

2/ 3 percent investment cost, contingency and incremental operating cost.

PROJECT OBJECTIVE:

The objective of this project is to convert the factory from halon to ABC dry chemical powder portable extinguishers, as part of the overall country strategy to phase out use of halon while simultaneously providing satisfactory alternate fire protection systems.

SECTOR BACKGROUND

Because halon extinguishers have unique qualities, such as clean, non-conducting, efficient, low toxicity, rapid knockdown of flames, halons use have been widespread in developed countries in the 1980s. Its use began in China in mid 1980s, along with economic development of China, came to extensive application to protect computer rooms, telecommunication centers, central control rooms, archives, transformer substations, oil depots, etc. Halon application in China is well accepted as the preferred fire protection system, but use of ABC powder as a main fire fighting chemical is still being evaluated under local conditions and fire safety regulations.

In 1992, about 4,500 tons of halons were consumed in producing fire fighting equipment in China. Benxi Fire Equipment Factory consumes 50 tons of Halon 1211 a year, accounting for 1.1 percent of sector consumption in China.

ENTERPRISE BACKGROUND

Benxi Fire Equipment Factory is attached to Benxi Iron and Steel Complex. It was established and put into operation in 1982. It is designated to manufacture fire fighting equipment by Liaoning Provincial General Brigade of Fire Protection. The factory has 9 senior and mid-level engineers and 4 quality inspectors among 174 staff of the factory. It has workshop buildings with an area of 2,147 square meters and a complete production equipment with a production capacity of 30,000 Halon 1211 extinguishers. Equipment that the factory possesses include machining, stretching, punching, welding (including CO_2 restraint welding), plastic-spraying, assembling installations, which can be used to produce various types of extinguisher and hosereel. Different functional departments are established at the factory, such as R&D, production, marketing, quality control, measurement, accounting, etc. The reliable quality control system guarantees long term stability of product quality.

The factory uses domestic production technology. Production is approved by Ministry of Public Security. Products have been appraised based on state criteria and examined by concerned quality inspection authorities. MPS issued production licenses to Benxi Fire Equipment Factory in 1987 after re-evaluation for Halon 1211 extinguisher and dry chemical extinguisher. Products are sold only domestically. Local ownership is 100 percent.

PROJECT DESCRIPTION

The conversion project would make use of its current Halon 1211 extinguisher production line built in 1982 with an annual production capacity of 30,000 units. Actual production in 1992 was 25,000 units. Technical conversion of the halon extinguisher production could be realized by adding key equipment and relevant testing apparatus and acquisition of technical know-how. After the conversion, current production of 25,000 units of halon extinguishers would thus be replaced by production of 25,000 units of ABC portable extinguishers. To meet requirements for the production of ABC extinguishers, the factory will undertake technical transformation of halon extinguisher production workshop (including adoption of new technology and rehabilitate workshop buildings). Project will be completed within one year upon the date of receiving the grant by the factory.

Currently, the factory uses 50 MT Halon 1211 per year. Conversion will be phased in during project implementation as part of trial production and market development program, including service applications. Halon consumption is planned to be stopped completely one year after project implementation. In the first year of operations, 25,000 ABC extinguishers will be produced and production of Halon 1211 extinguisher and halon supply to service stations will be completely stopped.

JUSTIFICATION FOR ALTERNATIVE TECHNOLOGY SELECTION

Substitute products will meet social demands for fire protection equipment. Like halon extinguishers, portable ABC portable extinguishers can put out Class A,B, and C fires and electric fires and the extinguishing performance of an ABC extinguisher exceeds a halon extinguishers with the same weight standard. Therefore, substitution of halon extinguisher by ABC extinguishers will satisfy demand for fire protection equipment.

TECHNOLOGY SOURCES AND AVAILABILITY

The first Halon 1211 extinguisher production conversion project, Zhejiang Fire Equipment Factory, approved by Montreal Protocol Executive Committee in March 1993, possesses or will soon be acquire technology for ABC extinguisher production. Benxi Fire Equipment Factory plans to obtain technology from Zhejiang Fire Equipment Factory, and purchase some key production and testing equipment inside China as well as making the relevant equipment by factory itself so as to form production capability of ABC extinguisher and achieve annual production of 25,000 units.

PROJECT COSTS

The total project cost of US$271,000 equals the ODS reduction portion of the overall project (investment cost plus net incremental operating cost). This project will not provide Benxi with any incremental revenues, but will result in profit loss which was used as proxy to calculate incremental operating cost.

Investment costs of US$147,000 including the purchase of additional equipments needed for the conversion of production line to replace Halon 1211 extinguisher with ABC extinguisher production and 15% contingency (Annex 1: Tables 1 & 2). To meet special requirements for production of ABC extinguishers, technical transformation of the original halon extinguisher production workshop conducted.

Net incremental operating costs of US$124,000 are equal to the profit loss for four years due to the conversion of production line to replace Halon 1211 with ABC extinguishers. Since ABC extinguishers do not sell well on the market as Halon 1211 extinguishers, average profit is lower than halon extinguishers. Therefore, the factory will lose an annual profit of US$31,000 after the conversion (Annex 2). Conversion project will be fully completed after project implementation. Trial production of ABC extinguishers will start and reach full scale of the production from the second year of the project implementation.

Incremental operating cost is defined as the net annual profit loss, which is based on current profit in the production of Halon 1211 fire extinguishers compared to the lower profit from production of ABC extinguishers. Annex 2 Table 1 gives the average production cost and profit indicators after conversion and shows an average annual profit of US$3,000 from the production of ABC extinguishers. Annex 2 Table 2 shows two scenarios: the projected production of halon extinguishers without conversion and projected production of ABC extinguishers after conversion and their operating cost and profits from 1995 to 1998. The annual reduced profit due to conversion from halon to ABC powder is:

US$34,000 - US$3,000 = US$31,000

As indicated in project description, production of ABC dry powder will reach full capacity after project implementation. Compensation for incremental operating cost is based on 25,000 units production per year during four years from 1995 to 1998. The estimated incremental operating cost will be:

US$31,000 x 4 years = US$124,000

Other costs. An additional US$8,000 (3%) was added to the grant request to cover the fee for services of the financial agent that will appraise and oversee procurement, disbursement and audits.

Requested Funding. The proposed OTF grant for Benxi is US$280,000 and was calculated as follows: sum of (1) investment costs, (2) 15 percent contingency of investment cost, and (3) net incremental operating cost of four years. The resulting total project cost was increased by 3% to account for the financial agent fee.

PROJECT IMPLEMENTATION

Management: Liaoning Provincial Fire Protection Bureau will oversee the successful implementation of the project. The project will be carried out at Benxi Fire Equipment Factory.

ENVIRONMENTAL CONSIDERATIONS

Environmental Assessment (EA) is carried out by local Environmental Protection Bureau (EPB) of NEPA. The project will meet standards and regulations stipulated by the local EPB. No new pollutants will be generated from the production.

REQUIRED REGULATORY ACTIONS

As the conversion project is not a profitable operations and in order to persuade other halon extinguishers producers into production conversion, we suggest that Chinese Government (through NEPA and MPS) make special law and regulations to limit the production and sales of halon extinguishant and extinguisher as soon as possible and promulgate preferential policy in tax to those conversion factories in order to phase out halon use in China.

PROJECT RESULTS

Direct Project Impact: This project will remove 50 MT of Halon 1211 annually (150 MT ODP).

Indirect Project Impact: This project does not lead to factory closing. This project plays a significant role of demonstration for conversion of halon extinguisher production at small size enterprises in China.

ANNEX 1

Table 1: Costs Breakdown of Equipment Needed for ABC Extinguisher Production
Foreign Currency Cost
US $

Description	Qty	Unit Cost	Total Cost
ABC DCP charging facility	2	8,500	17,000
Air Compressor	2	1,403	2,806
Cylinder surface trimmer	1	7,060	7,060
Dust Remove equipment	1	1,445	1,445
Electronic Scale	2	1,020	2,040
Cylinder bottom mode	8	2,848	22,784
Bottom Ring Press mode	4	340	1,360
Special Press Clipper	5	85	425
Hydro-Pressure test equip	1	1,870	1,870
Design and prototype			11,305
Prototype appraisal			2,975
Installation			1,450
Training			1,530
Subtotal			74,000
Contingency (15%)			11,000
Total			85,000

Table 2: Breakdown Costs of Halon Extinguisher Workshop Transformation
Local Currency Cost
US $

Description		Cost	Remarks
Equipment/Apparatus		22,695	Pneumatic Pressure testing equipment
Civil works:	Base Floor Wall	10,735 6,440 4,295	Rehabilitate 2147 Sq.M bldg, incl.labor, no lands fee will be charged.
Installation		2,295	
Technical Training		3,060	20 persons x 30 days
Trial Production		4,250	
Subtotal		54,000	
Contingency (15%)		8,000	
Total		62,000	

ANNEX 2

Table 1: Average Production and Profits Indicators After Conversion *

ABC- Ext'gshr	A.Ann. Output	Sales In- come- $/pc	Product. Cost- $/pc	Av. Sales Cost- $/pc	Profit $/pc	Ttl Profit ($)
MFZL2	6,250	7.80	7.49	0.17	0.14	875.00
MFZL3	6,250	8.72	8.36	0.21	0.15	937.50
MFZL4	6,250	9.74	9.40	0.23	0.11	750.00
MFZL5	6,250	10.90	10.46	0.29	0.15	937.50
Total	25,000	232,000	223,000	6,000		3,000

* The exchange rate between US$ and RMB used is $1.00 = RMB 8.70.

Table 2: Projected Fire Extinguisher Production and Incremental Operating Cost After Conversion (US$)

Without Conversion (Halon 1211)					With Conversion (ABC DCP)				Profit Loss (Inc.Operating Cost)
	Annual Output (Units)	Sales	Operating Cost	Profit	Annual Output (Units)	Sales	Operating Cost	Profit	
1995	25,000	341,000	307,000	34,000	25,000	232,000	229,000	3,000	31,000
1996	25,000	341,000	307,000	34,000	25,000	232,000	229,000	3,000	31,000
1997	25,000	341,000	307,000	34,000	25,000	232,000	229,000	3,000	31,000
1998	25,000	341,000	307,000	34,000	25,000	232,000	229,000	3,000	31,000
								Total	124,000

ANNEX 3

Breakdown of Project Cost and Financing
US $

	Investment Cost	Contingency	Total
I. Investment Cost			
ABC extinguisher production (T.1)	74,000	11,000	85,000
Halon extinguisher workshop transformation (T,2)	54,000	8,000	62,000
Subtotal	128,000	19,000	147,000
II. Incremental Operating Cost			124,000
Subtotal			271,000
III. Financial Agent Fee (3%)			8,000
Total			279,000
Proposed OTF Grant			280,000

ANNEX 4

Table 1: General Schedule of Project Implementation

1994--1995 Task	1996 Task
1. Design alternative product/equip, test & trial runs 2. Procure general equip., install and trial runs 3. Design, build install and trial runs special equip. 4. Training	Complete production conversion, eliminate halon use completely

Table 2: Schedule of Project Implementation

Items of Tasks	Description	1994	1995
Portable ABC extinguisher	General equip.	Order/Procure	Installation
	Special equip.	Design/Build	Install/test
	Technical equip.	Design/build	Exam/testing
	Trial production		Trial run

Table 3: Price of Main Product Material and Suppliers

	Halon 1211	ABC DCP	Cold Rolled Steel Sheet
Rate	3.67 US$/kg	0.67 US$/kg	600 US$/MT
From	Dongyang Chemical Co	BJ Fire Eq. Plant	Benxi Iron & Steel Complex

ANNEX 5

Calculation of Unit Abatement Costs

$$UAC = [C(F) + (OC-OS/R)]/ODP$$

Where:

- UAC = Unit Abatement Cost, $/kg ODP/year
- C = ODS reduction investment cost, including all initial one time costs such as technology and training
- F = Capital recovery factor, the annualized capital cost charges, discounted at a standard rate of 10% per year over the economic life of investment
- OC = The annual incremental operating costs in the first year of full operation: US$ 31,000
- OS/R = The annual incremental operating savings of revenue in the first year of full operation: 0
- ODP = The annual ODS reduction in the first year of full operation expressed in ODP units.

The investment cost of the project is US$147,000.00 (including 15 % of contingency), the economic life is 15 years.

$$C(F) = \{\$147,000.00 \times 0.1\}/\{1 - (1 + 0.1)^{-15}\} = 19,327$$

$$UAC = \{\$19,327 + (\$31,000 - 0)\}/150000 \text{ Kg ODP}$$

$$= \text{US\$0.34/Kg ODP/year}$$

Hughes Associates, Inc.
Fire Science & Engineering

6770 Oak Hall Lane, Suite 125, Columbia, Maryland 21045 (301) 596-2190 FAX (301) 596-2295

OORG APPROVAL
BENXI & ZHUZHOU

February 14, 1994
via FAX 202-477-1273

Ms. Helen Chan
Operations Officer
Industry and Energy
The World Bank
Washington, DC 20433

Re: China ODS Phase Out Projects, DPE Conversion, Benxi and Zhuzhou Factories

Dear Ms. Chan:

I have reviewed the amended proposals on the two referenced Halon 1211 to DPE portable extinguisher conversion projects. Both have responded to my earlier comments, and I recommend funding on a technical basis.

I have not reviewed in detail the revised cost estimates. My previous comments on the bases and assumptions of such cost calculations still apply. I do not believe reduced average profit in this case is a reasonable incremental recurring cost.

