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PROJECT PROPOSALS: PHILIPPINES

EXECUTIVE PROJECT SUMMARY

PHILIPPINES - OZONE DEPLETING SUBSTANCES PHASE OUT INVESTMENT PROGRAM

Grantee:	Government of Philippines
Total Project Cost:	US$ 22.90 million
Proposed OTF Grant:	US$ 14.84 million
Proposed Financing:	US$ 14.84 million (from OTF)
	US$ 8.06 million (from commercial sources)
ODS Use in the Country:	2,650 ODP mt/year
Project Impact: ODS Reduction	800 ODP mt/year
Tentative Grant Approval Date:	03/10/93
Peer Reviewers:	Messrs. King (ENVPR), Redfern (EA1CO), Rahill (EMTEN), Rhatigan (LA1EI)
Technical Review Panel:	Messrs. Bruestle (ASTES), Newcombe (ENVGC);
	External reviewers: Mr. Art Fitzgerald, Mr. Simon Oulouhojian, Mr. Lambert Kuijpers, Mr. Michael Jeffs (OORG)

Background

1. The Philippines economy is at a critical stage where it has the opportunity to leave behind a prolonged era of economic recovery and stabilization and to move ahead towards sustained growth with export led industry as one driving force. Industrial growth, however, will not be sustainable without taking environmental concerns into consideration. The Government has undertaken the first steps to create conditions for an environmentally sound development without disruption of industrial development. Philippines ratified the Montreal Protocol (MP) on Substances that Deplete the Ozone Layer in March 1991, and is eligible for Ozone Trust Fund (OTF) financing. The Government is committed to establishing a cost effective program for phasing out Ozone Depleting Substances (ODS). A Montreal Protocol Secretariat (Ozone Desk) has been established under the lead agency, the Department of Environment and Natural Resources (DENR), to oversee implementation of the MP. DENR and the Environment Management Bureau (EMB), the lead regulatory agency and coordinator of Ozone Desk activities, are capable, but are under-staffed and have insufficient resources to cope with ODS phase out and environmental protection in a growing economy.

2. A first draft of the Country Program (CP) that defines the strategy, incremental costs, policies and actions required to achieve early phase out was

completed in December 1992 with Bank assistance. The draft CP spells out the need for fiscal measures to reduce imports of ODS and to encourage the use of ODS substitutes and of non-ODS technologies, including the imposition of an Ozone Protection Tax. A final CP is expected in early 1993. The CP is based on an ODS Country Study completed by Cowiconsult in 1991. CP preparation and approval is being supervised by an Inter-agency Steering Committee chaired by DENR set-up by the Ozone Desk. A Technical Working Group under the Committee drafted the CP. UNDP is working with the Ozone Desk to develop a training and technical assistance program. An Institutional Strengthening Project is being prepared with Bank assistance to develop the implementation capability of the Ozone Desk in DENR. Two Engineering Studies, for which the Bank was implementing agency, were commissioned by DENR to identify and prepare ODS phase out subprojects. Sixteen subprojects have been identified in ODS refrigerant recycling, household refrigeration, foam blowing, tobacco processing, and electronics and metal cleaning, of which ten have already been pre-appraised. Under this proposed ODS Investment Program, funding will be requested from the MP Fund Executive Committee (MPEC) for the 10 preappraised projects and a permission to proceed for the other 6 identified subprojects.

3. In 1990, Philippines consumed about 3,850 tons ODS (equivalent to 2,650 tons expressed as Ozone Depleting Potential, ODP), mainly as refrigerants in refrigeration and air conditioning (45%), including automobiles (26%), blowing agents (16% foam and 13% tobacco) and as solvents in the electronics and metal industry (21%). The growth rate during 1986-90 was about 14% p.a. Per capita consumption in 1991 was 0.06 kg. ODP.

Project Objectives

4. The project objective is to support the GOP program to phaseout ODS by the year 2000 by (a) establishing an efficient mechanism for executing ODS phaseout projects through local institutions, and (b) implementing an initial group of cost effective priority subprojects. The proposed approach is to provide grant funding to several subprojects through a local financial institution (FI) to cover incremental costs of subprojects.

Project Description and Costs

5. The Project includes an investment component and technical assistance (TA) components. The TA components include: (a) TA and training needed for efficient implementation of the subprojects; this TA is included as integral part of specific subprojects; and (b) TA for the FI to build up technical expertise for the appraisal and the supervision of subprojects through training of FI staff for a total cost of US$ 0.1 million (see Annex 5). The investment component will support 16 subprojects in: (a) ODS refrigerant recycling; and (b) conversion to non-ODS technology in solvents, refrigeration, foam blowing and tobacco puffing [1]. A list of proposed subprojects is attached in Annex 1. Of the 16 identified

[1] Tobacco is puffed to increase its volume and to reduce the nicotine and tar content.

subprojects, 10 subprojects, representing about 85% of the total project investment cost and about 75% of total grant amount, have been pre-appraised. Pre-appraisals for the other six subprojects will be presented to the MPEC for approval once finalized. Technical reviews of the 16 subprojects have been completed.

6. Estimated subproject investment costs are US$ 22.90 million, of which US$ 14.74 million are incremental costs eligible for OTF grants. Incremental costs are defined as per Bank and MPEC guidelines, i.e. as the net present value of incremental economic project costs (investment plus operating costs net of operating benefits) discounted at 10% in real terms (constant prices). Firms with mixed local and foreign (developed country) ownership are eligible for OTF funding in proportion to their share of local ownership (see Annex 2).

Project Costs Estimates

	PROJECT COSTS			
	Investment Costs	Net Recurring Costs (4 Yrs)[a]	Total Eligible Incremental Cost[b]	Proposed OTF Grant[c]
Preappraised:				
-Household Refrigerator Foam (4 subprojects)	5.44	-0.86	3.38	3.99
-Solvents (5 subprojects)	2.30	0.23	2.30	2.71
-Tobacco (1 subproject)	11.81	-4.02[d]	4.00[e]	4.72
Subtotal Preappraised	19.55	-4.65	9.68	11.42
Identified:				
-Household Refrigerator Compressor (4 subprojects)	2.44	0.00	1.90	2.24
-ODS Recycling (2 subprojects)	0.91	0.00	0.91	1.08
Subtotal Identified	3.35	0.00	1.90	3.32
TA Component for FI	0.00	0.00	0.00	0.10
TOTAL PROJECT	22.90	-4.65	11.58	14.84

a/ Discounted at 10%. Negative numbers indicate operating savings.
b/ Eligible incremental cost = incremental cost x share of local ownership.
c/ Includes eligible incremental cost, 15% contingency, and 3% fee for financial agent.
d/ Recurring costs over 15 year project economic life.
e/ Incremental investment cost of US$ 8 million, based on depreciated value of existing assets, used in grant calculation.

Project Financing

7. The incremental costs of investment subprojects would be financed by an OTF Grant to the Government. Eligible investment subprojects will receive the incremental cost portion of the total cost as grants channelled through a financial institution (FI) with the balance financed from commercial sources or from the enterprises' own resources. The financing plan is:

Financing Plan

Source	US $ million equivalent
OTF Grant	14.84
Commercial Loans/or Enterprise Own Funds	8.06
TOTAL	22.90

Project Implementation

8. The Ozone Desk will ensure that ODS projects are consistent with the Country Program for ODS phaseout in the Philippines. The Ozone Desk of DENR will review each subproject prior to appraisal to ensure that cost-effective technologies will be applied and that the subproject conforms to CP priorities. The FI will be responsible for implementation of the investment component, including subproject appraisal, disbursement of OTF funds to the enterprises, and supervision of subproject implementation. The FI will receive a fee equivalent to 3% of grants for its services, of which the FI would receive one third (=1%) following approval of subproject appraisal reports by the Bank, and two thirds (=2%) upon disbursement of the grants to the subprojects. The FI would be guided by subproject eligibility, appraisal and financing criteria for Montreal Protocol project (summarized in Annex 2), and would operate under terms and conditions as defined in Annex 4. FI will prepare appraisal reports in a format acceptable to the Bank.

9. The Bank will review each appraisal summary and report to ensure compliance with MPEC guidelines prior to approval of the grant (no free limit as required under the OTF agreement). Subproject proponents (enterprises) will be responsible for subproject implementation in accordance with grant contracts signed with the FI. The FI would submit a contract format acceptable to the Bank before appraisal of the ODS Investment Program.

10. Reporting and Monitoring. The Ozone Desk will be responsible for monitoring the overall Project and attainment of ODS phaseout targets. DENR and FI will prepare semi-annual progress reports and the FI will prepare an annual audit report acceptable to the Bank. The Bank's supervision will include reviewing progress and audit reports, and approving all subproject appraisal reports.

Procurement and Disbursement

11. Procurement of goods, works, and services will be in accordance with Bank Guidelines for lending through financial institutions. FI will satisfy itself that the goods, works, and services to be purchased are for the investment subprojects and are reasonably priced, by ensuring that the grant recipient has canvassed the main sources of supply and purchased from the most advantageous source. Detailed draft procurement guidelines have been included in Annex 3. Consultants will be selected in accordance with the Bank Guidelines for the Use of Consultants. A Special Account would be established to facilitate disbursement of OTF grants. The FI would submit requests for replenishment of the Special Account based on Statement of Expenditures. Draft disbursement guidelines have been included in Annex 4. Project funds are expected to be disbursed according to the following schedule: 30% in calendar year 1993, 50% in 1994, and 20% in 1995.

Environmental Considerations

12. The overall Project objective is protection of the environment by reducing the emission of ODS. However, the change to non-ODS technologies or substitution of ODS with other chemicals may involve other environmental risks. such as atmospheric releases of substitute chemicals, in particular hydrocarbons, and water pollution particularly from use of aqueous bases solvents. These issues will be addressed before issuing an Environmental Compliance Certificate (ECC) which each sponsoring enterprises will have to obtain according to Philippine law. FI will ensure that subprojects have ECCs or are in the process of obtaining one and will submit them together with the appraisal report to the Bank.

Project Sustainability

13. The Project will assist the Government in establishing an efficient mechanism for developing and funding subprojects to initiate an ODS phase out program. In order to achieve a sustainable and cost-effective phase out of ODS with a broad coverage of the various ODS consuming sectors, it will be essential - in addition to the enterprise specific support - to establish economic policies which create incentives for reducing the import of ODS and which encourage the use of ODS substitutes and non-ODS technologies. Rising market prices for ODS are expected to be the major incentive for an accelerated ODS phase out. Prices are expected to increase as the world's major ODS suppliers are committed to drastically reduce their ODS production. Simultaneously, these suppliers are developing or are already actively marketing ODS substitutes. Prices for these substitutes are expected to fall. In addition to market forces, some fiscal measures are being recommended in the draft CP, including the imposition of import duties on ODS and fiscal incentives for ODS substitutes and non-ODS technologies.

Project Risks

14. Inadequate technical capability of the implementing agencies DENR and the FI could slow down appraisal and implementation of subprojects. This risk is being addressed by the training component for the FI (included in the Project) and the Institutional Strengthening Project for the Ozone Desk (submitted separately to the MPEC).

Lessons from Previous Bank Experience

15. Projects utilizing Ozone Trust Fund resources are being developed simultaneously in Mexico, China, Malaysia, Turkey, and other countries. No related previous projects within the Bank have been completed. However, preparation steps taken to date indicate the need for flexibility in Project design, the need for well prepared and documented components at the preappraisal stage, and the need for training and institutional strengthening support.

Rationale for Use of Ozone Trust Fund

16. The Project would form part of Philippine's ODS phaseout program. The proposed Project is consistent with the Implementation Guidelines and Criteria for OTF funding established by the MPEC.

Project Benefits

17. The Project will help the Government implement an accelerated ODS phaseout program by providing financing for priority subprojects. The Project is expected to reduce ODS consumption directly by about one-third in ODP weighted units by 1995. Further reductions are expected to be achieved during that time period at transnational corporations and at firms that will realize a cost savings by converting to non-ODS technologies. In addition, the project will enable export oriented firms to maintain their export markets by adjusting timely to non-ODS products as requested by importers from industrialized countries.

Issues and Actions:

18. By the time of appraisal, the following key issues have to be addressed:

(a) final selection of FI; the Government of the Philippines will select between the two candidates Development Bank of the Philippines, DBP, and Landbank, which both have expressed a strong interest in becoming the financial institution for MP projects (para 8);

(b) contractual relationship between the FI and the subproject proponent; the FI will submit a model contract acceptable to the Bank before appraisal of the ODS Investment Program (para 9).

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SUMMARY TABLE

Company	End Use	Philippine Ownership (%)	Consumption in 1991 (ODP MT)	Annual Reduction in 1995 (ODP MT)	Investment Cost (US$M)	Net Recurring Costs (4yrs)[2]	Proposed OTF Grant (US$M)[3]
Preappraised							
Fortune Tobacco	Tobacco Fluffing	100%	350 CFC-11	350 CFC-11	11.81	-4.02[4]	4.72[5]
Philacor	Foam Blowing	61%	200 CFC-11	120 CFC-11	3.18	-0.71	1.77
Concepcion	Foam Blowing	100%	45 CFC-11	35 CFC-11	0.80	-0.13	0.79
Sanyo	Foam Blowing	70%	13 CFC-11	9 CFC-11	0.80	-0.01	0.66
Federal Electric	Foam Blowing	100%	5 CFC-11	5 CFC-11	0.66	-0.01	0.77
Ionic Circuits	Solvent Cleaning	90%	105 CFC113 9 TCA	114 113/TCA	0.51	0.24	0.79
Pacific Semiconductor	Solvent Cleaning	80%	13 CFC113 2 TCA	15 113/TCA	0.59	0.16	0.71
Electronic Assemblies	Solvent Cleaning	100%	5 CFC-113	5 CFC-113	0.56	0.04	0.71
Integrated Microelec.	Solvent Cleaning	100%	20 CFC-113	20 CFC-113	0.55	-0.18	0.43
Solid Circuits	Solvent Cleaning	100%	4 CFC-113	4 CFC-113	0.09	-0.03	0.07
Subtotal			**771 ODP**	**677 ODP**	**19.55**	**-4.65**	**11.42**
Identified							
ASAP (Recycle)	Refrigeration	100%	260 CFC-12 90 CFC-11	55 CFC-12 8 CFC-11	0.42	0.00	0.50
PASAPI (MAC)	Air-conditioning	100%	600 CFC-12	60 CFC-12	0.49	0.00	0.58
Philacor	Refrigeration	61%	55 CFC-12	0	1.24	0.00	0.89
Concepcion	Refrigeration	100%	8 CFC-12	0	0.90	0.00	1.06
Sanyo	Refrigeration	70%	3 CFC-12	0	0.18	0.00	0.15
Federal Electric	Refrigeration	100%	2 CFC-12	0	0.12	0.00	0.14
Subtotal			**1018 ODP**	**123 ODP**	**3.35**	**0.00**	**3.32**
TA for Financial Institution	**All**	**na**	**na**	**na**	**0.00**	**0.00**	**0.10**
GRAND TOTAL			**1789 ODP**	**800 ODP**	**22.90**	**-4.65**	**14.84**

[2] Discounted at 10%. Negative numbers indicate operating savings.
[3] Includes 15% contingency and 3% fee for financial institution
[4] Recurring cost over 15 year project economic life.
[5] Incremental investment cost of US$ 8.02 million, based on calculation for depreciated value of existing assets, used in calculation of grant eligibility.

PHILIPPINES - ODS PHASE OUT INVESTMENT PROGRAM

Annex 1: SUBPROJECT DESCRIPTIONS

TOBACCO EXPANSION

Conversion of Tobacco Fluffing Process from CFC-11 to CO_2 at Fortune Tobacco Corporation

This project will eliminate the 350 MT consumption of CFC-11 for tobacco fluffing at Fortune Tobacco Corporation. The CFC-11 fluffing process will be replaced with a carbon dioxide-based system. The project will also eliminate a negligible amount of HCFC-22 used as a refrigerant in one component of the fluffing process. Since Fortune Tobacco is the only company in the Philippines that uses CFCs to fluff tobacco, eliminating its use of CFC-11 will simultaneously eliminate all CFC use in the Philippine tobacco fluffing sector. The proposed project addresses only the phaseout of CFC-11 in Fortune's tobacco fluffing process and does not provide assistance to other parts of Fortune's cigarette manufacturing operations.