Very truly yours,

Philip J. DiNenno, P.E.
Vice President

PJD/cdp

TOTAL P.2

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December 1, 1993

Benxi - First Review

Ms. Jessica Poppele
Ozone Ops Coordinator – Asia
Global Environment Coordination, Room S2-133
World Bank Group
Washington, DC 20433

Dear Ms. Poppele:

I have attempted to review the four project proposals related to halons in China. Specific project comments follow, but I offer the following overall questions and comments that apply to all proposals.

(1) I cannot (nor should I) verify the economic basis of the proposals. This is most important because in general the project costs are dominated by "nontechnical" cost items such as "lost" profit, unemployment, lost revenue, etc.

(2) In regards to issues associated with "lost profit," it seems to me that the production of lower cost and hence lower profit Halon 1211 portable extinguishers is a net country economic benefit. For a particular factory, the lower cost/lower profit replacement unit (e.g., DPE vs. 1211) is "lost revenue" the nation receives the same benefit of a portable fire extinguisher for a lower cost. Therefore, it is not clear to me that the World Bank or others should fund this "cost."

(3) In general, replacement of 1211 extinguishers with DPE is technically acceptable. There is some residual demand for a "clean" extinguisher such as CO_2 (for use in control rooms, computer rooms, etc.). It is of some concern that none of the projects are directed in this manner.

(4) I have technical questions on each of the proposals which require resolution. Hence, I am unable to make a specific recommendation on any of them.

(5) The efficacy or effectiveness of any of these proposals is tied to overall plan for the country. Since I am not familiar at all with the overall program for China, it will be difficult to adequately assess any particular project. If the country program documentation would be made available, perhaps some of my concerns would be alleviated.

(6) The unit abatement costs vary widely across all proposals as do the assumptions on economic life of the proposed plant or modifications. These need to be rationalized.

A. Construction of Halon Recovery Equipment

(1) The value of recycling/recovery equipment proposed in reducing the unwanted 1211 emissions depends on where and how the current emissions are arising. If the emissions are due to vapor heels in bulk containers, 1211 production losses or filling losses at the factory, the proposed equipment will be of little or no value in reducing the current 350 tons/year emission estimate.

(2) The use of recycling/recovery equipment such as the unit proposed is primarily for servicing fire extinguishers. That is to allow the recovery of agent from the extinguisher, perform the necessary inspections, and then refill the extinguisher with the agent which was just removed. The degree to which the equipment can be used to reduce emissions given other loss mechanisms is dependent on by whom, how, and where the equipment will be used. Hence, some additional information on how exactly the equipment will be used, by whom, and where is of significance.

(3) Without external government regulatory control or price controls, "recycled" Halon 1211 will cost more than newly produced. What is the incentive for the use of recycled 1211 given the current cost/regulatory structure on the use of newly produced 1211?

(4) The need for 1,000 sets of recovery equipment has not been demonstrated. For a total emission control of 400 tons/year, this implies a very low (0.4 tons/year) utilization per set.

B. Production Transfer of Xylene Alkyl 1211 Extinguishant

This project involves changeover from Halon 1211 manufacture to Class A foam manufacturing.

(1) The efficacy of Class A foam as a portable fire extinguisher agent has not been demonstrated. It, by definition, is only applicable to Class A fires, and comparisons with plain water indicate marginal benefit on these types of fires. Without additional information on the type of foam and specific performance data on portable extinguisher use with such foam, it is not possible to recommend proceeding.

(2) The use of Class A foam on Class B (flammable and combustible liquid) fires cannot be supported given the availability of dry chemical extinguishers and/or AFFF extinguishers.

(3) Technology transfer with a company called HUNCR in the U.S. is proposed. There is no recognized portable fire extinguishant/extinguisher manufacturer by that name in the U.S. I have not personally heard of the company.

(4) The economic justification seems problematic; payment for a dismantled 1211 production unit as well as its lost revenue and profit seems excessive.

(5) There is no description of how the Class A foam is to be used. The proposal concerns manufacture of the foam not the extinguish. Who will manufacturer the extinguisher in which the foam is used? Are there further proposals along this line?

C. **Conversion of Halon 1211 Extinguisher Production (to DPE), Benxi Iron and Steel Corporation**

This project involves conversion of an extinguisher manufacturing plant from Halon 1211 to ABC dry powder. In general, ABC dry powder is an acceptable alternative to Halon 1211, and hence, such conversion makes sense. The following specific comments and questions apply to this proposal.

(1) This proposal is one of several aimed at converting from the manufacture of Halon 1211 portable extinguishers to the manufacture of ABC powder extinguishers. Are these proposals being coordinated relative to supply/demand or technology transfer issues?

(2) There is a somewhat perverse economic argument that comprises a major cost item in the proposal. The lost revenue and profit associated with selling and manufacturing a less expensive, but equally effective portable extinguisher is deemed an economic cost. Actually, it is a benefit (equal protection, less cost) and should not be accounted as a cost of changeover. In the limiting case, the plant could sell the ABC portables at the same price as 1211 portables. There is the recurring problem here of trying to economically introduce alternatives while the production of new Halon 1211 continues unregulated.

(3) The technology transfer scheme and associated costs needs to be further developed and resolved.

(4) Since apparently the Zhuzhou Factory possesses the necessary DPE technology, obtaining the necessary technology from this source should be evaluated.

D. Halon 1211 Fire Extinguisher Replacement at Zhuzhou Factory

This project involves replacement of Halon 1211 portable fire extinguisher manufacturing capability with ABC dry powder and AFFF (light water) portable fire extinguisher manufacturing.

(1) Apparently, this factory has the existing capability to manufacturer ABC powder and extinguishers utilizing this powder. Perhaps this technology could be transferred internally to other factories seeking international technology transfer for the same purpose (e.g., Benxi Iron and Steel Corporation).

(2) One of the technical problems associated with this project is the requirement for corrosion resistant extinguisher tanks for the AFFF extinguisher. It is my understanding that AFFF portables manufactured in the U.S. use the same construction as those for plain water. There is no need for special corrosion resistant shells; only stainless steel shells need be used. The primary U.S. manufacturer of AFFF portables is Amerex Corporation, not Ansul as indicated in the proposal. Ansul does not manufacture a handheld AFFF portable extinguisher.

(3) It is not clear whether or not the Factory has existing capability to manufacture or procure locally the AFFF concentration. It is a central issue regarding the efficacy of this technology. This will have a substantial bearing on the economics of the replacement extinguisher.

(4) As previously indicated, replacement of Halon 1211 portable extinguishers with ABC dry chemical is appropriate. For some applications, the use of AFFF/water portables is also appropriate. I am unable to comment on the economic analysis, but further evaluation of items (2) and (3) above may change the cost structure.

(5) Is the reduction in halon use 250 tons/year of agent or 250 tons/year ODP? Both terms are used, I believe it is 250 tons (agent)/year or approximately 1000 tons (ODP)/year.

If you have any questions, please feel free to contact me.

Very truly yours,

Philip J. DiNenno, P.E.
Vice President

PJD/cdp

THE MONTREAL PROTOCOL ON
SUBSTANCES THAT DEPLETE THE OZONE LAYER
CHINA ODS PHASE OUT PROJECT

Cover Note on Halon Projects: Benxi and Zhuzhou

The two halon phase out project submissions for China, "Fire Extinguisher Production Conversion from Halon 1211 to ABC Dry Chemical" at Benxi Fire Equipment Factory (Benxi) and "Fire Extinguisher Production Conversion from Halon 1211 to ABC Dry Chemical" at Zhuzhou Fire Equipment Factory (Zhuzhou), are an integral part of China's phase out strategy for this sector. Overall, China's strategy to phase out halons aims to gain acceptance of halon alternatives by: (1) changing market perception; and (2) revising codes and standards that may require halon use while phasing out both the production of halon as well as its consumption in extinguishers and fixed systems. As noted in the project proposals, halons' clean agent property and historical quality problems with dry powder extinguishants have resulted in a strong perception in the Chinese market that Halon 1211 is a superior agent. The current fire protection product price structure reflects this perception.

Incremental Operating Costs (IOC)

The Benxi and Zhuzhou projects address both aims of China's halon phase out strategy. The projects seek to gain market acceptance of halon substitutes by pricing them competitively while eliminating halon use in the production of extinguishers. Thus, the incremental cost calculations include both the incremental capital costs required to convert the enterprises to production with halon substitutes as well as requests for four years of IOC based on reduced cash flow which will result from product pricing required to gain market acceptance of the halon substitute extinguishers. Like the aerosol filling center projects approved by the Executive Committee for Tianjin and Shanghai, Benxi and Zhuzhou will need to pass operating savings on to their customers to give customers sufficient incentive to use a non-ODS product. However, unlike Tianjin and Shanghai where circumstances meant that only a portion of savings were passed on, halon substitute extinguishers must be priced so low that the cash flows of Benxi and Zhuzhou would actually be reduced as a result of project implementation. In other words, the incremental capital costs would be insufficient compensation to allow the enterprises to price their halon substitute products such as to gain market acceptance. Without considering lost profits as IOC, customers would continue to buy halon.

These two projects request four years of incremental operating costs based on China's Country Program goal to eliminate production of Halon 1211 extinguishers by 2000. As halon extinguisher production is curtailed, we expect that by 1998 halon substitute extinguishers will have sufficient market acceptance to allow for a more favorable price structure. The closure of Halon 1211 production facilities (see Tongxiang project initiative) will, of course, better position Zhejiang, Benxi and Zhuzhou to promote halon substitutes.

The Zhuzhou and Benxi projects are similar in scope and content to the Zhejiang Halon Extinguisher Conversion project approved initially by the Executive Committee in June 1992, with supplemental funding approved in March, 1993. The Zhejiang project had considered two alternatives to minimize the cash flow loss that would result from a straight halon to halon substitute conversion. The option which was approved for funding by the Executive Committee included increasing production capacity from 150,000 halon units to 250,000 ABC units. The alternative, maintaining existing capacity at 150,000 units, was examined, but the additional investment costs estimated for production expansion

were less than estimates of four years of lost profits based on equivalent capacity. The incremental cost request was, therefore, based on production expansion. The Ministry of Public Security, which is responsible for overseeing China's halon phase out program, recognizes that production expansion, as a means of compensating halon extinguisher manufactures for reduced cash flows which result from the need to promote halon substitutes, is not sustainable given the limited market demand for halon or halon equivalent fire extinguishers. Thus, for the current and for future submissions, IOC requests for halon extinguisher conversion projects in China will be based on reduced cash flows (lost profits), rather than production expansion.

Discounting of IOC

Two aspects of World Bank disbursement practice for MLF financed operations have led to a request for IOC without discounting future costs: (1) Interest earned on funds deposited in the Bank's Ozone Projects Trust Fund are retained by the Bank and credited to the MLF; and (2) Disbursements for IOC are paid out over time against actual expenditures, rather than as a lump sum up-front payment. To minimize the risk of windfall profits accruing to an enterprise, disbursements are made based on actual production costs and benefits after project completion and are closely related to non-ODS production levels actually achieved. For these reasons, basing grant requests on discounted costs results in insufficient funding for future years. Therefore, IOC requests in these and future projects will not be discounted.

Should consideration of these two points, compensation for reduced cash flow (lost profits) as IOC and non-discounting of IOC, be deferred, we ask that the two China halon project proposals be considered within the existing eligibility guidelines.

6/10/94

THE MONTREAL PROTOCOL ON
SUBSTANCES THAT DEPLETE THE OZONE LAYER

COUNTRY	India
PROJECT TITLE	Conversion of CFC-12 open-type compressor designs for use of HCFC-22 refrigerant.
SECTOR COVERED	Refrigeration and Air Conditioning
ODS CONSUMPTION IN SECTOR	1814 MT of CFC-12 in 1991
PROJECT IMPACT	Phase out 35 MT CFC-12 (1994)
UNIT ABATEMENT COST	$1.09/kg ODS/year
PROJECT DURATION	3 YEARS
PROJECT ECONOMIC LIFE	10 years.
TOTAL PROJECT COST	Incremental Capital Cost $ 233,500 Incremental Operating Cost 0 TOTAL PROJECT COST $ 233,500
PROPOSED OTF GRANT	US$ 240,500[1]
IMPLEMENTING ENTERPRISE	FREEZEKING INDUSTRIES PVT. LTD., New Delhi
COORDINATING MINISTRY	MINISTRY OF ENVIRONMENT AND FORESTS (MOEF)
IMPLEMENTING AGENCY	THE WORLD BANK/IDBI

PROJECT SUMMARY

This project will phase out CFC-12 consumption by developing HCFC-22 open-type refrigeration compressors at FREEZEKING INDUSTRIES PVT. LTD. (the Enterprise). Freezeking, with the assistance of FRICK INDIA LIMITED (a company originally established in collaboration with Frick Company USA and a reputed manufacturer of HCFC-22 reciprocating compressors in India), will redesign FREEZEKING make CFC-12 based compressors for use with HCFC-22. After HCFC-22 compressor designs are finalized and tested, the company will convert its existing CFC-12 compressor production line to the production of HCFC-22 compressors. This project will result in complete phase out of CFC-12 compressor production at FreezeKing Industries in a period of three years (by 1997).

TECHNICAL ASSESSMENT: This subproject has been reviewed and supported by OORG technical reviewer Dr. L. Kuijpers. His comments are attached.

[1] A 3% financial agent fee has been added to the total project cost in the determination of the proposed OTF grant.

PROJECT OBJECTIVES. The objective of this project is to eliminate the use of CFC-12 refrigerant in open-type FREEZEKING compressors.

SECTOR BACKGROUND. India's refrigeration and air-conditioning industry consumed 1814 MT of CFC-12 in 1991. This amount will continue to grow unless new equipment is built for CFC substitutes. In 1996, CFC-12 consumption is expected to reach 3279 MT for refrigeration and air-conditioning applications.