FOAM BLOWING

Conversion of Blowing Agents Used in Refrigerator Insulating Foam at Philippines Appliance Corporation

This OTF request is for funding Phase I of a three phase program that will lead to the phase out of over 200 MT of CFC blowing agents for production of the polyurethane insulation in the refrigerator cabinets manufactured at Philacor. In Phase I, Philacor's foam formulation will be adjusted to reduce CFC-11 consumption by up to 50% resulting in elimination of 120 MT CFC-11 consumption p.a. In addition, its foaming operations will be converted to equipment capable of processing high pressure foam formulations. The high pressure equipment improves performance of the low CFC formulation and will be required in the future phases to a complete phaseout of ODS in foam production. Following the availability of high pressure HCFC foam formulations, Phase I will also include batch testing of these formulation in preparation for a complete CFC phaseout in a subsequent Phase II project. As HCFC consumption is controlled by MP, the final phase of the project will be conversion to a non-ODS, such as HFC-134a, that requires high pressure handling.

Conversion of Blowing Agents Used in Refrigerator Insulating Foam at Concepcion Industries

This OTF request is for funding Phase I of a three phase program that will lead to the phaseout of over 65 MT of CFC blowing agents p.a. for production of the polyurethane insulation in the refrigerator cabinets manufactured at Concepcion. In Phase I, Concepcion's foam formulation will be adjusted to reduce CFC-11 consumption by up to 50% resulting in elimination of 35 MT CFC-11 consumption p.a. In addition, its foaming operations will be converted to equipment capable of processing high pressure foam formulations. The high pressure equipment improves performance of the low CFC formulation and will be required in the future phases to a complete phaseout of ODS in foam production. Following the availability of high pressure HCFC foam formulations, Phase I will also include batch testing of these formulation in preparation for a complete CFC phaseout in a subsequent Phase II project. As HCFC consumption is controlled by MP, the final phase of the project will be conversion to a non-ODS, such as HFC-134a, that requires high pressure handling.

Conversion of Blowing Agents Used in Refrigerator Insulating Foam at Sanyo Philippines

This OTF request is for funding Phase I of a three phase program that will lead to the phaseout of over 20 MT of CFC blowing agents p.a. for production of the polyurethane insulation in the refrigerator cabinets manufactured at Sanyo. In Phase I, Sanyo Philippines's (Sanyo) foam formulation will be adjusted to reduce CFC-11 consumption by up to 50% resulting in elimination of 9 MT CFC-11 consumption p.a. In addition, its foaming operations will be converted to equipment capable of processing high pressure foam formulations. The high pressure equipment improves performance of the low CFC formulation and will be required in the future phases to a complete phaseout of ODS in foam production. Following the availability of high pressure HCFC foam formulations, Phase I will also include batch testing of these formulations in preparation for a complete CFC phaseout in a subsequent Phase II project. As HCFC consumption is controlled by MP, the final phase of the project will be conversion to a non-ODS, such as HFC-134a, that requires high pressure handling.

Conversion of Blowing Agents Used in Refrigerator Insulating Foam at Federal Electric Company

This OTF request is for funding Phase I of a three phase program that will lead to the phaseout of over 10 MT of CFC blowing agents p.a. for production of the polyurethane insulation in the refrigerator cabinets manufactured at Federal Electric. In Phase I, Federal Electric's foam formulation will be adjusted to reduce CFC-11 consumption by up to 50% resulting in elimination of 5 MT CFC-11 consumption p.a. In addition, its foaming operations will be converted to equipment capable of processing high pressure foam formulations. The high pressure equipment improves performance of the low CFC formulation and will be required in the future phases to a complete phaseout of ODS in foam production. Following the availability of high pressure HCFC foam formulations, Phase I will also include batch testing of these formulation in preparation for a complete CFC phaseout in a subsequent Phase II project. As HCFC consumption is controlled by MP, the final phase of the project will be conversion to a non-ODS, such as HFC-134a, that requires high pressure handling.

SOLVENT CLEANING

Conversion of Electronic Cleaning Process from CFC-113/Alcohol Blended Solvents to Semi-Aqueous and Aqueous Cleaning Solvents at Ionics Circuits

This project will eliminate the use of CFC-113 and TCA in the cleaning of electronic circuit cards, computer disk drives, and associated electronic equipment at Ionics Circuits Incorporated (Ionic). The phaseout will be accomplished by dismantling existing vapor degreasers and installing aqueous and semi-aqueous cleaning equipment. Ionics currently uses eight batch vapor degreasers in its cleaning operations. The project will replace these eight cleaning machines with one in-line aqueous cleaning machine and four batch semi-aqueous cleaning machines. The project also provides for engineering support and training, exhaust system improvements, and appropriate wastewater treatment facilities. The conversion to non-ODS technology will eliminate annual

consumption of 98 MT of CFC-113 and 73 MT of TCA. This represents a reduction in national consumption levels of almost 40 percent and 5 percent, respectively.

Conversion of Electronic Cleaning Process from CFC-113 and 1,1,1 Trichloroethane (TCA or Methyl Chloroform) Solvents to Low-Emission Processes using non-ODS Organic Solvents at Pacific Semiconductors

This project will eliminate the use of CFC-113 and TCA in the cleaning of electronic components, metallic lead frames, and other metal parts at Pacific Semiconductors Incorporated (Pacific). The phaseout will be accomplished by dismantling existing vapor degreasers and installing low-emissions vapor degreasers. Pacific currently uses two in-line CFC-113 vapor degreasers and three batch TCA vapor degreasers. The project will replace these five cleaning machines with five batch low-emission vapor degreasers. The cleaning solvent chosen for use in the machines will likely be perchloroethylene, dichloromethane, or another organic solvent. The project also provides for an automatic hoist and programmable controller for each vapor degreaser, engineering support and training, and exhaust system improvements. The conversion to non-ODS technology will eliminate annual consumption of 11.5 MT of CFC-113 and 13 MT of TCA. This represents a reduction in national consumption levels of almost 5 percent and 0.9 percent, respectively.

Conversion of Electronic Cleaning Process from CFC-113/Alcohol Blended Solvents to Semi-Aqueous and Aqueous Cleaning Solvents at Electronic Assemblies

This project will eliminate the use of CFC-113 in the cleaning of electronic circuit cards at Electronic Assemblies Incorporated (EAI). The phaseout will be accomplished by dismantling existing vapor degreasers and installing aqueous and semi-aqueous cleaning equipment. EAI currently uses three batch CFC-113 vapor degreasers in its cleaning operations. The project will replace these three batch machines with one in-line aqueous cleaning machine and one in-line semi-aqueous cleaning machine. The project also provides for engineering support and training, exhaust system improvements, and appropriate wastewater treatment facilities. The conversion to non-ODS technology will eliminate annual consumption of 4.8 MT of CFC-113. This represents a reduction in national consumption levels of almost 2 percent.

Conversion of Electronic Cleaning Process from CFC-113/Alcohol Blended Solvents to High-Purity Water Cleaning at Integrated Microelectronics

This project will eliminate the use of CFC-113 in the cleaning of a wide variety of electronic devices and metal parts at Integrated Microelectronics Incorporated (IMI). Products manufactured by IMI include pulse transformers, coils, hard disk drives, and spare parts for disk drives. The phaseout will be accomplished using two distinct alternative processes. IMI currently uses one in-line CFC-113 vapor degreaser and one batch CFC-113 vapor degreaser in its cleaning operations. The project will replace the high volume in-line vapor degreaser with a high-volume in-line aqueous cleaning machine, while retrofitting the batch vapor degreaser for use with a non-ODS chlorinated solvent. The chlorinated solvent to be used will most likely be methylene chloride or trichloroethylene, and the retrofits will aid in reducing emissions from the

machine to extremely low levels. The project also provides for engineering support and training, exhaust system improvements, and appropriate wastewater treatment facilities. The conversion to non-ODS technology will eliminate an annual consumption of 18.7 MT of CFC-113. This represents a reduction in national consumption levels of almost 8 percent.

Conversion of Electronic Cleaning Process from CFC-113/Alcohol Blended Solvents to Semi-Aqueous Cleaning Solvents at Solid Circuits

This project will eliminate the use of CFC-113 in the cleaning of specialty electronic components at Solid Circuits Incorporated (Solid). The phaseout will be accomplished by dismantling Solid's existing batch CFC-113 vapor degreaser and installing a batch semi-aqueous cleaning machine. The project also provides for a closed-loop water rinsing system, a drying oven, exhaust system improvements, and engineering support and training. The conversion to non-ODS technology will eliminate an annual consumption of 3.8 MT of CFC-113. This represents a reduction in national consumption levels of 1.5 percent.