OPEN-TYPE COMPRESSORS: Approximately 40% of the total CFC-12 consumption in the refrigeration and airconditioning sector is consumed in new installations of open-type compressors and servicing of existing installations in the field. Being slow speed and rugged in design, open-type compressors are most popular for use in refrigeration plants set up in remote areas where there are excessive power break-downs, voltage fluctuations, and other adverse conditions. Hermetically sealed compressors are ineffective in these areas and it is certain that people will continue to buy open-type compressors in the future. These compressors are also being used in package air conditioners and chillers all over India where reliablity and high performance is required.

Other applications are :-

1) Ice-Candy Plants
2) Deep Freezers & Walk-In Coolers
3) Transport (Buses, Trucks, Trains & Ships)
4) Low Temperature Applications (menthol crystalization plants, plate freezers,etc.)
5) Other AC & R units in Commercial and Industrial sectors.

NOTE: All use CFC-12 Refrigerant

ENTERPRISE BACKGROUND. Freezeking Industries is located in New Delhi (India). It is a Private Limited company and employs 140 people.

Sales for 1991-92 were Rs. 8.1 million (US $ 257,142)
Sales for 1992-93 were Rs. 10.5 million (US $ 333,333)
Sales for 1993-94 were Rs. 13.0 million (US $ 412,698)

FreezeKing has projected to reach a total sales turn-over of Rs. 52 million (US$ 1.65 million) by the year 1999. In the year 1993-94, approximately 35 MT of CFC-12 was consumed in new plants using open-type FreezeKing compressors only.

FreezeKing is the leading manufacturer of open-type compressors in India for a wide range of capacities. It was incorporated in the year 1966 and has been producing slow speed open-type compressors that use CFC-12 as refrigerant. These compressors have capacities ranging from 1/4 HP to 20 HP. All of its sales are to the domestic market. The compressors sold are used for commercial as well as industrial air-conditioning and refrigeration systems.
The production capacity of the manufacturing plant in Delhi is 5,000 compressors per year. Yearly production was as follows:

Production in year 1991-92 was about 700 compressors
Production in year 1992-93 was about 720 compressors
Production in year 1993-94 was about 950 compressors

The existing technology being used by Freezeking in production of its compressors has been developed by its own in-house Research & Development unit. It has its own foundry to provide it with good graded castings. The company is completely self-contained and manufactures all components under one roof.

FreezeKing is also taking up manufacturing of condensing units and custom designed refrigeration systems to promote its sales and diversify its products. Being a pioneer in manufacturing open-type compressors, FreezeKing is backed by the valuable experience of its staff, engineers, and workers. The management team of the company is highly qualified to tackle both engineering as well as managerial challanges.

PROJECT DESCRIPTION. This project will be carried out in 3 years. The existing 11 models of open-type CFC-12 compressors will be redesigned by Freezking to produce 6 models of open-type HCFC-22 compressors to cover the same capacity range.

During the first 2 years, engineering design, manufacturing development redesigning and prototyping of HCFC-22 compressors will be carried out by Freezeking. Earlier efforts were made to collaborate with a foreign manufacturer of HCFC-22 compressors, however, being a small scale unit, the company was unable to negotiate successfully.

FreezeKing has chosen Frick India as it is has offered an attractive package for technical assistance to the company. Frick India has been a subsidary of Frick Company USA for nearly 25 years during which time the entire technology of manufacturing HCFC-22 compressors was transferred to them. Today, Frick India is a reputed manufacturer of HCFC-22 compressors in India with 30 years of technical expertise, fully capable of providing the newest technology and reliable technical assistance to FreezeKing. As per their offer, Frick India would provide:

(1) HCFC-22 Compressor Technology

(2) Assistance for building production and inspection system

(3) Assistance for vendor development

Further, the first 2 years of the project will include developing:

(a) jigs & fixtures,
(b) special purpose tooling,
(c) patterns & dies,
(d) new testing equipment, and
(e) complete testing of the prototype compressors for best performance and efficiency.

In the 3rd year, the existing compressor production line will be redesigned to produce the new HCFC-22 compressors. This will include:

(a) vendor development and customer assistance (service),
(b) rearrangement and implementation of new technology,
(c) equipment modification,
(d) training and
(e) resetting of the production system for efficient output.

During the 3rd year, production of HCFC-22 compressors will begin at 30% capacity. After completion of the project, the company will fully convert its production line to manufacture HCFC-22 compressors.

JUSTIFICATION FOR ALTERNATIVE TECHNOLOGY SELECTION. FreezeKing would like to convert their open-type CFC-12 compressors to HCFC-22 compressors because:

(1) this gas is being manufactured in India and is available locally in most refrigeration retail stores; and

(2) the overall design of the compressor using HCFC-22 is simple and is the most suitable proven technology for Indian conditions.

Also FreezeKing feels that this will be the most economical way to convert from the existing CFC-12 compressor production to HCFC-22 compressors. The entire conversion process will take only 3 years since:

(a) India is using HCFC-22 as refrigerant in air conditioning, Operation and maintenance technology is available throughout India.

(b) The technology to manufacture HCFC-22 compressors is closest to the existing CFC-12 technology, and therefore, will incur minimum incremental capital costs.

(c) Frick India will incorporate the newest technology in the technology transfer package to Freezeking.

PROJECT COST

Incremental Capital Cost (w/10% Contingency)	$ 233,500
Incremental Operating Cost	Nil
Total Project Cost (Refer to Annex A)	$ 233,500

BENEFITS: There are no operating cost benefits from the project

LOCAL OWNERSHIP FRACTION: 100% Indian

UNIT ABATEMENT COST: US $1.09/kg ODS/year

FINANCIAL AND ECONOMIC ANALYSIS

Financial Rate of Return (FRR)

The project involves one-time capital costs followed by nil recurring operating costs (No savings/cash inflows involved). Since the project involves only cash outflows, hence FRR for the project is undefined.

Economic Internal Rate of Return (ERR):

The project involves one-time capital costs followed by nil recurring operating costs (No savings/cash inflows involved). Hence ERR is undefined.

FINANCING PLAN. Total project cost is to be met fully by the OTF grant amount.

PROJECT IMPLEMENTATION.

MANAGEMENT: This project will be carried out at FreezeKing Industries (the Enterprise). Frick India Limited will provide technical assistance to FreezeKing during project execution.

PROJECT IMPLEMENTATION SCHEDULE: See Annexure B

REQUIRED REGULATORY ACTION

Request to Government of India to waive taxes and duties since these are transfer payments and not the economic costs.

RESULTS (OUTPUT):

Direct Project Impact

This project will completely phase out the manufacture of CFC-12 open-type compressors at FreezeKing Industries by converting the present production line to a HCFC-22 compressor production line. The conversion will take a total of 3 years to successfully implement the new changes. This project will remove 150 Metric Tons of CFC-12 use in new FreezeKing compressors during the first year after completion of Project. (Calculated considering project completion in June 1997).

Indirect Project Impact

This project will have a strong indirect impact such as:

a) New technology will become avaliable in India which will eventually eliminate production and use of CFC-12 open-type compressors.

b) Since FreezeKing offers free technical assistance in setting up new systems and modifying old systems to its customers, it will encourage the use of HCFC-22 systems and help eliminate ODS use all over India in the shortest time span.

ENVIRONMENTAL IMPACT. This project will not result in any additional emissions, effluents or waste. It will meet all applicable Indian Government's environmental, health and safety regulations.

CHANGES IN PROJECT SCOPE FOLLOWING PREIOUS REVIEW

The project schedule was been modified to reflect completion in 3 years rather than 4 years. Incremental Operating Costs were determined to be negligible. The project impact and unit abatement costs were based on the current usage of ODS by the enterprise (35 MT per year) rather than on a projection of a usage which included servicing requirements.

ANNEXURE A

Freezeking
PROJECT COST SUMMARY

CAPITAL COSTS		US $	Rs.
Technology Transfer Fee for Frick India Limited -HCFC-22 compressor technology -Assistance in production, QC and Vendor development		38,095	1,200,000
Engineering Design, Development, Implementation & Customer Service		62,412	1,966,000
Compressor Test Equipment		15,713	494,978
Calorimeter Test Equip.		10,476	
Compressor idle running Testing Beds		2,351	
UltraSonic Flaw Detector		2,886	
Dynamic Balancing Machine		5,556	175,000
Deburring and Finishing Machine		5,990	188,700
Measuring Instruments for Tool-Room & Production-Line		17,110	538,961
Dies, Patterns, Jigs, Fixtures & Tools		62,756	1,976,817
Prototype Trials		4,603	144,990
-No. of models requiring testing	6		
-No. of trials/model	3		
-Avg. Material cost			8,055
SUB-TOTAL		212,235	6,685,446
Contingency (10%)		21,265	669,804
INCREMENTAL CAPITAL COSTS		**233,500**	**7,355,250**
INCREMENTAL OPERATING COSTS [1]		**Nil**	**Nil**
TOTAL PROJECT COST [2]		**233,500**	**7,355,250**

[1] See Annexure C for details.
[2] Duties and taxes have been excluded from all project costs.

ANNEXURE B

PROJECT IMPLEMENTATION SCHEDULE
TOTAL DURATION : 3 years

PROJECT START : 3rd Quarter, 1994

	FROM	TO
Technology Transfer	3Q-94	2Q-95
Develop Patterns & Dies	4Q-94	4Q-95
Procurement	1Q-95	4Q-95
Construction of Test Equipment	4Q-95	2Q-96
Build & Test Prototypes	1Q-96	4Q-96
Modify Inspection System	4Q-96	1Q-97
Vendor Development	3Q-96	2Q-97
Modify Production Facility (to permit 30% production)	1Q-97	2Q-97
Achieve 100% production	3Q-97	2Q-98

ANNEXURE C

INCREMENTAL OPERATING COST

There will be no increase in material cost for manufacture of HCFC-22 compressors as compared to existing CFC-12 compressors. Also, FreezeKing is only in the business of manufacturing compressors, and there is no direct incremental operating cost occuring due to cost of chemicals. However, our customer will incur an additional expense for the HCFC-22 needed to charge and service their HCFC-22 compressors. The quantity of refrigerant charged varies widely in different applications. For example, a 7.5 TR compact packaged airconditioner with air cooled condensor requires 15 kgs of CFC-12. On the other hand, if the same compressor is used in an ice-candy plant, thermal storage system, the charge of CFC-12 goes upto 40 kgs. Therefore, it is difficult to predict as to what extent our customer will incur an additional expense due to switching over of refrigerant.

For instance, looking at the density of CFC-12 and HCFC-22, it can be noted that the latter is lighter in weight. Calculations are as under:

CFC-12 Liq. at 105 deg F = 78.0 lbs/cu.ft; Price: US$ 4.69/kg

HCFC-22 Liq. at 105 deg F = 70.4 lbs/cu.ft; Price: US$ 5.78/kg

Avg. increase in price at current mkt. rate (excluding taxes & duties) will be US$18.7/cu. ft to charge HCFC-22 in place of CFC-12.

Avg. increase due to the above = US $ 0.53/kg

Based on the above calculations, it is seen as under:
For a 7.5 TR Compressor:

Application: **Package AC**

Increase in refrigerant cost due to conversion = 15 kg * US$ 0.53/kg = **US $ 7.95**

Application: **Ice-candy plant**

Increase in refrigerant cost due to conversion = 40 kg * US$ 0.53/kg = **US $ 21.2**

As indicated, there is an incremental cost involved, however, it is not possible to calculate the actual increase in cost due to wide variations in applications. Further, since the incremental operating cost is not being incured by FreezeKing directly, it has been treated as nil. We suggest that our customer should somehow be compensated for this increase.

To N. Hadjitarkani
The World Bank
Washington D.C.
fax: 1- 202- 477 7352

From Dr Lambert Kuijpers
Cochair UNEP Technology Panel
Technical University/ W & S /4 Bldg
PO Box 513
NL - 5600 MB Eindhoven
tel: 31- 40- 47 2487
fax: 31- 40- 46 6627

Date 94-06-02

Pages 1 (including this one)

Subject Recommendation Freezeking

I can support the project proposal for Freezeking in its 1 June 1994 form.

Sincerely,

P.S.
Corrections:
First page : Dr. L.J.M. Kuijpers, or Dr L. Kuijpers
Page 4: refrigernat ..refrigerant, and throughtout India (5/6th line)

Regards

India

REVIEW OF A HCFC-22 CONVERSION PROJECT

Manufacture of HCFC-22 Compressors at Freezeking Ind. Ltd

Project Proposal by The World Bank, May 1994

RTU-UNWB-LK-94228 -1k

Scope

The project under review covers the two phases of the conversion of CFC-12 open compressors to HCFC-22, the transfer of the technology involved, the development of in-house technology, the construction of some new laboratory facilities, the testing of HCFC-22 compressors and full conversion to production.

Technology

The HCFC-22 technology selected is a proven technology, and is preferred by other manufacturers in this field. HCFC-22 is a transitional refrigerant. For a certain part of the production there would be a nontransitional refrigerant, i.e. HFC-134a. However, its use is not recommended for medium and low temperature equipment as manufactured by Freezeking. Therefore the selection of HCFC-22 is the appropriate one.

The proposed technology transfer agreement is shortly described. It can be assumed that it will cover all necessary items. However, it is not clear whether Frick as the technology partner will transfer newest technology to Freezeking (market potential of Frick versus Freezeking in India is not explained). Where it concerns open compressors such technology should be transferred that minimizes refrigerant leakage to the ambient; this is not made clear.

Other technologies than HCFC-22 were not considered and there is no reason for it.