IDENTIFIED - REFRIGERANT RECYCLING

Establishment of a Central Recycling Scheme in Metro Manila

This OTF request is for permission to proceed on final preparation of a project proposal to develop a central recycling scheme in Metro Manila. The project would establish a central CFC recycling scheme in Metro Manila to reduce consumption of CFC-12 by 55 MT, CFC-11 by 8 MT and HCFC-22 by 40 MT. The Appliance Service Association of the Philippines (ASAP) is developing a plan to run the center by providing users with dedicated recovery cylinders for the collection of refrigerant. Recovered refrigerant would be bought by the scheme and reclaimed refrigerant would be sold to users for about 15% less than the market price for imported refrigerant.

Establishment of a MACs Recycling Scheme

This OTF request is for permission to proceed on final preparation of a project proposal to develop a mobile air-conditioning recycling scheme in the Philippines. The Philippines Association of Suppliers and Parts Installers (PASAPI) is developing a plan to purchase 100 MAC refrigerant recovery machines and lease them at nominal rates to MAC service centers in the Philippines; seventy-five in the Metro Manila area and the rest split between Cebu and Davao. The operation of these units would be monitored and the data obtained would form the basis of promotion to the remaining MACs service centers in the country.

IDENTIFIED - REFRIGERATION

Engineering Design and Assistance for the Use of HFC-134a Refrigerant in Household Refrigerators at the Philippines Appliance Corporation

This OTF request is for permission to proceed on final preparation of a project proposal to develop HFC-134a refrigerator production capability at Philippines Appliances Corporation (Philacor - 61% Philippine owned). The technical program for the project, especially the technology transfer arrangements, are being completed by the enterprise in accordance with the OORG reviewer's comments. Phase I of the project will be ready for submission to the next EC meeting at which time funding will be requested. Phase I of the project would lead to the conversion of an existing CFC based refrigerator manufacturing facility at Philacor to production of refrigerators using HFC-134a as the working fluid. In Phase I, about 650 prototype and test refrigerators would be produced and recovery/reclamation procedures would be adopted for servicing in-plant defective CFC-12 refrigerators. Phase I would provide equipment needed to convert one of Philacor's three production lines to the manufacturer of HFC-134a units. Equipment for the remaining two lines and the incremental operating costs for production of HFC-134a refrigerators would be included in a Phase II project. The full project when completed would provide a major indigenous source of non-ODS domestic refrigerators for the Philippine market. Technology for the non-ODS refrigerators would be transferred by the Philacor's parent company, General Electric.

Engineering Design and Assistance for the Use of HFC-134a Refrigerant in Household Refrigerators at Concepcion Industries

This project will fund engineering development of the manufacturing process for HFC-134 household refrigerators at Concepcion Industries. The project will be modeled after the Philacor project described above. Concepcion currently consumes 8 ODP-weighted MT of CFC-12 and produces 70,000 refrigerators per year. Over the life of the project, however, Concepcion will avoid using even greater annual quantities of CFC-12 because the demand for refrigerators and other household appliances in the Philippines is expected to grow by 15 percent per year. It is projected that Concepcion will annually save and average of 1.05 ODP-weighted MT in Phase I and 17.18 ODP-weighted MT in Phase II.

Engineering Design and Assistance for the Use of HFC-134a Refrigerant in Household Refrigerators at Sanyo Philippines

This project will fund engineering development of the manufacturing process for HFC-134a HFC-134 household refrigerators at Sanyo Philippines (Sanyo). The project will be modeled after the Philacor project described above. The project will result in the phaseout of Sanyo's 4 MT consumption of CFC-12 based on its 1991 production of 24,000 refrigerators.

Engineering Design and Assistance for the Use of HFC-134a Refrigerant in Household Refrigerators at the Federal Electric Company

This project will fund engineering development of the manufacturing process for HFC-134 household refrigerators at Federal Electric Company. Federal Electric currently consumes 2 MT of CFC-12 and produces 8,000 refrigerators per year. Over the life of the project, however, Federal Electric will avoid using even greater annual quantities of CFC-12 because the demand for refrigerators and other household appliances in the Philippines is expected to grow by 15 percent per year. it is projected that Federal Electric will annually save an average of 0.25 MT in Phase I and 5.15 MT in Phase II.

PHILIPPINES - ODS PHASE OUT INVESTMENT PROGRAM

Annex 2: DRAFT SUBPROJECT ELIGIBILITY, FUNDING AND APPRAISAL CRITERIA

The major criteria are summarized below:

A. Subproject and Funding Eligibility

19. Subprojects should be on priority list as given in the CP or confirmed by the local ODS Agency and the appraisal team as essential to achieve CP objectives. Subprojects should have direct and demonstrable results in reducing ODS consumption in the country. They should be cost effective and based on environmentally sound technologies or substitutes for the substances controlled by the MP, or recycling of controlled substances or substitutes, taking into account the national industrial policy of the Country.

20. OTF funding is on the basis of grants to the enterprise/agency/institution implementing the subproject. The grant is calculated in economic terms for the "incremental costs" as elaborated below. Methodology for calculating incremental costs should be consistent with eligibility as defined by MPEC and with the Bank's interpretation of incremental costs.

21. Determination of Incremental Costs:

a) Incremental costs are defined as the net present value of incremental economic subproject costs (investment capital plus operating costs net of operating benefits) discounted at 10% in real terms (constant prices). When appropriate, projecting operating benefits, risks associated with technology, market and financial factors of undertaking the subproject should be taken into consideration.

b) In cases where the subproject proponent has to put up own capital (or commercial loans) to co-finance part of the project costs, the necessity for providing sufficient financial incentive to undertake the subproject should be considered, i.e. enterprise obtains an acceptable return on its own capital. The Grant amount could then be determined in such a way that the Economic Rate or Return on the risk capital is 10% (real terms). For comparison, also a financial rate of return for the subproject should be calculated. If the financial rate of return differs substantially from the ERR (e.g. because of major distortions of market prices) and would be unacceptably low for the enterprise, the grant amount may be determined based on a minimum FRR. Such situation should be raised as an issue in the Subproject Summary. The minimum FRR should be determined based on an objective assessment of the country's local financial sector and should correspond to the best judgement of a reasonable return on capital expectation within the country's industrial sector. In many cases subproject proponents will view ODS phaseout investments as necessary business costs and may not require financial incentives in addition to a grant for incremental costs.

22. Policy Considerations. The purpose of the Interim Multilateral Fund is to encourage countries/enterprises to undertake operations quickly to correct an external environmental problem, and to compensate for direct costs incurred by those operations. Overall economic/industrial policy reform is excluded from consideration by the MP guidelines and policies required to develop and implement the country's ODS phase out program are to be addressed in the ODS Country Program that is approved by the MPEC. However, policies that directly affect the successful implementation of the subproject should be identified and addressed in the EPS process, preferably before the subproject is submitted to the MPEC.

23. Ownership. An enterprise/subproject is eligible for funding in direct proportion to local ownership percentage of the enterprise.

24. Exports. A subproject is eligible for funding provided unless it is located in a "free zone" and its products for export only.

25. Eligibility for Reimbursement. Under present informal MPEC guidelines, recurring costs net of operational savings are considered only for the first 4 years of project operation. Reimbursements for longer periods would have to be approved on a case by case basis. Direct taxes (import, excise, etc) are not eligible for reimbursement. However, normally UN/Bank projects would be exempt from such taxes. (The issue of taxes should be addressed in the appraisal process and if an issue, raised in the Project Summary and EPS.)

B. Elements of the Subproject Appraisal

The subproject feasibility and appraisal reports should include:

26. Project scope - including full description, technology, source of supply; divided into (a) component relating to ODS phase out and (b) other components, such as expansion of output or product upgrading.

27. Schedule and quantity of ODS (expressed as ODS and ODP) phased out directly attributed to subproject, on annual and total basis.

28. Project costs, divided into (a) components relating to ODS phase out and (b) other components. Foreign exchange and local costs should also be shown according to standard project analysis methodology.

29. Review of technical feasibility of subproject should be undertaken to determine the soundness of the technical proposal.

30. Economic and financial analysis of the subproject should be undertaken according to standard Bank methodology. Any significant difference between FRR and ERR should be explained. Any policy distortion that effects the successful implementation of the subproject or effecting the implementation of the country's ODS CP should be identified, analyzed and appropriate recommendations made in the EPS prior to submitting the EPS to the MPEC.

31. Financial analysis of enterprise. A set of minimum financial indicators to ensure enterprise viability and its ability to implement the

subproject successfully should be determined based on local conditions and should be consistent with commercial financial practice in the country.