Environmental impact

The refrigerant proposed has a remaining ODP and GWP. However, non-ODP and non GWP solutions are not available for these purposes. Health and safety impacts are minimized. Whether the environmental impact is minimized is not clear (see above). Namely, the leakage of HCFC-22 in the new type of compressors should also be minimized; whether this is covered in the technology transfer agreement is not made clear.

Project costs

The majority of the cost components are essential for the conversion. None of the components are expected to be present before the conversion.

There is one item that is not clear, which concerns "Engineering design, development, implementation and customer service". This item cannot be found in the project description. Does it comprise activities that are not covered by the Frick transfer agreement, or is it extension of staff in the development and implementation phase ?

The level of the investments proposed is moderate and acceptable.

Recommendations

The project is approved.

Eindhoven, 94 06 01
Kuijpers, LJM

Appendix (Freezeking)

India

Manufacture of HCFC-22 Compressors at Freezeking Ind. Ltd

Further information by The World Bank, 30 August 1993

RTU-UNWB-LK-93228 -lk

Scope

The project under review covers the two phases of the conversion of CFC-12 open compressors to HCFC-22, the transfer of the technology involved, the development of in-house technology, the construction of some new laboratory facilities, the testing of HCFC-22 compressors and full conversion to production.
The first phase is in agreement with the phased approach recommended by the OORG; the second phase can be requested since HCFC-22 technology is a technology that is commercially proven since a large number of years.

Recommendation

The original review mentioned that Frick India should transfer an "attractive package" for technical assistance to Freezeking. There should be a guarantee that Frick transfers new technology to Freezeking; as to this there need to be some guarantees. Frick has obtained HCFC-22 technology during an association of nearly 25 years with Frick USA -which cooperation has ceased at a certain moment-.
Further information given 30 August 1993 mentions that Frick India manufactures HCFC-22 in a different range than Freezeking will do. This again leaves the question open whether Frick India has the technology available from Frick Co for transferring the up to date designs and manufacturing technology of the smaller capacity range compressors to Freezeking.

The original project proposal mentions the conversion from CFC-12 to HCFC-22 open compressors, without mentioning any specific data with regard to the electric drives. Data on whether or not these are bought outside, adapted for HCFC-22 starting etc. must be incorporated in the proposal.
Data given 30 august 1993 mention that motors are bought outside. This takes away the latter concern.

The project is now supported under the condition that there is a guarantee that Frick India has up-to-date technology available for manufacturing the small capacity HCFC-22 compressor range.

Eindhoven, 9 September 1993

Kuijpers, L.J.M. (OORG)

COUNTRY:	Republic of Indonesia	
PROJECT TITLE:	Elimination of CFC-11 in the manufacture of flexible polyurethane foam (slabstock)	
SECTOR COVERED:	Non-Insulating Foams	
ODS USE IN SECTOR:	Approximately 1,215 MT of CFC-11 and CFC-12 in all foam-blowing applications in 1993 (1,215 ODP-weighted MT). Of this, about 1,000 MT of CFCs is consumed in the non-insulating foam industry.	
PROJECT IMPACT:	Phaseout of 100 MT of CFC-11 (100 ODP-weighted MT)	
PROJECT DURATION:	1 year	
PROJECT ECONOMIC LIFE:	10 years	
TOTAL PROJECT COST:	ODS Reduction Investment Costs: Incremental Operating Cost/(Savings): Total Project Costs:	US$ 535,000 US$(215,000) US$ 320,000
COST EFFECTIVENESS:	US$0.11/ODP-weighted kg of ODS phased out	
PROPOSED OTF FINANCING:[1]	US$379,000 as grant	
IMPLEMENTING ENTERPRISE:	P.T. Erlangga Trimanunggal Kusumah	
COORDINATING MINISTRY:	Indonesian Ministry of the Environment (LH)	

PROJECT SUMMARY

This project will phaseout 100 MT of CFC-11 consumption in the production of flexible polyurethane foam (slabstock and molded) at PT Erlangga Trimanunggal Kusumah by converting two continuous foam production lines to methylene chloride combined with increased water levels (for slabstock) and water-blown systems (for molded). The resulting additional process heat that is generated, particularly in production of low density slabstock foams, will be removed by a vacuum cooling system. The enterprise will use support from an international foam process specialist to convert the foam formulation and to train personnel in the safe handling of methylene chloride.

TECHNICAL ASSESSMENT

Comments made by the OORG technical reviewer (Dr. Michael Jeffs) during a preliminary review on January 6, 1994 on the assumptions used for calculating operating costs and costs associated with trial production runs have been reflected in this version of the project proposal.

[1] Includes 15 percent contingency and 3 percent financial agent fee.

PROJECT OBJECTIVE

The objective of this project is to phaseout the use of CFCs in the manufacture of flexible polyurethane foam (slabstock and molded) at PT Erlangga Trimanunggal Kusumah (hereafter referred to in this investment project proposal as "Erlangga").

SECTOR BACKGROUND

The Indonesian non-insulating foam sector consists of approximately 36 large and medium-sized manufacturers, mainly concentrated on Java, and about two hundred small manufacturers, scattered over the other islands of the Republic. For the purposes of this project, large companies are defined as those using continuous foaming processes and having an ODS consumption of more than 50 MT. Among the large companies, 6 are producers of extruded polystyrene (EPS) and polyethylene (EPE) foam, 12 are flexible polyurethane foam (PUF) manufacturers (continuous process), and 2 are miscellaneous PUF manufacturers. In 1993, total consumption of CFC-11 and CFC-12 at these companies is estimated to be approximately 800 MT. Assuming that the smaller companies account for about 20 percent of the total consumption of ozone-depleting substances (ODS), total ODS consumption in all non-insulating end uses is estimated to be close to 1,000 MT. Insulating end uses such as appliance insulation are expected to account for approximately 200 MT of CFCs. Overall consumption in the foam-blowing sector is therefore estimated to be approximately 1,200 ODP MT.

As articulated in the Republic of Indonesia's draft Country Program, the Indonesian State Ministry of Environment (LH) intends to achieve a phaseout of CFC use in the foam sector by 1997, provided that sufficient financing is available from the Multilateral Fund. Major challenges to this goal include the large amount of small users in the sector and the lack of availability of mature technologies for certain foam-blowing applications.

ENTERPRISE BACKGROUND

Erlangga Trimanunggal Kusumah was established in 1975. The company is a fully licensed, 100 percent Indonesian-owned enterprise with its head office and factory located in Bandung, West Java. The company produces approximately 2,000 MT of flexible slabstock polyurethane foam and 110 MT of flexible polyurethane foam per year.

The slabstock operation has two continuous production lines. One of the lines uses a high pressure Hennecke foaming unit while the other uses a low pressure Vertimax unit. The Hennecke unit is used for foams with densities ranging from 10 to 18 kg/m3 and the Vertimax for foams with densities ranging from 10 to 30 kg/m3. The Hennecke unit is customized for production of controlled cell foams for the shoe industry. Erlangga makes approximately 15 major types of foams with densities ranging from 10 to 30 kg/m3. About half of Erlangga's foams are what it classifies as medium to high density (i.e., above 20 kg/m3).

The molded operation uses a low pressure Canon C-30. The machine was purchased in 1989 and is used for producing foams for furniture and motorcycle seats. The company also produces about 200 MT per year of rebond foam, a recycled product made from foam scrap. This product is used for seats for certain public vehicles and for foam mattresses.

Overall, the company has experienced significant growth in demand for foam in recent years. In 1991, the company's output increased by approximately 30 percent over 1990. In 1992, production

increased by 15 percent over 1991. The company is anticipating 10 to 15 percent growth for the foreseeable future. In 1993, the company used approximately 100 MT of CFC-11 (80% in slabstock and 20% in molded).

PROJECT DESCRIPTION

Erlangga will convert both its slabstock and molded foam-blowing operations from CFC-11 to non-CFC alternatives.

Methylene chloride has been identified as the preferred replacement for CFC-11 in slabstock foam-blowing operations. The technology is commercially available. Its use will require some modifications to Erlangga's high pressure Hennecke and low pressure Vertimax production lines in conjunction with safety related modifications in the production environment. Methylene chloride alone is not a sufficient replacement for CFC-11 currently used to produce the very low density foams that are common in Indonesia. Use of methylene chloride alone results in scorching that has an unacceptable adverse effect on the foam quality and, furthermore, constitutes a fire risk to workers. The conversion to methylene chloride will therefore be supplemented with a vacuum cooling system that will remove additional process heat that is generated. Vacuum cooling will also permit a reduction in the use of methylene chloride and a partial substitution to water-blown formulations.

Modifications needed to implement the use of methylene chloride and water as the blowing agents include:

- Increase in process ventilation for both production lines
- Procurement of fire and safety equipment
- Installation of vacuum cooling equipment, and
- Reformulation.

The company will also convert its molding line to water blown foams. However, the low pressure molding system is not capable of handling the related higher viscosities resulting in the need to convert to high pressure equipment. The current low pressure machine (Cannon C-30) will therefore be replaced by a high pressure unit.

The project budget includes an international foams process expert to assist Erlangga in making the necessary formulation adjustments and to provide the necessary safety training. The technology selected for this project is not licensed and the process specialist will ensure that effective transfer of the technology to Erlangga occurs. Because Erlangga's quality requirements for its slabstock foam products are quite high, it will experience a slight increase in scrappage costs after converting to methylene chloride and increased water levels during the first two years. The estimated project budget accounts for the incremental costs associated with slightly increased scrappage during this period.

JUSTIFICATION FOR SELECTION OF ALTERNATIVE TECHNOLOGY

There are numerous technologies to replace the use of CFCs in flexible foam. Methylene chloride constitutes the most economic solution. With the implementation of adequate safeguard, methylene chloride can also result in an environmentally acceptable solution. Methylene chloride alone, however, is not appropriate for manufacturing foams with very low densities (i.e., those foams with densities below about 20 kg/m3). After learning about the results of trial runs using methylene chloride to replace CFC-11 at P.T. Foamindo (another Indonesian company making slabstock flexible

polyurethane foam that has already had a project approved by the Multilateral Fund), the management of Erlangga decided to opt for the use of methylene chloride along with increased water levels and vacuum cooling to replace its use of CFC-11.

For the molded line, Erlangga has decided to switch to modified chemistry, resulting in water-blown foam for molded foam production.

The combination of these technologies will allow replacement of CFCs in a cost effective way, without unacceptable losses in performance and processing. A pre-condition is, however, a well planned reformulation program to implement adjustments in the amount of blowing agent as well as in the amount and type of catalysts.

Also, work place concentrations of methylene chloride have to be limited to acceptable industrial hygienic standards. Methylene chloride is a highly volatile chlorinated substance with a relatively low acute toxicity. The volatility can trigger high concentrations in the air. The substance is classified by both the U.S. Environmental Protection Agency (USEPA) and the International Agency for Research on Cancer (IARC) as a probable human carcinogen. The U.S. Occupational Safety and Health Administration has set an 8 hour time weighted average (TWA) level of 500 ppm for methylene chloride. Careful handling is therefore required to avoid over exposure. Examples of safety measures typically needed include: proper encapsulation of the production units that use methylene chloride, ventilation of production and storage areas, training of personnel in handling of the substance, and industrial hygienic monitoring.

PROJECT COSTS

As described below, and detailed in the relevant annexes, the total project cost (investment costs and recurring operating costs) over the first 4 years of the project is US$320,000. This project will not provide Erlangga with any incremental revenues.

Investment Costs of US$535,000 are detailed in Annex A.

Net Incremental Operating Savings of US$215,000 are equal to the net present value of the first four years of incremental operating costs minus offsetting benefits. Operating costs reflect expected growth in demand for CFCs of 10 percent per year, a CFC-11 price of 5,000 rupiah per kilogram (US$2.50), a methylene chloride price of 1,500 rupiah per kilogram (US$0.75), and a slightly increased scrappage rate for slabstock foam over the first two years of the project. Given a ten percent discount rate, the net present value of the incremental operating costs minus the offsetting savings over the first four years of the project results in a net savings of US$215,000. A more detailed breakdown of the operating costs and the assumptions used for each year of the project are provided in Annex B.

Other Costs. A 15% contingency (US$48,000) was also included to ensure adequate funding of project costs following project appraisal. An additional US$11,000 (3%) was added to the grant request to cover the fee for services of the financial institution (FI) that will appraise the projects and oversee procurement, disbursement and audits.

Requested Funding. The proposed OTF grant for Erlangga is US$379,000 and was calculated as follows: the present value of the net incremental operating savings over the first four years of the project were subtracted from the total investment costs. The resulting total project cost was multiplied by the percentage of Indonesian ownership (100 percent). This figure was increased by a 15 percent

contingency to yield the grant amount. Finally, this figure was increased by 3 percent to account for the financial institution fee.

UNIT ABATEMENT COST (UAC)

As derived in Annex C, the UAC calculated over the ten year life of the project is US$0.11 per ODP-weighted kg of CFC-11 phased out. This number is derived from the incremental annualized capital costs of US$87,000, the net annualized incremental operating savings of US$68,000 (annualized over the first four years because operating costs and savings vary year to year) and average annual savings of approximately 175.3 ODP-weighted MT of CFC-11 assuming a 10 percent annual growth rate in demand for CFC-11. Because the UAC is low, the project is extremely cost effective.

REQUIRED REGULATORY ACTIONS

At present, the Government of Indonesia levies varying duties on imported equipment. Because duties and taxes are considered transfer payments between organizations rather than true economic costs, the Multilateral Fund does not consider such costs as incremental. Hence, in order to reduce the total costs incurred by Erlangga, it is recommended that the Indonesian government waive the import duty for all equipment supplied for this project.

RESULTS

This project will eliminate the use of at least 100 MT of CFC-11 in the first year of implementation. Market and company growth indicates that this may increase by 10% annually in subsequent years.