32. Financing arrangements, sources and terms and conditions, divided into (a) incremental costs related to ODS phase out to be financed as a grant from the OTF, (b) amount to be provided by the enterprise from its own resources; and (c) local and/or foreign loans to be financed through commercial loans from local and/or foreign institutions (at commercial interest rates), should be shown and confirmed.

33. Project implementation arrangements including management, engineering and technology acquisition, procurement, installation, operation, marketing and schedule for all implementation steps should be included in the appraisal report. Procurement and selection of consultants should follow procedures consistent with the relevant Bank Guidelines. Environmental aspects of the subproject have to be documented and the FI has to ensure that the subproject proponents will undertake the necessary steps for obtaining an Environment Compliance Certificate according to local regulations prior to grant disbursement.

34. Reporting requirements by the subproject proponent would include progress reports to the FI (with copy to the Ozone Desk of DENR) according to the practice applied by the FI in similar projects. As a minimum, the enterprise would submit one project progress report at the time when the proposed investment activities have been implemented and the new installations are operating. In cases where multiple disbursement tranches have been agreed, the enterprise would submit one progress report prior to each tranche release.

Subproject Priority and Unit Abatement Costs

35. Subprojects with the most cost effective technology and with the lowest unit abatement cost of ODS in the shortest period of time in terms of global impact should receive priority. Relative cost effectiveness is measured by the" unit abatement cost", an index for comparison that is defined by the following formula:

$$A = \frac{C(F) + (OC-OS)}{W}$$

WHERE:

A - Unit abatement cost, $/kg ODP saved/year (at full operation)
C - Incremental capital cost, including all initial one time costs such as technology, training
F - Capital recovery factor; the annualized capital cost charges, discounted at a standard discount rate of 10% per year, over the economic life of the project.
OC - Annual Operating Costs at full operation
OS - Annual Operating benefits at full operation
W - Quantity of ODS saved annually expressed as ODP units

The purpose of the unit abatement cost calculation is to give a relative ranking of projects across countries and within the same sector. The lower unit abatement costs corresponds to the higher priority in terms of cost effectiveness. The unit abatement cost is calculated at standard discount rates to facilitate cross country comparisons.

PHILIPPINES - ODS PHASE OUT INVESTMENT PROGRAM

Annex 3: DRAFT PROCUREMENT ARRANGEMENTS

1. The FI will be responsible that procurement under the project follows previously agreed guidelines. It will arrange procurement (international and local) for the packages in each subproject to be handled between the respective participating enterprises and qualified procurement agencies authorized by the Government and acceptable to the Bank. Bidding documents will be prepared based on model bidding documents acceptable to the Bank (e.g. sample Bank bidding documents).

2. The following contracts and bid packages will be subject to prior review:

(i) over US$ 2 million;

(ii) over US$ 200,000 but less than the agreed number of bids being sought;

(iii) for proprietary technology and equipment;

(iv) for selection of consultants;

3. For Procurement of Equipment the following procedures would apply:

(i) contracts over US$ 2 million (excluding proprietary packages) would be procured under international competitive bidding (ICB)

(ii) contracts between $200,000 and $2 million would be procured on the basis of comparison of price quotations solicited from at least three qualified supplier from at least two countries;

(iii) contracts below $200,000 would be procured on the basis of comparison of price quotations solicited from at least three qualified suppliers.

4. Consultants (including those from local institutions) retained under the project would be recruited in accordance with the "Guidelines for the use of consultants by the World Bank", published by the World Bank in August 1981.

PHILIPPINES - OZONE DEPLETING SUBSTANCES PHASE OUT INVESTMENT PROGRAM

Annex 4: Framework for FI Role in Developing ODS Projects and Draft Terms and Conditions for Special Account and Statement of Expenditure

Overall responsibilities

1. Ozone Desk of DENR will have responsibility for ODS country program (CP) implementation and will ensure that ODS subprojects are consistent with the CP for ODS phase out. The Financial Institution (FI) will be responsible for channeling funds from the Ozone Trust Fund (OTF) which is administered by the World Bank, to the subprojects, including the appraisal of subproject proposals, the disbursement of OTF grants to subprojects, and the supervision of subproject implementation.

Financial Service Fee

2. The FI will receive a fee equivalent to 3% of the subproject grant amount for its intermediation services. The FI would receive one third (=1%) upon approval of the subproject appraisal report by the Bank, and two thirds (=2%) upon disbursement of the grants to the subprojects

Processing Steps

3. Processing of subprojects requesting OTF funding would include the following steps.

(1) Project preparation: enterprises will be responsible for preparing pre-investment studies. It may request assistance from the Ozone Desk of DENR which will strengthen its technical capabilities in project preparation.

(2) DENR endorsement: Ozone Desk of DENR will endorse each subproject to ensure that the subproject proposal conforms to priorities established under the Country Program.

(3) Technical review and Bank endorsement: The Bank will oversee technical reviews subproject proposals and endorse each project to ensure that they are consistent with MPEC guidelines.

(4) MPEC approval: For larger projects (over US$500,000) MPEC approval has to be obtained for each project. Individual MPEC subproject approval is not required for projects of less than US$500,000. Such subprojects are being included into the Workprogram of the Bank which is submitted as whole to the MPEC for approval. If convenient, the Bank may decide to present a batch of subprojects for simultaneous MPEC approval.

(5) Subproject appraisal: FI will appraise subprojects based on criteria as outlined in Annex 2. FI would prepare appraisal summaries and reports in accordance with Bank format

(6) Bank Review and Grant Approval: The FI will submit the endorsed appraisal to the Bank which will review each appraisal summary and report prepared by FI to ensure compliance with MP goals and procedures before approving the grant. (There is no free limit for FI in accordance with MPEC guidelines).

(7) Disbursement:

(a) Between Bank and FI: Once approved, MPEC will transfer grants to the OTF and upon effectiveness and receipt of a withdrawal application from the borrower, the Bank will make initial deposits of upto US$ 1.0 million into a Special Account which the FI would open. Replenishments of this Special Account and all other disbursements would be made against full documentation except for expenditures under contracts valued below US$200,000 for which the Bank will accept Statements of Expenditures (SOE). Supporting documents for SOEs including contracts, procurement documentation, and evidence of payment should be kept in a central location for examination by independent auditors and Bank staff during supervision missions. The minimum size of application for replenishment of the Special Account would be US$200,000. Bank will accept application for direct payment and issuance of special commitment (outside special account) only above a minimum amount of US$50,000. In addition to the details of disbursement procedures given in the Disbursement Handbook published by the Bank in 1992, a Disbursement Letter will be issued after the Grant is signed.

(b) Between FI and Subproject: Up to US$ 2 million per contract, the FI will disburse to the subproject proponent for eligible expenses without prior review by the Bank (see procurement guidelines).

(8) Disbursement in Tranches:

For large projects (over US$0.5 million) with a large share (proposed minimum threshold: over 50%) of grant funding for operating costs (as opposed to investment costs), the FI should propose a disbursement plan in two or more tranches. Release of the tranches would be based on receipt of progress reports (see point 8) satisfactory to the FI.

(9) Procurement: The FI will be responsible that procurement under the project follows the agreed guidelines. It will arrange procurement (international and local) for the packages in each subproject to be handled between the respective participating enterprises and qualified procurement agencies authorized by the Government and acceptable to the Bank. Bidding documents will be prepared based on model bidding documents acceptable to the Bank (e.g. sample Bank bidding documents). Draft Procurement Guidelines are attached in annex 3.

(10) Subproject Implementation: Each enterprise will be responsible for subproject implementation. For that purpose, it will sign a contract with the FI upon receipt of the Grant; the contract will spell out the responsibilities of the enterprise and its commitment to undertake the necessary activities agreed upon in the subproject proposal in order to achieve the intended ODS reduction or phase out.

Enterprises will be responsible for preparing a progress reports and submitting it to the FI (with copy to the Ozone Desk of DENR) according to the practice applied by the FI in similar projects. As a minimum, the enterprise would submit one project progress report at the time when the proposed investment activities have been implemented and the new installations are operating. In cases where multiple disbursement tranches have been agreed, the enterprise would submit one progress report prior to each tranche release.

(11) Subproject Supervision: FI will have prime responsibility for supervising implementation of subprojects while it is still disbursing to the subprojects. Even after the grant has been fully disbursed, the FI will review and approve the progress reports submitted by the enterprises and, if necessary, verify them. The FI's responsibility for subproject supervision ends after full disbursement and approval of the final enterprise progress report.