SCHEDULE

TASK	Q1	Q2	Q3	Q4
Finalize specifications, tenders, review bids, select equipment	XXXX			
Site preparation		XXXX		
Equipment arrival		X		
Installation of equipment			XX	
Start-up, trials with high pressure (molded) and methylene chloride (slabstock), and training			XX	
Follow up visit from international foams expert				X

ANNEX A
Capital Costs (US$)

Slabstock

Process ventilation	
- for Hennecke machine	66,400
(based on 304 ft of $100/ft piping, plus 2 exhaust fans at $5,000 each, plus encapsulation of cutting area at $20,000, plus transportation and installation at $6,000.)	
- for curing area	10,000
- for Vertimax machine	44,600
Fire safety	
- water lancing system	10,000
- sprinkler/piping/pumps	40,000
- pump shelter	2,000
- small portable dry chemical fire extinguishers	3,000
Occupational safety equipment	
- respirators (8)	1,200
- vapor tester for MeCl	2,000
Vacuum cooling	
- (based on 40 m2 and $4,000 per m2 and 15,000 for construction and installation. Only one set of equipment is needed because only one production line is run at a time)	175,000
Trial Material (15 minutes*15 foam types*$450/minute)	101,250
75% cost recovery	(75,940)

Molded

High pressure molded foam production unit	120,000
Freight, installation	20,000
Value of existing low pressure equipment (tanks, pipes)	(10,000)
Trail materials	5,000

Both

International process specialist (2 trips) (includes training, trials, and set up)	20,000
TOTAL CAPITAL COSTS (US$)	535,000

ANNEX B
Net Incremental Operating Costs/Savings

COST ITEM	1994	1995	1996	1997
Baseline				
CFC-11 costs	275,000	302,500	332,750	366,025
Molded formulation	332,750	366,025	402,628	442,890
Post-Project				
Methylene chloride/water	70,125	77,138	84,851	93,336
Catalysts	4,875	5,363	5,899	6,489
Electricity for cooling	5,000	5,000	5,000	5,000
Reduced product yield	231,000	127,050	0	0
New molded formulation	382,663	420,929	463,022	509,324
Net Incremental Operating Costs/(Savings)	85,913	(33,046)	(176,606)	(194,766)
NPV @ 10 percent (4 years)	**(220,000)**			

Assumptions:

-- 15 percent growth in demand
-- loss in product yield is 3% in first year. Assuming a typical learning curve, company halves this loss in next year. In first year loss is computed as follows: 2000 tons * $3.5/kg * 3 percent * 1.1
-- cost of amine catalyst US$3.75/kg, company uses 0.5 MT/year in first year of conversion
-- cost of tin catalyst US$3 per year, company uses 1 MT/year in first year of conversion
-- cost of CFC-11 is US$2.50/kg.
-- cost of increased methylene chloride formulation is US$0.75/kg
-- substitution ratio of methylene chloride for CFC-11 is 85%
-- baseline cost of molded formulation is $2.75/kg
-- post-project cost of molded formulation is $3.15/kg
-- ratio of slabstock to molded output remains 80:20

ANNEX C
Unit Abatement Cost

A. ODS Savings

ODP of CFC-11	1.0
Annual growth in CFC-11 demand	10 percent
Use of CFC-11 in 1993	100 MT
Economic Life of Project	10 years
Average Annual ODS Phased Out	175.3 MT

B. Incremental Capital Costs

Total investment costs	535,000
Annualized incremental capital costs	87,000

C. Net Annualized Incremental Operating Savings 68,000

UAC ($/kg ODP phase out) **0.11**

OORG TECHNICAL REVIEW - P.T. ERLANGGA TRIMANUGGAL KUSUMAH

TECHNOLOGY

The project involves the phaseout of CFC 11 in the production of flexible polyurethane slabstock and moulded foams by the implementation of methylene chloride-based technology assisted by vacuum technology and by water blown technology respectively. Both are sound, well proven technologies and appropriate to the respective production processes. The provision of a process expert to assist in formulation adjustment (and safety training) is noted.

ENVIRONMENTAL IMPACT

The key issue is to ensure the thoroughness of training on safety issues and to monitor methylene chloride levels during commissioning and regularly during subsequent production. It is recommended that the strictest international standards are compiled with - which are more stringent than those designated by the US EPA.

PROJECT COSTS

The project capital costs are considered to be appropriate with high emphasis on health and safety aspects. The high pressure dispenser for moulded foam production is necessary because of the higher viscosity components which result when CFC 11 is removed.

The reviewer is in agreement with the operating costs determination.

IMPLEMENTATION TIMEFRAME

This appropriate provided equipment can be delivered within three months of placing orders - is this feasible ?

RECOMMENDATION

The project is approved as proposed.
The comments on safety and health should be followed.

OORG Technical Reviewer : Dr. M. Jeffs (MD 152)

Date Review Completed : 6/6/94

COUNTRY:	Republic of Indonesia	
PROJECT TITLE:	Elimination of CFC-11 in the manufacture of flexible polyurethane foam (slabstock)	
SECTOR COVERED:	Foam-Blowing	
ODS USE IN SECTOR:	Approximately 1,215 MT of CFC-11 and CFC-12 in all foam-blowing applications in 1993 (1,215 ODP-weighted MT). Of this, about 200 MT of CFCs is consumed by small users in the non-insulating foam industry.	
PROJECT IMPACT:	Phaseout of 120 MT of CFC-11 (120 ODP-weighted MT)	
PROJECT DURATION:	1 year	
PROJECT ECONOMIC LIFE:	10 years	
TOTAL PROJECT COST:	ODS Reduction Investment Costs: Incremental Operating Cost/(Savings): Total Project Costs:	US$ 351,000 US$(151,000) US$ 200,000
COST EFFECTIVENESS:	US$(0.05)/ODP-weighted kg of ODS phased out	
PROPOSED OTF FINANCING:[1]	US$237,500 as grant	
IMPLEMENTING ENTERPRISE:	P.T. Royal Abadi Sejahtera	
COORDINATING MINISTRY:	Indonesian Ministry of the Environment (LH)	

PROJECT SUMMARY

This project will phaseout 120 MT of CFC-11 consumption in the production of flexible polyurethane foam (slabstock) at PT Royal Abadi Sejahtera by converting foam-blowing agent from CFC-11 to methylene chloride combined with increased water levels. To eliminate scorching during production of low density foams, the additional process heat that is generated will be removed by a vacuum cooling system. The enterprise will use support from an international foam process specialist to convert the foam formulation and to train personnel in the safe handling of methylene chloride.

TECHNICAL ASSESSMENT

Comments made by the OORG technical reviewer (Dr. Michael Jeffs) during a preliminary review on January 6, 1994 on the assumptions used for calculating operating costs and costs associated with trial production runs have been reflected in this version of the project proposal.

[1] Includes 15 percent contingency and 3 percent financial agent fee.

PROJECT OBJECTIVE

The objective of this project is to phaseout the use of CFCs in the manufacture of flexible polyurethane foam (slabstock) at PT Royal Abadi Sejahtera (hereafter referred to in this investment project proposal as "Royal").

SECTOR BACKGROUND

The Indonesian non-insulating foam sector consists of approximately 36 large and medium-sized manufacturers, mainly concentrated on Java, and about two hundred small manufacturers, scattered over the other islands of the Republic. For the purposes of this project, large companies are defined as those using continuous foaming processes and having an ODS consumption of more than 50 MT. Among the large companies, 6 are producers of extruded polystyrene (EPS) and polyethylene (EPE) foam, 12 are flexible polyurethane foam (PUF) manufacturers (continuous process), and 2 are miscellaneous PUF manufacturers. In 1993, total consumption of CFC-11 and CFC-12 at these companies is estimated to be approximately 800 MT. Assuming that the smaller companies account for about 20 percent of the total consumption of ozone-depleting substances (ODS), total ODS consumption in all non-insulating end uses is estimated to be close to 1,000 MT. Insulating end uses such as appliance insulation are expected to account for approximately 200 MT of CFCs. Overall consumption in the foam-blowing sector is therefore estimated to be approximately 1,200 ODP MT.

As articulated in the Republic of Indonesia's draft Country Program, the Indonesian State Ministry of Environment (LH) intends to achieve a phaseout of CFC use in the foam sector by 1997, provided that sufficient financing is available from the Multilateral Fund. Major challenges to this goal include the large amount of small users in the sector and the lack of availability of mature technologies for certain foam-blowing applications.

ENTERPRISE BACKGROUND

Royal Abadi Sejahtera was first established in 1980 as P.T. Surya Agung. The enterprise was renamed in 1988 to its current name. The company is a fully licensed, 100 percent Indonesian-owned enterprise with its head office, main factory, and branch office located in Bandung, West Java. The company produces approximately 2,200 MT of flexible slabstock polyurethane foam per year on a continuous production line. This line is run using a Canon Viking maxfoam low pressure unit. Royal makes approximately 16 major types of foams with densities ranging from 8 kg/m3 to 40 kg/m3. About half of Royal's foams are what it classifies as medium to high density (i.e., above 20 kg/m3).

The company also has a batch foam-production unit. Part of Royal's foam is utilized directly on-site in the production of mattresses for spring beds. The company manufactures approximately 36,000 beds per year. The company has experienced significant growth in demand for foam in recent years. In 1991, 1992, and 1993, the company's output has increased by approximately 20 percent per year. This has resulted in a growth in the company's annual consumption of CFC-11. In 1992, for example, the company used almost 100 MT of CFC-11 while in 1993, consumption had increased to 120 MT of CFC-11.

PROJECT DESCRIPTION

Methylene chloride has been identified as the preferred replacement for CFC-11 in slabstock foam-blowing operations. The technology is commercially available. Its use will require some modifications to Royal's low pressure maxfoam line in conjunction with safety related modifications in the production environment. Methylene chloride alone is not a sufficient replacement for CFC-11 currently used to produce the very low density foams that are common in Indonesia. Use of methylene chloride alone results in scorching that has an unacceptable adverse effect on the foam quality and, furthermore, constitutes a fire risk to workers. The conversion to methylene chloride will therefore be supplemented with a vacuum cooling system that will remove additional process heat that is generated. Vacuum cooling will also permit a reduction in the use of methylene chloride and a partial substitution to water-blown formulations.

Modifications needed to implement the use of methylene chloride and water as the blowing agents include:

- Increase in process ventilation for both maxfoam and batch foam-making lines
- Procurement of fire and safety equipment, and
- Installation of vacuum cooling equipment for both the maxfoam and batch equipment
- Reformulation.

The project budget includes an international foams process expert to assist Royal in making the necessary formulation adjustments and to provide the necessary safety training. The technology selected for this project is not licensed and the process specialist will ensure that effective transfer of the technology to Royal occurs. Because Royal's quality requirements for its foam products are high, it will experience an increase in scrappage costs after converting to methylene chloride and increased water levels during the first two years. The estimated project budget accounts for the incremental costs associated with increased scrappage during this period.

JUSTIFICATION FOR SELECTION OF ALTERNATIVE TECHNOLOGY

There are numerous technologies to replace the use of CFCs in flexible foam. Methylene chloride constitutes the most economic solution. With the implementation of adequate safeguard. methylene chloride can also result in an environmentally acceptable solution. Methylene chloride alone, however, is not appropriate for manufacturing foams with very low densities (i.e., those foams with densities below about 20 kg/m3). After learning about the results of trial runs using methylene chloride to replace CFC-11 at P.T. Foamindo (another Indonesian company making slabstock flexible polyurethane foam that has already had a project approved by the Multilateral Fund), the management of Royal decided to opt for the use of methylene chloride along with increased water levels and vacuum cooling to replace its use of CFC-11.

The combination of these technologies will allow replacement of CFCs in a cost effective way, without unacceptable losses in performance and processing. A pre-condition is, however, a well planned reformulation program to implement adjustments in the amount of blowing agent as well as in the amount and type of catalysts.

Also, work place concentrations of methylene chloride have to be limited to acceptable industrial hygienic standards. Methylene chloride is a highly volatile chlorinated substance with a relatively low acute toxicity. The volatility can trigger high concentrations in the air. The substance is classified by both the U.S. Environmental Protection Agency (USEPA) and the International Agency for

Research on Cancer (IARC) as a probable human carcinogen. The U.S. Occupational Safety and Health Administration has set an 8 hour time weighted average (TWA) level of 500 ppm for methylene chloride. In several other industrialized countries, the level is even stricter and is set at 50 ppm. Careful handling is therefore required to avoid over exposure. Examples of safety measures typically needed include: proper encapsulation of the production units that use methylene chloride, ventilation of production and storage areas, training of personnel in handling of the substance, and industrial hygienic monitoring.

PROJECT COSTS

As described below, and detailed in the relevant annexes, the total project cost (investment costs and recurring operating costs) over the first 4 years of the project is US$200,000. Funding from OTF is requested for US$237,500.

Investment Costs of US$351,000 are detailed in Annex A.

Net Incremental Operating Savings of US$151,000 are equal to the net present value of the first four years of incremental operating costs minus offsetting benefits. Operating costs reflect expected growth in demand for CFCs of 15 percent per year, a CFC-11 price of 5,000 rupiah per kilogram (US$2.50), a methylene chloride price of 1,500 rupiah per kilogram (US$0.75), and a reduction in product yield over the first four years of the project. Given a ten percent discount rate, the net present value of the incremental operating costs minus the offsetting savings over the first four years of the project results in a net savings of US$151,000. A more detailed breakdown of the operating costs and the assumptions used for each year of the project are provided in Annex B.

Other Costs. A 15% contingency (US$30,000) was also included to ensure adequate funding of project costs following project appraisal. An additional US$7,000 (3%) was added to the grant request to cover the fee for services of the financial institution (FI) that will appraise the projects and oversee procurement, disbursement and supervision.