The Ozone Desk of the DENR has the right to monitor the progress of MP funded subprojects in fulfillment of its overall responsibility for the implementation of the MP ODS phase out Country Program.

(12) Auditing and Reporting: FI will submit semi-annual reports on the status of the grant disbursements and the progress of the subprojects, acceptable to the Bank. Copies of these reports will be submitted to the Ozone Desk of the DENR. FI will prepare an annual audit report by an independent auditor acceptable to the Bank.

Combined commercial and grant funding

4. In those subprojects where the total project costs exceeds the grant amount, the FI would offer a financing package including the grant and a loan to be provided from FI's own sources. The subproject proponent would be free to accept the financing package or to seek complementary funding to the grant from other sources. Terms and conditions for this complimentary financing would typically follow commercial practice.

Response to Comments on Philippine's ODS Phase Out Program

Pre-appraised projects

1. Tobacco

a) The grant request is based on acquisition of the DIET CO_2 process technology, the most appropriate and substitute for Fortune's operations. Justification for selection of this process is attached.

b) Most large and medium ODS consuming Article 5 countries have now completed studies of national ODS consumption. To our knowledge, no other country has identified tobacco fluffing as an ODS consuming industry. It is possible that operations in other countries had licensed/acquired non-ODS based technology in the past for reasons not associated with the Montreal Protocol.

c) Fortune is the largest ODS consumer in the Philippines, accounting for 16% of total consumption (weighted for ODP value). The Tobacco fluffing ODS phaseout project fully meets eligibility criteria for the MPMF. The project scope is limited to the phaseout of CFC-11 in Fortune's tobacco expansion process and the grant request is restricted to the incremental cost of ODS phaseout.

2. Rigid Polyurethane Foam

a) Attached are the investment costs estimates for four projects. See comments under c below.

b) "Cost effectiveness" is influenced by many factors. As Dr. Jeffs notes, the indicator is biased in favor of larger plants due to economies of scale. The industrial strategy of the Philippines, like that of many Article 5 countries, favors small-scale production at several facilities over large-scale centralized production. As such, the "cost effectiveness" for ODS phase out at smaller, less efficient plants will be proportionately higher. Arcelik produces one million refrigerators annually. Annual production at the four Philippine manufacturers varies from 8,000 to 362,000 units.

The Philippine rigid foam projects, phase I of a three-phase ODS phase out strategy, include the purchase and installation of equipment compatible with low-boiling point non-ODS blowing agents, required for complete ODS phase out (including elimination of interim HCFC substitutes). However, while this project puts in place the equipment for a complete phaseout, only 50% phase out is accomplished during the phase I scope of the project (100% phaseout technology is not yet commercially available and was thus excluded). Thus, the unit abatement cost understates the effectiveness of a complete phase out in comparison to other similar activities.

The method for calculation of cost effectiveness may vary among projects and impact the apparent effectiveness. For purposes of comparison, the calculation method for these projects, and their calculation are attached.

c) The Bank reviewed Dr. Jeffs comments through discussions with specialized consultants. Dr. Jeffs raises important points, but further investigation is required in some cases. Comments were considered as follows:

Philacor: The Bank recognizes that enterprise equipment needs may vary widely for adoption of similar ODS phaseout technology depending on existing technology/equipment. At this

stage, sufficient justification has been provided to include cost items, however, inclusion of unusual cost items, like new jigs, and other cost issues raised by Dr. Jeffs will be carefully scrutinized during appraisal. The purchase of Easy Froth will be postponed until end of Phase I, but is a critical part of Phase I project design. Equipment costs were supported with budget estimates from suppliers. The procurement process provides for competitive purchase of all equipment. The amount requested for this project is a reasonable estimate including contingencies. It is likely that the final appraisal may show somewhat lower funding requirements.

Justification for new jigs: The firm believes its current jigs cannot withstand higher pressures and the consultant confirmed that "several foam injection companies with which [they] spoke during the project [preparation] recommended that refrigerator manufacturers switch to new jigs capable of withstanding 15-20 psi. The other refrigerator manufacturers.. indicated that they would not need new jigs."

Federal Electric, Sanyo, and Concepcion: A detailed breakdown of costs for pilot line testing facility will be reviewed during appraisal with input from Dr. Jeffs. Only justified cost items will be included. Two other specialized consultants supported the amount of $300,000 for this facility. Sanyo amount was adjusted from $500,000 to $300,000. The purchase of Easy Froth will be postponed until end of Phase I, but is a critical part of Phase I project design. Equipment costs were supported with budget estimates from suppliers. The procurement process provides for competitive purchase of all equipment. The amount requested for these projects are reasonable estimates including contingencies. It is likely that the final appraisal may show somewhat lower funding requirements.

3. Solvent Cleaning

a) Grant requests for "Solid Circuits" and "Integrated Microelectronics" are under the $500,000 limit for projects requiring EC approval. The documentation submitted is in accordance with the requirements for projects under $500,000.

b) "Cost effectiveness" is influenced by many factors as noted above (2,b). In the solvent cleaning industries, smaller firms lack economies of scale and this impacts the cost effectiveness of ODS phase out. The smaller firms, however, are often in the greatest need of external financing to phase out ODS as they are typically 100% locally owned and lack foreign investors who can supply technology and financing for phase out. The OORG reviewer, Mr. Fitzgerald, while noting that cost effectiveness varies, he raises no questions about cost items which were provided with detailed break down for his review. Most importantly, given the variations in plant size, Mr. Fitzgerald notes that "the average cost of converting the five companies is quite reasonable". Cost breakdowns are attached.

c) Technology and safety packages are integral parts of each project and address specific need which vary depending on the selected substitute technology. As indicated in the Environmental Overview for the Project (the complete investment program), "International safety and environmental standards for projects" will be applied and "waste water treatment components for projects that convert to aqueous based solvents" will be included. Project designs followed these guidelines.

d) The Philippines is not participating in the Global Solvents project which is being managed by ICOLP. The Bank is coordinating all solvent projects to ensure that lessons learned are incorporated into project designs.

e) Yes. Cost estimates and contingencies are sufficient to cover expenditures to address environmental issues raised by Mr. Fitzgerald.

For all subprojects:

For each sub-project, an implementation schedule was included noting project duration, expected appraisal and grant signing dates, and expected funding disbursement. Detailed implementation schedules are attached.

jp 02/03/93/p#secret.res

PHILIPPINE ODS PHASE OUT PROGRAM SUMMARY TABLE

Company	End Use	Philippine Ownership (%)	Consumption in 1991 (ODP MT)	Annual Reduction in 1995 (ODP MT)	Investment Cost (US$M)	Net Recurring Costs (4yrs)[1]	Proposed OTF Grant (US$M)[2]
Preappraised							
Fortune Tobacco	Tobacco Fluffing	100%	350 CFC-11	350 CFC-11	11.81	-4.02[3]	4.72[4]
Philacor	Foam Blowing	61%	200 CFC-11	120 CFC-11	3.18	-0.71	1.77
Concepcion	Foam Blowing	100%	45 CFC-11	35 CFC-11	0.80	-0.13	0.79
Sanyo	Foam Blowing	70%	13 CFC-11	9 CFC-11	0.80	-0.01	0.66
Federal Electric	Foam Blowing	100%	5 CFC-11	5 CFC-11	0.66	-0.01	0.77
Ionic Circuits	Solvent Cleaning	90%	105 CFC113 9 TCA	114 113/TCA	0.51	0.24	0.79
Pacific Semiconductor	Solvent Cleaning	80%	13 CFC113 2 TCA	15 113/TCA	0.59	0.16	0.71
Electronic Assemblies	Solvent Cleaning	100%	5 CFC-113	5 CFC-113	0.56	0.04	0.71
Integrated Microelec.	Solvent Cleaning	100%	20 CFC-113	20 CFC-113	0.55	-0.18	0.43
Solid Circuits	Solvent Cleaning	100%	4 CFC-113	4 CFC-113	0.09	-0.03	0.07
Subtotal			**771 ODP**	**677 ODP**	**19.55**	**-4.65**	**11.42**
Identified							
ASAP (Recycle)	Refrigeration	100%	260 CFC-12 90 CFC-11	55 CFC-12 8 CFC-11	0.42	0.00	0.50
PASAPI (MAC)	Air-conditioning	100%	600 CFC-12	60 CFC-12	0.49	0.00	0.58
Philacor	Refrigeration	61%	55 CFC-12	0	1.24	0.00	0.89
Concepcion	Refrigeration	100%	8 CFC-12	0	0.90	0.00	1.06
Sanyo	Refrigeration	70%	3 CFC-12	0	0.18	0.00	0.15
Federal Electric	Refrigeration	100%	2 CFC-12	0	0.12	0.00	0.14
Subtotal			**1018 ODP**	**123 ODP**	**3.35**	**0.00**	**3.32**
TA for Financial Institution	**All**	**na**	**na**	**na**	**0.00**	**0.00**	**0.10**
GRAND TOTAL			**1789 ODP**	**800 ODP**	**22.90**	**-4.65**	**14.84**

[1] Discounted at 10%. Negative numbers indicate operating savings.
[2] Includes 15% contingency and 3% fee for financial institution
[3] Recurring cost over 15 year project economic life.
[4] Incremental investment cost of US$ 8.02 million, based on calculation for depreciated value of existing assets, used in calculation of grant eligibility.