Requested Funding. The proposed OTF grant for Royal is US$237,500 and was calculated as follows: the present value of the net incremental operating savings over the first four years of the project were subtracted from the total investment costs. The resulting total project cost was multiplied by the percentage of Indonesian ownership (100 percent). This figure was increased by a 15 percent contingency to yield the grant amount. Finally, this figure was increased by 3 percent to account for the financial institution fee.

UNIT ABATEMENT COST (UAC)

As derived in Annex C, the UAC calculated over the ten year life of the project is US$(0.05) per ODP-weighted kg of CFC-11 phased out. This number is derived from the incremental annualized capital costs of US$57,124 the net annual incremental operating savings of US$65,173 (averaged over the first four years because operating costs and savings vary year to year) and average annual savings of approximately 172 ODP-weighted MT of CFC-11 assuming a 15 percent annual growth rate in demand for CFC-11. Because the UAC is slightly negative, the project is therefore extremely cost effective and an excellent candidate for funding.

REQUIRED REGULATORY ACTIONS

At present, the Government of Indonesia levies varying duties on imported equipment. Because duties and taxes are considered transfer payments between organizations rather than true economic costs, the Multilateral Fund does not consider such costs as incremental. Hence, in order to reduce the total costs incurred by Royal, it is recommended that the Indonesian government waive the import duty for all equipment supplied for this project.

RESULTS

This project will eliminate the use of at least 120 MT of CFC-11 in the first year of implementation. Market and company growth indicates that this may increase by 15% annually in subsequent years.

SCHEDULE

TASK	Q1	Q2	Q3	Q4
Finalize specifications, tenders, review bids, select equipment	XXX			
Site preparation		XXX		
Equipment arrival		X		
Installation of equipment			XX	
Start-up, trials, and training			XX	
Follow up visit from International Foams Expert				X

ANNEX A
Capital Costs (US$)

Process ventilation	
- for Canon Viking maxfoam machine	39,800
(based on 38 ft of $100/ft piping, plus 2 exhaust fans at $5,000 each, plus encapsulation of cutting area at $20,000, plus transportation and installation at $6,000.)	
- for curing area	10,000
- for batch foam-making machine	10,000
Fire safety	
- water lancing system	10,000
- sprinkler/piping/pumps	40,000
- pump shelter	2,000
- small portable dry chemical fire extinguishers	3,000
Occupational safety equipment	
- respirators (8)	1,200
- vapor tester for MeCl	2,000
Vacuum cooling	
- for the Canon Viking maxfoam machine (based on 40 m2 and $4,000 per m2 and 15,000 for construction and installation)	175,000
- for the batch foam-making machine	11,000
International process specialist (2 trips) (includes training, trials, and set up)	20,000
Trial Material (15 minutes*16 foam types*$450/minute)	108,000
75% cost recovery	(81,000)
TOTAL CAPITAL COSTS (US$)	351,000

ANNEX B
Net Incremental Operating Costs/Savings

COST ITEM	1994	1995	1996	1997
Baseline				
CFC-11 costs	345,000	396,750	456,263	524,702
Post-Project				
Methylene chloride/water	87,975	101,171	116,347	133,799
Catalysts	4,875	5,606	6,447	7,414
Electricity for cooling	5,000	5,000	5,000	5,000
Reduced product yield	442,750	254,521	146,384	134,673
Net Incremental Operating Costs/(Savings)	195,600	(30,391)	(182,084)	(243.815)
NPV @ 10 percent (4 years)	**(150,630)**			

Assumptions:

-- 15 percent growth in demand
-- loss in product yield is 5% in first year. Assuming a typical learning curve, company halves this loss in each subsequent year. In first year loss is computed as follows: 2200 tons * $3.5/kg * 5 percent
-- cost of amine catalyst US$3.75/kg, company uses 0.5 MT/year in first year of conversion
-- cost of tin catalyst US$3 per year, company uses 1 MT/year in first year of conversion
-- cost of CFC-11 is US$2.50/kg.
-- cost of increased methylene chloride formulation is US$0.75/kg
-- substitution ratio of methylene chloride for CFC-11 is 85%

ANNEX C
Unit Abatement Cost

A. ODS Savings

ODP of CFC-11	1.0
Annual growth in CFC-11 demand	15 percent
Use of CFC-11 in 1993	120 MT
Average Annual ODS Phased Out (1st 4 years)	172 MT

B. Incremental Capital Costs

Economic life of project	10 years
Total investment costs	351,000
Annualized incremental capital costs	57,124

C. Net Average Annual Incremental Operating Savings 65,173
(averaged over the first 4 years)

UAC ($/kg ODP phase out) **(0.05)**

OORG TECHNICAL REVIEW - ROYAL ABADI SEJAHTER, INDONESIA

TECHNOLOGY

The project involves the phaseout of CFC 11 in the production of flexible polyurethane slabstock foam by the implementation of methylene chloride-based technology assisted by vacuum cooling to produce the lower end of the density range. This technology is sound and well proven. The provision of a process expert to assist in formulation adjustment (and safety training) is noted.

ENVIRONMENTAL IMPACT

The main issue here is to ensure that the training in safety related issues is thorough. In addition the reviewer strongly recommends that the formulation expert arranges for methylene chloride level monitoring during commissioning to ensure that the strictest international standards are compiled with. In addition, the enterprise should arrange for regular monitoring post implementation.

PROJECT COSTS

The project capital costs are appropriate with proper attention to safety and health aspects and relate to the intended conversion. The reviewer is in agreement with the operating costs determination.

TIME FRAME FOR IMPLEMENTATION

The time scale is appropriate provided that equipment can be delivered within three months of ordering.

RECOMMENDATION

The project is approved as proposed.
The reviewer advises that the recommendations on health and safety are followed.

OORG Technical Reviewer : Dr. M. Jaffs (MD 152)

Date Review Completed : 6/6/94

The Montreal Protocol on
Substances that Deplete the Ozone Layer

Indonesia Second ODS Phase Out Investment Project Preparation

Project Cover Sheet

COUNTRY:	Republic of Indonesia
PROJECT TITLE:	ODS Phase Out Investment Project Preparation
SECTORS COVERED:	All Sectors
PROJECT DURATION:	Eight Months
PROJECT IMPACT:	Development of 12 High Priority ODS Phaseout Projects
PROPOSED BUDGET:	US$170,000 (all incremental costs)
NATIONAL COORDINATING AGENCY:	State Ministry of Environment (SME)
IMPLEMENTING AGENCY:	The World Bank

PROJECT SUMMARY

This project will build on the success of initial project preparation activities to prepare an additional 12 project proposals which will become the basis for the Second ODS Phaseout Project in Indonesia. Funds will also be used to support detailed planning and work program preparation for the "Technical Assistance Program for Small CFC Users in the Flexible Polyurethane Foam Sector" already approved. Activities to prepare the 12 proposals will include: (i) finalization of the 7-8 project concepts that were developed under the first Project Preparation Advance (PPA I) to SME (household refrigeration, halons, and solvents sectors); (ii) preparation of proposals for additional 3-4 projects identified during PPA I implementation (MACs sector); (iii) preparation of a feasibility study to assess and compare options for establishing a local supplier for quality hydrocarbon aerosol propellant (HAP); and (iv) preparation of about six additional project concepts for commercial refrigeration or other sectors as appropriate. SME and the World Bank will agree on the most effective project execution arrangement upon approval of project preparation funds.

COUNTRY:	Thailand
PROJECT TITLE:	Production of HFC-134a mobile air conditioner parts
SECTOR COVERED:	Mobile Air-Conditioning (MAC)
ODS USE IN SECTOR:	320 MT of CFC-12 for new equipment in 1991 1,320 MT of CFC-12 for servicing in 1991
PROJECT IMPACT:	Reducing the consumption of CFC-12 by 85 MT per year
PROJECT DURATION:	1 year
PROJECT ECONOMIC LIFE:	10 years
TOTAL PROJECT COST:	US$ 241,430
PROPOSED OTF FINANCING:	US$ 155,000
IMPLEMENTING ENTERPRISES:	Nippondenso Thailand
IMPLEMENTING AGENCY:	The World Bank
COORDINATING MINISTRY:	Department of Industrial Works Ministry of Industry Kingdom of Thailand

PROJECT SUMMARY

The project will eliminate the need for CFC-12 in mobile air conditioning systems at approximately 84 MT per annum. The project is designed into two phases: Phase I: Conversion of the Existing Assembly Line, and Phase II: Replacement of Brazing Oven. At this stage, Nippondenso is seeking for the approval of its Phase I which includes the replacement of tools and equipment for the production and assembly of evaporators, condensors, piping, and connectors. The proposed project is looking for funding for its investment cost of Phase I only. This project will reduce dependency on CFC-12 in the mobile air conditioning sector.

PROJECT OBJECTIVE

The project objective is to convert the existing local production facilities of one manufacturer of mobile air conditioning systems. The project is aimed to reduce the demand of CFC-12 in new mobile air conditioning systems by approximately 85 MT per annum.

SECTOR BACKGROUND

At present, there are approximately 2.8 million vehicles in Thailand, up from 1.8 million in 1989. The large increase reflects the high rate of economic growth in recent years.

Some 2.3 milion vehicles have an air conditioning unit installed, all of which use CFC-12 as the refrigerant. To charge, service and repair these mobile air-contioners (MAC's) 1,640 MT of CFC-12 are consumed annually at an estimated number of 1,500 service stations spread across the country.

The number of vehicles is projected to grow rapidly in the coming decade. Moreover, the percentage of vehicles with a MAC installed is expected to increase from the present level of 85 per cent to around 96-98 per cent.

Some new vehicles assembled locally will be fitted with MAC's based on HFC-134a as early as 1993. Total vehicle production in Thailand is 360,000 units for 1992 of which 20 per cent or 63,000 units were installed with Nippondenso air-conditioning systems. Other major suppliers of mobile air-conditioning systems in Thailand are Kiki, Sunden, Clarion, Formula, Mahachark, and Thai Heat Exchanger. The Thai government, as part of its phaseout program for the MAC sector, plans to assist these manufacturers in the conversion to HFC-134a systems as well.

ENTERPRISE BACKGROUND

Nippondenso Thailand Co. Ltd is currently producing motors, alternators, spark plugs, and air-conditioning systems for automobiles. The company is located at 369 Teparak Road, Samrong-Nua, Samutprakarn. The company was established in 1972 with the initial registered capital of 150 million Baht. The shareholders are 64% Thai, while 36% of the company is owned by the Japanese counterpart, Nippondenso Japan.

Regarding the production of mobile air-conditioning systems, Nippondenso Thailand channels its products both directly to the major automobile assemblers/manufacturers and to Nippondenso Thailand Sales. The components of mobile air-conditioning systems made by Nippondenso comprise hoses, pipes, evaporator parts, and condenser parts. All mobile air-conditioner compressors are imported. In 1992, Nippondenso manufactured 62,400 sets of three different sizes of mobile air-conditioning systems which constitute a market share of 20%. Cars equipped with Nippondenso air

conditioning system are Toyota, Honda, Daihatsu, Mitsubishi, Mazda, Hino, Renault, Volvo, and Mercedes-Benz. The current capacity of the manufacturing facility is 84,000 sets per annum. The production is expected to reach the full capacity in 1994.

Currently Nippondenso employs 800 workers of which 100 people are working in the areas related to the production of mobile air-conditioning components. Nippondenso Japan is responsible in providing technical expertise for Nippondenso Thailand. However, Nippondenso Thailand has also started using its local technical staff to design some of its parts. To keep up with the development of mobile air-conditioning technology, Nippondenso Thailand has an annual program for sending their engineers to attend further training in Japan. The details of the technical agreement which covers the transfer of technology concerning with the production of HFC-134a mobile air-conditioning systems is attached in Annex A.

PROJECT DESCRIPTION

The production facilities of mobile air-conditioning systems at Nippondenso Thailand comprises 5 sectors:

Condenser and Evaporator Sub-Assembly Section
Piping Section
Hose Caulking Section
Condenser and Evaporator Brazing Section
Final Assembly Section

Due to the differences in thermodynamic properties and cooling capacity of the two refrigerants: CFC-12 and HFC-134a, significant modification and replacement of equipment and tools are required. Nippondenso has adopted a policy of early phaseout of CFC-12 mobile air conditioner production. The phaseout program consists of two phases: Phase I: Conversion of Assembly Line, and Phase II: Replacement of Brazing Oven. At this stage, Nippondenso intends to submit only Phase I for the consideration of the Executive Committee of the Multilateral Fund. The decision on the implementation of Phase II of the project is being deterred until the technological and economical viability of the Phase II project is confirmed.

Phase I

Evaporator Assembly Section

Nippondenso currently produces two types of evaporators: serpentine, and single tank units. After converting the production to HFC-134a mobile air-conditioning system, Nippondenso plans to halt the production of a single tank evaporator model due to the technology difficulty. All single tank evaporators will be imported directly from Japan. The production of a serpentine evaporator model can be carried out via the existing facilities. No new investment is required.

Piping Section

Pipes required for the circulation of refrigerant in the mobile air-conditioning system must be bended and bulged with the level of accuracy specified by the standard of Nippondenso Japan. In HFC-134a mobile air-conditioning system, the design of connectors must be improved to minimize leakage. To achieve such requirement, all connectors and a connection between a piping line and a receiver tank must be redesigned to accommodate the higher system pressures associated with HFC-134a. The piping connector of HFC-134a system must undergo an 8 step bulging process instead of a 2 step bulging process used in CFC-12 system. Thus, the current bulging machine must be replaced by a new bulging machine with three different sets of punches and dies to accommodate the production of three different sizes of mobile air-conditioners.

To achieve a tight connection, the piping line and a receiver tank must be connected with a specially designed connector. To connect the pipe with the connector, the connecting end of the connector will be pressed to tightly fit with the pipe via a crimping joint machine. Therefore, a crimping joint machine must be acquired.

Hose Caulking Section

In switching a refrigerant from CFC-12 to HFC-134a, one component that must also be changed are hoses. To avoid leakage due to chemical reaction between HFC-134a and the material of the hoses for both low pressure and high pressure sides, a new four layer type or low leakage hose in which the internal wall of the hose is coated with nylon must be used. Due to the difference in sizes of the CFC-12 hoses and the HFC-134a hoses, the existing hose caulking machine must be equipped with two new sets of dies: one for the low pressure side and one for the high pressure side.

Final Assembly Section

A condensing unit will be packed with a steel bracket. Minimum modification of the existing tool is required for the production of HFC-134a mobile air-conditioning system.

Phase II

Condenser Assembly Section

The condensing unit is formed by two components: main corrugated tubes and heat exchanging fins. The main corrugated tubes are formed into a specific shape before being attached to heat exchanging fins. For a new HFC-134a condensing unit, the thickness of the main tube is minimized to enhance the rate of heat rejection. Since the size of the main tube and the pitch of a serpentine condenser significantly differ from the existing unit, the existing forming and bending machines must then be replaced. Moreover, the design of heat exchanging fins must also be modified accordingly. Thus, it is also mandatory that a new fin forming unit must be acquired. The surfaces of corrugated tube are coated with adhesive agent which will bond the tube and the fins tightly together when the agent is heated in the brazing unit.

Nippondenso plans to keep the old equipment and use it for producing spare parts for CFC-12 systems. Eventually, the company will produce retrofit kits for existing CFC-12 MAC systems.

Condenser Brazing Section

In switching to a HFC-134a mobile air conditioning system, the most crucial parts that must be modified to maintain similar cooling capacity as a R-12 system are the condenser and evaporator . One way of achieving similar cooling capacity is by increasing the sizes of the condenser and the evaporator. However, this option is restricted for some model cars by limited space in the passenger compartment. For these models, Nippondenso has to introduce either new concept serpentine or multi-flow typed condensers which require smaller heat exchanging surface area for superior heat exchanging rate.

The existing brazing oven is designed for a standard serpentine type condenser only. Thus, a new condenser brazing oven which can accommodate either new compact serpentine or multi-flow typed condensers must be attained. The current process of brazing, in which the assembled condensers are soaked with chlorox flux to minimize any oxidizing reaction at the surfaces of tubes and fins while they are undergoing thermal treatment within the brazing oven, is not applicable for the brazing process of either the new compact serpentine or multi-flow typed condesers. Modification or replacement of the existing brazing oven is required.

Presently, Nippondenso is evaluating the two aforementioned options. The implementation of this phase is expected to start in 1997. Therefore, Nippondenso will resubmit this project for consideration of the Executive Committe at later stage. In the mean time, the demand for some HFC-134a evaporator and condensor models will be fulfilled via importing these units directly from Nippondenso Japan.

JUSTIFICATION FOR SELECTION OF ALTERNATIVE TECHNOLOGY

HFC-134a is the currently recommended alternative to CFC-12 that can be used in mobile air-conditioners. HFC-134a technology for mobile air conditioners is fully mature and widely accepted.

PROJECT COSTS

Total Project Cost

Since Nippondenso is looking for the grant for its Phase I investment cost, the total project cost is US$ 241,430. The project will not provide Nippondenso with any incremental revenues.

Investment Cost

As detailed in Annex 1, the total investment cost is US$ 241,430. Major components of this cost include the purchase and installation of pipe bulging machine, hose caulking system. Training expense is estimated in the order of US$53,600.

Operating Cost

Incremental operating costs are not included as part of this project.

Unit Abatement Cost (UAC)

As shown in Annex 3, the UAC for this project is US$ 0.456 per ODP-weighted kilogram of ODS phased out per year. This number is derived from annualized investment costs of US$38,500.

Proposed OTF Financing

The proposed OTF grant for Nippondenso Thailand, US$ 155,000, is calculated by multiplying the total reduction cost of Phase I project of US$ 241,430 by the percent Thai ownership (64 percent) of the company to yield the grant amount.

FINANCIAL STATUS OF ENTERPRISE

To be completed by DIW and/or the World Bank.

FINANCING PLAN

To be completed by DIW and/or the World Bank.

PROJECT IMPLEMENTATION

Management

To be completed by DIW and/or the World Bank.

Schedule

Description	1993	1994	1995	1996	1997	1998
Procurement						
Bulging Machine	■					
Crimping Joint Machine	■					
Hose Caulking Dies	■					
Brazing Oven					▒	
Training (Persons)	4	2	2	2	2	
Production						
Pipe		80%	100%	100%	100%	100%
Hose		80%	100%	100%	100%	100%
Evaporator (imported)		80%	100%	100%	100%	100%
Condenser domestic		80%	10%	10%	5%	0%
imported		20%	90%	90%	95%	100%

Procurement

To be completed by DIW and/or the World Bank.

Disbursement

To be completed by DIW and/or the World Bank.

Audits

To be completed by DIW and/or the World Bank.

REQUIRED REGULATORY ACTIONS

No regulatory actions, other than routine permitting, are required to implement this project. Under existing agreement with the World Bank, equipment and machinery imported as part of this project will be exempt from import duties levied by the Thai government.

RESULTS

a) Direct project impacts

This project will eliminate the CFC-12 dependency of mobile air conditioners by 84 MT per annum.

b) Indirect project impacts

This project will have no impacts on the performance and product quality of Nippondenso mobile air conditioners. However, since the operating costs have not been included in this project, it is impossible to predict the impacts on product price.

ANNEX 1

BREAKDOWN OF INVESTMENT COSTS

Estimated Costs in US Dollars

Training and Engineering	
Technical assistance from Nippondenso Japan for model development (design, production drawings, testing, etc.)	$ 23,000
Training for Thai engineers (12 persons)	$ 53,600
Equipment	
Pipe Bulging System	
Bulging Punch (2 sets x US$ 24,800)	$ 49,600
Bulging Machine	$ 88,000
Jig	$ 4,000
Hose Caulking System	
Tool Caulking Connector Receiver Tank	$ 88,100
Jig	$ 7,500
Caulking Jig for Joint Receiver	$ 5,100
Freight and Insurance	$ 2,300
Installation Cost (5% of equipment cost)	$ 12,230
Total InvestmentCost	$241,430

ANNEX 2

BREAKDOWN OF INCREMENTAL OPERATING COSTS/SAVINGS

Estimated Costs in US Dollars

	Incremental Cost/Unit	
Condenser	$ 28	
Evaporator	$ 36	
Compressor	$ 64	
Receiver	$ 0	
Hose	$ 16	
Piping	$ 16	
Other component & small parts	$ 1	
Total Incremental Cost per unit	$161	
Total Incremental Cost per Year ($161x84,000 units/yr)		$13,524,000

Note: The incremental cost is not a part of the project.

ANNEX 3

CALCULATION OF UNIT ABATEMENT COST

Estimated Costs in US Dollars

A. ODS SAVINGS:

Average Use of CFC-12 per Year:	84 MT
Average Use of HFC-134a per Year:	84 MT
ODP of CFC-12:	1.0
ODP of HFC-134a:	0
ODP Weighted Savings:	84 MT

B. ANNUALIZED CAPITAL COST:

Total from Annex 1:	$ 218,430
Equipment Life:	10 years
Discount Rate:	10%
Annualized Capital Costs	$ 38,500

C. ANNUAL INCREMENTAL OPERATING COSTS: $ 0

D. UNIT ABATEMENT COST:

	Cost per Year	Unit cost per kg ODP saved
Annualized Capital Cost:	$38,500	$ 0.456
Annual Incremental Operating Cost:	$ 0	$ 0
Unit Abatement Cost ($/kg)		$ 0.456

Thailand : A proposal for funding a project titled "Production of HFC-134a mobile air conditioner parts ".
This is a technical review for the Ozone Operations Resource Group .

1.RECOMMENDATION : The proposal appears to be sound and consistent with the objectives of the Montreal Protocol Ozone Trust Fund . Even though this proposal is submitted as phase one of a two part program it appears to contribute significantly to the goal of CFC reduction and is considered acceptable on its own merits .

2.RELEVANCE AND ADEQUACY OF INFORMATION PROVIDED : The technical information supplied appears adequate .

3.TECHNICAL SOUNDNESS : The technical assistance committed by Nippondenso Japan will undoubtedly be adequate . The most significantly feature of the technical adequacy is the training of the Thai engineers at the beginning of the program .

4.LESSONS FROM EXPERIENCE : I believe the implementation of this program will help expedite the use of R134a and the new tooling will provide system integrity thereby reducing the leakage of R134a as well .

5.ENVIRONMENTAL ISSUES : It should be a stated objective that the technology improvement and economic advantages demonstrated by this project are intended to motivate other enterprises .It is noted that no mention of leak test technique or recapture of leak test gasses is mentioned and it should be addressed.

6.SAFETY ISSUES : I am not aware of any unique safety practices required for handling R134a or R134a products .

7.COST EFFECTIVENESS : The proposal appears to be reasonably cost effective , with the grant recipient providing significant input .

9-29

R.H.Proctor PE.

COUNTRY:	Kingdom of Thailand
PROJECT TITLE:	Conversion of Electronic Cleaning Process from CFC-113 to High-Purity Water Cleaning at TeamTronics Co., Ltd.
SECTOR COVERED:	Solvent Cleaning
ODS USE IN SECTOR:	3,200 MT of CFC-113 in 1991 7,100 MT of 1,1,1-trichloroethane (TCA) in 1991 3,170 MT of Total ODP-weighted consumption
PRODUCT IMPACT:	Eliminate annual consumption of 11.5 MT (weighted) of CFC-113
PROJECT DURATION:	6 months
PROJECT ECONOMIC LIFE:	10 years

TOTAL PROJECT COST:

ODS Reduction Investment Cost:	US$ 234,562
Incremental Operating Costs:	US$ 14,000
Incremental Operating Revenue:	US$ 0
Total ODS Reduction Project Cost:	US$ 248,562
Other Project Costs:	US$ 0
Total Project Costs:	US$ 248,562

PROPOSED OTF FINANCING: US$ 248,562 as a grant

IMPLEMENTING ENTERPRISE: TeamTronics Co., Ltd.

IMPLEMENTING AGENCY: The World Bank

COORDINATING MINISTRY: Department of Industrial Works
Ministry of Industry

PROJECT SUMMARY

This project will eliminate the use of CFC-113 solvent in the cleaning of flexible circuit card assemblies at TeamTronics. TeamTronics is a contract manufacturing facility producing high technology circuit card assemblies for use in electronic equipment such as computers. At TeamTronics, the phaseout of ozone depleting solvents (ODS) will be accomplished by replacing the current CFC-113 batch cleaner with one in-line aqueous cleaner. The aqueous cleaners will be used to remove flux residues and light ionic contamination from the circuit cards.

PROJECT OBJECTIVE

The objective of this project is to eliminate the use of CFC-113 in cleaning operations. The CFC-113 electronics cleaners will be replaced with an aqueous cleaning system.

SECTOR BACKGROUND

Solvent cleaning processes represent the largest use of ozone depleting substances (ODS) in Thailand. In 1991, the solvent cleaning sector consumed 3,200 MT of CFC-113 and more than 7,100 MT of 1,1,1 trichloroethane (TCA). On an ozone depletion potential (ODP) weighted basis, the 1991 Thai consumption in the solvent sector amounted to 3,170 MT, approximately 37 percent of total ODP-weighted consumption in the country. The rapid increase in the use of ODS in Thailand is a result of an expansion of the electronics industry, particularly through investment in joint ventures or captive Thai-owned companies, by Japanese, European, and American firms.

ODS consumption in the solvents industry is split almost equally between electronics and metal cleaning processes. Electronic cleaning processes include circuit-card and electronic part cleaning. Metal part cleaning includes most gross cleaning processes of large or heavily soiled parts, such as sheet metal cleaning, cleaning prior to painting or surface finishing, and cleaning to remove machine oils from manufactured parts. The cleaning of high-reliability precision parts, such as instrumental aircraft gyroscopes, is not a significant contributor to Thai cleaning operations.

ENTERPRISE BACKGROUND

TeamTronics is a 100 percent Thai-owned company located in Prathumthanee, 20 kilometers from Bangkok. TeamTronics employs 100 people. In 1992, the company had revenue of US$ 1.24 million and produced approximately 4.8 million flexible circuit cards and 200,000 printed circuit boards. Approximately 100 percent of the product is sold locally, although the company hopes to begin exporting its products and has opened sales offices in the United States and Singapore.

TeamTronics has committed to eliminate the use of ODS in circuit card production before January 1994. Currently the company uses approximately 14.4 MT of virgin and 21.6 MT of recycled CFC-113 solvents.

PROJECT DESCRIPTION

TeamTronics will eliminate the use of CFC-113 in flexible circuit card cleaning operations with the use of pure water aqueous cleaning. TeamTronics currently uses three Branson-5200 batch cleaners with CFC-113 solvent. TeamTronics will incur costs for the following project elements:

- Process development and material compatibility testing
- Purchase of one high-volume aqueous cleaning machine
- Purchase of water purification and filtration equipment
- Installation costs
- Worker training costs

Each of these project elements is explained in detail below:

Process development and material compatibility testing will be performed by TeamTronics prior to the purchase of the aqueous cleaning machines. The use of organic acid (OA) solder flux is being considered as a replacement for rosin mildly activated flux (RMA) so that the flux may be removed more easily in the aqueous process. The company will arrange cleanliness verification tests to ensure that the new equipment is capable of achieving the cleanliness required by TeamTronics's customers. Typically, this will involve making ionic and organic contamination measurements on representative samples of the product before and after cleaning.