The Montreal Protocol on Substances that Deplete the Ozone Layer

Philippines ODS Phase Out Investment Program

Project Cover Sheet

COUNTRY:	Philippines
PROJECT TITLE:	Conversion of Tobacco Fluffing Process to Carbon Dioxide at Fortune Tobacco Corporation
SECTORS COVERED:	Tobacco Fluffing
ODS CONSUMPTION IN SECTOR (1991):	350 MT CFC-11
PROJECT IMPACT:	Phaseout 350 MT CFC-11 per year
PROJECT DURATION:	2 years
TOTAL PROJECT COST:	US$ 11.8 million Investment US$ (0.4 million) Operating
PROPOSED OTF FINANCING:	US$ 4.72 million
COST EFFECTIVENESS:	$3.40/kg ODP/year[1]
NATIONAL COORDINATING AGENCY:	Department of Environment and Natural Resources (DENR)
IMPLEMENTING AGENCY:	The World Bank
APPRAISAL DATE:	June 1993

PROJECT SUMMARY

This project will eliminate the 350 MT of CFC-11 used for tobacco fluffing at Fortune Tobacco Corporation. The CFC-11 fluffing process will be replaced with a carbon dioxide-based system. The project will also eliminate a negligible amount of HCFC-22 used as a refrigerant in one component of the expansion process. Since Fortune Tobacco is the only company in the Philippines that uses CFCs to expand tobacco, eliminating its use of CFC-11 will simultaneously eliminate all CFC use in the Philippine tobacco fluffing sector. The proposed project addresses only the phaseout of CFC-11 in Fortune's tobacco expansion process and does not provide assistance to other parts of Fortune's cigarette manufacturing operations.

1/ Investment costs annualized over 15 years using 10% discount rate.

BACKGROUND

Fortune Tobacco comprises the Philippines' entire tobacco fluffing sector. The company is the largest user of ozone-depleting substances in the Philippines, accounting for approximately 16 percent of the country's total ODP-weighted consumption in 1991. The demand for tobacco in the Philippines is reaching a plateau, so future demand for CFC-11 at Fortune will likely be constant. Fortune Tobacco Corporation, which is wholly Filipino-owned, sells about 90% percent of its cigarettes domestically.

Tobacco shrinks when it is harvested, processed, and stored. The tobacco fluffing process restores the dried leaves back to approximately their original size and at the same time reduces the tar and nicotine content. Worldwide, the tobacco industry uses various fluffing technologies and processes. The primary value of using a portion of fluffed tobacco to manufacture cigarettes is cost savings: less tobacco is used per cigarette.

PROJECT OBJECTIVES

The objective of this project is to enable Fortune to convert expansion agents from CFC-11 to carbon dioxide in its tobacco expansion process.

PROJECT DESCRIPTION

This project will replace Fortune's CFC-11 tobacco fluffing plant with a new Dry Ice Expanded Tobacco (DIET) $C0_2$ process and associated equipment. The existing plant will continue operating throughout the construction of the new facility so that the CFC-11 phaseout will be achieved without disrupting Fortune's cigarette production capabilities. The effect of the project will be to phase out of the use of CFC-11 in the tobacco expansion sector in the Philippines. The tobacco expansion process is the only part of Fortune's cigarette manufacturing operations that will be affected by the proposed project. The project will not enhance the manufacture or sale of tobacco products in any other way nor does the project represent an expansion of Fortune's cigarette production capacity.

The patent holder and distributor of the DIET CO_2 process technology is AIRCO Industrial Gases in New Jersey, the United States. AIRCO co-developed the DIET process with Philip Morris and the two companies have a cross-licensing agreement for the technology. Funding for this project will provide for the acquisition of AIRCO's services to design, plan, and install a 2,500 lb/hr DIET plant. It is anticipated that a new DIET plant could be operational within two years of project initiation. The project planning process will reflect the existing capital stock at Fortune, the need to not disrupt its processing of expanded tobacco, and Fortune's design requirements (e.g., energy availability, topographic requirements, and local building codes).

PROJECT COSTS

The total project incremental cost of US$ 7.79 million was calculated as the economic investment costs plus the net incremental operating costs/savings for fifteen years discounted at 10%. The full economic life of the project was considered because of the unusual stream of incremental operating costs which become savings after the fourth year when royalty payments on the DIET process cease.

Investment costs of US$ 11.81 million is for the DIET plant. Due to the high cost of this conversion project, for which no existing equipment is salvaged, only "incremental" investment costs were considered as eligible for funding. Two methods were used to calculate the portion of the investment that should be considered incremental. In both cases, the incremental investment was calculated to be about US$ 8 million and this amount was used in grant request calculation. DENR and Fortune have agreed that only US$ 8 million should be considered eligible incremental investment costs and Fortune will secure financing for the balance from other sources.

Net incremental operating savings of US$ 4.02 were calculated considering the projects 15 year economic life. As noted above, operating costs are positive until the 1998, as a result of royalty payments. After the patent expires in that year, operating savings will accrue as operation of the new system is projected t be cheaper than continued use of CFC-11 given the expected price increases for the ODS.

Other costs. US$ 120,000 (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. A 15% contingency is also included.