Team Tronics produces a variety of circuit card assemblies using the latest in surface mount and chip-on-board technology. The company operates one line of printed circuited board assembly, and another line of flexible card assembly. Both lines use flux in their soldering operations. The flux must be removed from the circuit card assemblies in order to ensure that the flux residues will not damage the circuitry. One aqueous in-line cleaning machin is required to maintain current production levels.

Aqueous cleaning systems must use high purity water. so along with the aqueous cleaning machine funds are requested for the rinse water treatment system. The waste water from the electronic cleaning equipment is generally contaminated with lead from the cleaning of the tin-lead solder. salts from human contact, and particulate generated from the general manufacturing environment and must be cleaned before disposal. Installation costs and technical training for engineers and process training for assembly workers are standard costs of introducing new equipment and processing methods into a facility. Funding is requested to help offset these costs.

Team Tronics will need to prepare and submit environmental permit applications for the installation of the new equipment. This topic is covered in more detail in Annex 4.

JUSTIFICATION FOR SELECTION OF ALTERNATIVE TECHNOLOGY

In the solvent sector, especially in the case of electronics cleaning, there are many options to the use of ozone depleting solvents. Usually the choice of the alternative cleaning process is dependent upon the type of market served by the solvent user. Most commercial applications have more flexibility in the use of new technology, because commercial entities must maintain their competitiveness in the world market. These organizations spare no cost to ensure that products made by their organizations are dependable and reliable.

Switching from CFC-113 or TCA based cleaning processes to aqueous-based processes is one practical option for companies that prefer to eliminate organic solvents from their cleaning operations. The preference for aqueous cleaning processes over other cleaning processes assumes the availability of ample quantities of water and the ability to treat the waste effluent. Waste water treatment is required to ensure that the waste from the cleaning process does not cause environmental damage. Changing to aqueous based processes also requires that the materials used in the product are not damaged by long term moisture exposure or aqueous based residues.

Team Tronics has chosen to use an aqueous-based process because the efficient use of water as a solvent will not damage the environment and because water is available in Thailand. Those other alternatives, such as no clean, are not appropriate for the products made by Team Tronics. The use of aqueous cleaning for the removal of flux residues is a good alternative for companies that can invest the time and effort to research aqueous fluxes and other new materials so as to ensure compatibility with the aqueous cleaners and the production processes of the company.

PROJECT COSTS

Total Project Cost

As described below and presented in detail in the relevant annexes, the total project cost is US$ 238,660. Because there are no non-ODS investment costs associated with this project, the total project cost equals the ODS reduction portion of the overall project. This project will not provide TeamTronics with any incremental revenue.

Investment Cost

As described in Annex 1, the total investment cost is US$234,562. Major components of this cost include the purchase and installation of one aqueous cleaning machine (US$120,000), one closed loop reverse-osmosis water recycling system (US$83,712), as well as the costs of the transportation for the equipment (US$14,000).

Operating Costs

If the project was not undertaken, the annual operating cost for the CFC cleaning machine exclusive of tax on imported CFC-113, would be US$123,570. If the project is implemented, the annual operating cost will be US$126,557, resulting in an annual incremental operating costs of US$2,987. Given an equipment lifetime of 10 years and a discount rate of 10 percent, the net present value of the first four years of incremental operating costs is US$14,000. A more detailed breakdown of operating costs is provided in Annex 2.

Unit Abatement Cost (UAC)

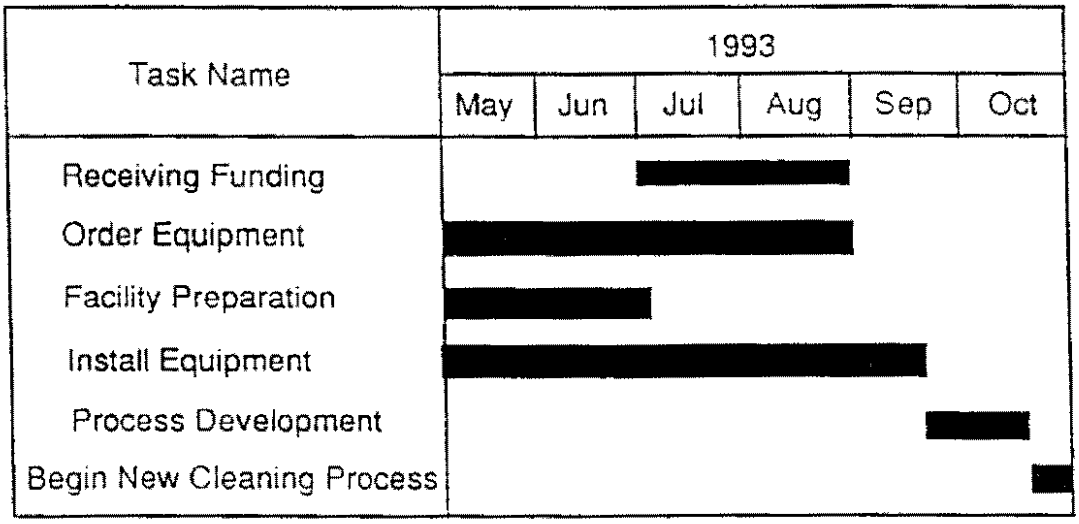
As shown in Annex 3, the UAC for this project is US$3.55 per ODP-weighted kilogram of CFC-113 phased out per year. This number is derived from annualized incremental capital costs of US$37,383, first year incremental annual operating costs of US$3,465, and savings of 11.5 MT (weighted) of CFC-113 per year.

Proposed OTF Grant

The proposed OTF grant for TeamTronics is US$248,562 and was calculated as follows. First, the total investment cost of US$234,562 was added to the present value of the incremental operating cost over the first four years of the project, which is US$14,000. The resulting total of US$248,562 was multiplied by the percent Thai ownership (100 percent) of the facility to yield the grant amount.

PROJECT IMPLEMENTATION

Schedule



REQUIRED REGULATORY ACTIONS

No regulatory actions, other than routine permitting, are required to implementing this project. Under existing agreement with the World Bank, euipment and machinery imported as part of this project will be exempt from import duties usually levied by the Thai government.

RESULTS

Direct Project Impacts

The project will eliminate 11.5 MT (weighted) of CFC-113 per year at TeamTronics.

Indirect Project Impacts

This project will not have any indirect project impacts. Assuming a successful transition to aqueous cleaning, the performance of TeamTronics' products will remain unchanged. Because of the favorable economics of the ODS alternatives, there is unlikely to be any impact on product price. Absent a change in quality or price, consumer demand and production levels are expected to be unaffected by the project. The environmental impacts associated with this project are discussed in Annex 4.

ANNEX I

BREAKDOWN OF INVESTMENT COSTS

Estimated Costs in US Dollars

Training and Engineering	
Material Compatibility, Safety and Process Development	12,000
Equipment Training (400 hours)	2,000
Consulting Engineering Support	2,000
Aqueous Cleaning System (e.g. Electrovert)	120,000
Equipment Installation (160 hours)	800
Demineralized Water System	
1 Reverse-Osmosis Water Recycling System	39,660
2 Ion Exchange Water Treatment System	3,780
Other Accessories (e.g. chemical & water pumps, filters)	10,072
Equipment Installation-Supplier Staff	1,000
Facility Modifications (Piping and Electrical)	2,000
Foundation Work for a DI Water System	8,000
Waste Water Treatment System	
Chemical Treatment System (ion exchane regeneration for treating back - wash water from R-O system)	3,200
Reactor Tank	
Sedimentation Tank	
Waste Water Treatment System (capacity of 20 cubic meters per day)	16,000
Anaerobic Filter	
Sedimentation Tank	
Environmental Permit and Fees	50
Transportation, Shipping, Insurance and Fees	14,000
TOTAL INVESTMENT COSTS	**234,562**

ANNEX 2

BREAKDOWN OF INCREMENTAL OPERATING COSTS/SAVINGS

Estimated Costs in US Dollars

	Pre-Project	Post-Project
Solvent Costs per Year:		
36,000 kg CFC-113	100,080	
14,400 kg of virgin CFC-113 ($5.15/kg)	74,160	
21,600 kg of recycled CFC-113 ($1.2/kg)	25,920	
		2,246
Water, 5,760 cubic meters ($0.39/cu. meter)		
(20 cu.m./day x 24 days/months x 12 months)		
Electric Costs per Year: ($0.06 per KWH)		
Current System (KWH)		
Three Branson Batch Cleaning System (4,425 KW	266	
		41,472
New System		1,244
One Aqueous Processes (691,200 KWH)		
One DI Water System (20,740 KWH)		
Manpower Costs per Year: ($0.63 per man-hour)		
Current System, 36,864 hours	23,224	23,224
Aqueous Cleaning Process, 36,864 hours		4,800
Technician for Maintaining Aqueous Cleaning Process		4,800
Technician for Maintaining DI Water System		4,800
Technician for Maintaining Water Treatment System		

Water and Waste Water Treatment Costs per Year:		15,970
Ion Exchange Column Regeneration		18,400
Membrane Maintenance/ Replacement		9,600
Waste Water Treatment		
TOTAL PRE-PROJECT COSTS PER YEAR:	123,570	
TOTAL POST-PROJECT COSTS PER YEAR:		126,557
TOTAL INCREMENTAL COSTS PER YEAR:		2,987

ANNEX 3

CALCULATION OF UNIT ABATEMENT COST

Estimated Costs in US Dollars

A. ODS SAVINGS:

Average Use of CFC-113 per Year	36 MT
Virgin CFC-113	14.4 MT
Recycled CFC-113	21.6 MT
ODP of CFC-113	0.80
ODP Weighted Savings	11.52 MT

B. ANNUALIZED CAPITAL COST:

Total from Annex 1	$234,562
Project Life	10 years
Discount Rate	10%
Annualized Capital Cost	$37,383

C. ANNUAL INCREMENTAL OPERATING COSTS: $3,465

D. UNIT ABATEMENT COST:

	Cost per Year	Cost per kg ODP Saved
Annualized Capital Cost	$37,383	$3.25
Annual Incremental Operating Costs	$3,465	$0.30
Unit Abatement Cost ($/kg)		$3.55

ANNEX 4

ENVIRONMENTAL ASSESSMENT

In the proposed aqueous cleaning systems, de ionized water will be used to clean circuit card assemblies without the aid of additional cleaning agents. The waste water effluent from the aqueous in-line cleaning system will be filtered and de ionized by the addition of one reverse osmosis cleaners. The solid waste generated during resin column and filter maintenance will be treated or disposed of properly off-site.

The equipment recommended in this proposal, when properly installed and diligently maintained, will eliminate any adverse environmental impacts that might result from this project's implementation. It is unlikely that this project will have a negative environmental impact.

northern telecom

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September 30, 1993

VIA TELECOPIER

File: [illegible]
cc: Project File/ [illegible]

Mr. Konrad von Ritter
The World Bank
1818 H Street N.W.
Washington, D.C.
20433

Dear Konrad:

I have reviewed the TeamTronics sub project proposal and its attachments and have also revisited my earlier comments. Based on the material submitted, I endorse the project. The proponents, however, will want to consider the following comments before finalizing the submission:

1. Although I generally do not agree with the statement: "other alternatives, such as no clean, are not appropriate", I do agree that aqueous cleaning is a viable alternative to CFC-113 in the manufacture of TeamTronics' products. It would appear that the project includes provisions for appropriate waste water treatment and subsequent recycle/reuse of the treated waste water. The owners must ensure disposal of filter backwash and contaminated filters in an environmentally sensitive manner.

2. The financial calculations should be re-examined because it appears that Freon TMS is supplied at $7.32 per kilogram (one of the attachments), whereas virgin CFC-113 cost is shown as $5.15 per kilogram in the calculation.

3. The cost per kilogram of eliminating CFC-113 at TeamTronics appears to be reasonable.

I trust my comments are helpful and that they are submitted in time to allow submission of the proposal for the November meeting of the Parties.

Yours truly,

[signature]
afar

Arthur D. FitzGerald
OORG Solvent Advisor

ADF/jm
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The Montreal Protocol on
Substances that Deplete the Ozone Layer

Turkey Second ODS Phase Out Investment Project Preparation

Project Cover Sheet

COUNTRY:	Republic of Turkey
PROJECT TITLE:	ODS Phase Out Investment Project Preparation
SECTORS COVERED:	Refrigeration, Foam and Solvents
PROJECT DURATION:	Eight Months
PROJECT IMPACT:	Development of new ODS Phaseout Projects
PROPOSED BUDGET:	US$100,000
NATIONAL COORDINATING AGENCY:	Ministry of Environment
IMPLEMENTING AGENCY:	The World Bank

PROJECT SUMMARY

The Government of Turkey has requested the World Bank to prepare a second ODS Phaseout Project. As the implementation of the first project and flow of funds are initiated, enterprises are now coming forward with new project proposals and even feasibility studies. The Bank has received two feasibility studies for refrigeration sector projects. The Technology Development Foundation has already received project preparation resources through the first grant agreement with Turkey. This work program amendment will allow the Bank to appraise the two refrigeration-sector projects and to develop, appraise and process an umbrella grant agreement with the GOT for the second ODS phaseout project. Project preparation is expected to focus on refrigeration, foam (flexible and rigid) and solvents (through ICOLP and possibly Swedish EPA bilateral support). The 1994 Work Program for Turkey approved at the 12th EC Meeting only provided for resources to supervise the first project.