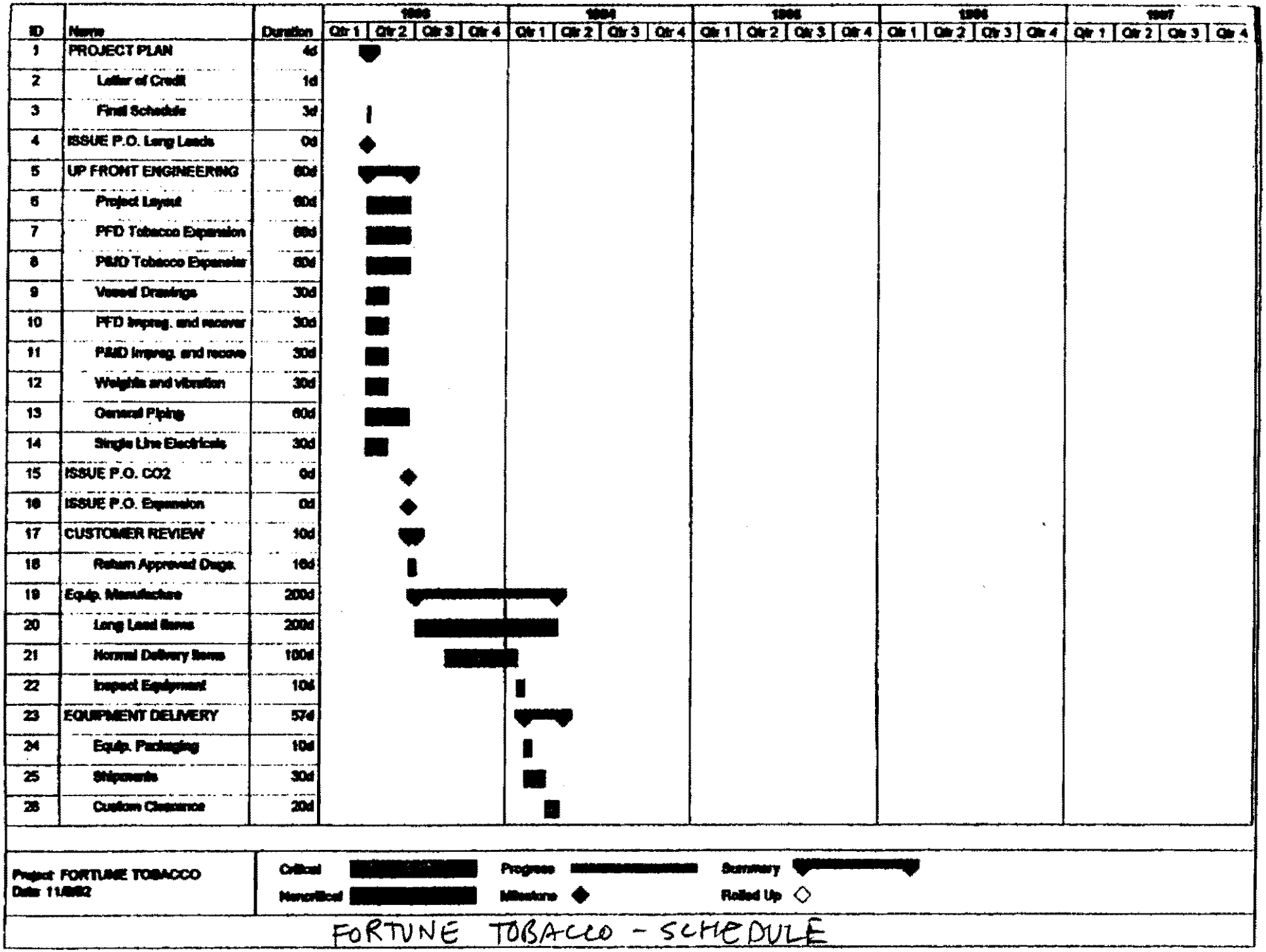
PROJECT IMPLEMENTATION

The Ozone Desk under DENR will coordinate with the financial institution (FI) to oversee and supervise implementation of this project. The FI is expected to appraise the project in June, following initial training, and signing of the grant agreement for transferring funds to the Philippines is expected in August.

ESTIMATED DISBURSEMENT: 10 % in 1993, 60% in 1994, and 30% in 1995.

TECHNICAL ASSESSMENT

Support for this project on its technical merits and cost effectiveness was endorsed by the OORG reviewer Dr. Michael Jeffs. A copy of his review is attached.



FORTUNE TOBACCO - SCHEDULE

FORTUNE TOBACCO- JUSTIFICATION FOR ALTERNATIVE TECHNOLOGY SELECTION

A number of possible alternatives to the CFC-11 process currently employed by Fortune exist. These include processes based on carbon dioxide, nitrogen, and steam. Each of these alternatives fully eliminates ozone-depleting substances from the tobacco expansion process. The carbon dioxide process is suggested here for two reasons: 1) the steam process achieves only 20 to 30 percent expansion as opposed to the nearly 100 percent expansion achieved in the CFC-11 and carbon dioxide processes; thus, if Fortune used the steam process, operating costs would increase significantly as Fortune would have to use more mass of tobacco leaf per cigarette to achieve the desired firmness; and 2) the nitrogen process requires the maintenance of extremely high pressures (e.g., 7,000 psi) and thus, higher energy costs than the other available options. Moreover, the nitrogen-based process can achieve only a 60 to 70 percent expansion of tobacco. Industry sources believe that only one tobacco manufacturer, Reemtsma based in Hamburg, Germany, currently uses a nitrogen-based expansion process. This manufacturer does not license its technology. In contrast to the steam- and nitrogen-based processes, the CO_2 process results in puffing that is equivalent to the level achieved by CFC-11 and does not have the disadvantages associated with high energy or high pressure.

Another alternative that Fortune could consider is shifting from the use of expanded to non-expanded tobacco. This option would, however, result in cigarettes being produced with much higher tar and nicotine content thereby posing a far greater health risk to Fortune's consumers. Moreover, as discussed below in the section on proposed financing, such a change would result in a significant adverse economic impact on Fortune because of the need to include much more tobacco per cigarette.

There are two suppliers of the DIET process. As described above, AIRCO is the patent holder and distributor of this technology. AIRCO's process is commercially available and is already being used at 26 locations worldwide by leading cigarette manufacturers. Distillers UK, based in Surrey, England, also supplies a DIET process for tobacco plants owned by the British American Tobacco corporation which bought AIRCO's DIET technology in 1978.[1] Fortune's selection of AIRCO over Distillers is primarily based on the fact that AIRCO and its cross licensing partner, Philip Morris, have patent rights to the use of DIET technology in the Philippines. As discussed in more detail below in the section of operating costs, the Philippine Bureau of Patents has verified that the pertinent patent expires on May 4, 1998.[2]

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[1] Personal communications, Abyd Karmali (ICF Incorporated) with Bob Drucker (AIRCO) and Richard Perkins (Distillers UK), December 2, 1992.

[2] Fax communication, Ted Mendoza (Filtkenik Consultants, Inc.) to Abyd Karmali (ICF Incorporated), December 3, 1992.

PROJECT - TOBACCO EXPANSION : FORTUNE, PHILIPPINES

Recommendation

The project is supported on the basis that it eliminates the annual usage of a relatively large amount (350 mt) of CFC 11 plus a small amount of HCFC 22.

Relevancy and Adequacy of information

The information is mostly complete although the project implementation section has not been detailed.

Technical Soundness

The chosen DIET CO_2 technology is closest to the current CFC 11-based technology in terms of the expansion achieved.

Lessons from Experience

No comment.

Environmental Issues

There are no apparent issues. Emissions are mostly non-hazardous. CO_2 emissions are modest.

Safety issues

No comment.

Cost effectiveness

There are no direct comparisons available of Unit Abatement Costs.

Other

This may be the category to comment on the implied threat to move to high nicotine, high tar cigarettes if the funding is not given. I question the morality of funding cigarette production in the first place and certainly under such circumstances.

GMFJ/kd/4/1/93

Mike Jeffs

FORTUNE TOBACCO- PROJECT COSTS

Investment Costs

Representatives of AIRCO, estimate that the costs of installing a 2,500 lb/hour capacity tobacco expansion plant will cost US$10.5 million. This cost excludes estimated import duties of US$3.5 million. The costs of spare equipment, carbon dioxide storage tank, carbon dioxide pump, and technical assistance add a further US$1.85 million to the total costs. Freight costs are estimated to add another $250,000 to bring the total to US$12.6 million. Freight could be reduced if local modular construction is used for the some of the more standard process equipment. Based on AIRCO's typical payment schedule, it has been assumed in the net present value calculation that 40 percent of costs are incurred at the start of the project, a further 50 percent after one year, and the remaining 10 percent upon project completion (two years after project initiation). The net present value of total investment costs is thus US$11.81 million, exclusive of duties. Annex 1 provides a more detailed breakdown of all investment costs.

Consideration of incremental investment costs instead of full investment costs, reduces investment requirements by $3.8 million. Incremental costs are costs in addition to costs that would be incurred under a business as usual scenario. If Fortune were to continue to use CFC-11, it would eventually have to replace its tobacco expanding equipment. The amount that Fortune would otherwise have had to invest to continue its CFC operations was deducted from the amount required for conversion to CO2 equipment to arrive at the actual incremental investment amount. This incremental investment cost can be calculated in two ways:

a) Consider the investment as a future payment and discount that amount back to the present year. Based on information provided by Fortune, investment in new CFC-11 equipment would have to be made in about nine years and the process would cost $ 8-10 million. At a 10% discount rate, $ 9 million is about $ 3.8 million in current dollars. This amount can be deducted from the investment cost of $11.81 million to obtain the incremental investment cost.

b) Consider the depreciated value of existing CFC-11 assets. For example, if the equipment were depreciated 100% and Fortune was planning to install new CFC equipment next year, then the amount of incremental investment would be the difference between the investment for CO2 equipment, $ 11.81 million, and the amount for CFC equipment, $9 million. However, Fortune has only depreciated its assets by 40%, and was not planning to invest in new equipment for another nine years, thus only $ 3.6 million (40% of $ 9 million) can be deducted from the $11.81 million to arrive at the amount of incremental investment.

The values obtained by these two methods are almost identical and so the incremental investment required for this project was considered to be $8 million ($3.8 million less than the total investment).

Operating Costs/Savings

This section discusses incremental operating costs and savings realized by Fortune over the project's life. Those process variables resulting in net incremental costs are discussed first, followed by a discussion of the offsetting savings.

A key operating cost that Fortune will have to incur for the first few years of the project is patent royalties. There are two patents for DIET technology in the Philippines. Philip Morris was issued Philippines patent number 14295 on May 4, 1981 for the original DIET process and AIRCO was issued Philippines patent number 19801 on July 2, 1986 for improvements to the process. The patent applicable to Fortune's proposed project is patent number 14295. The Philippines Bureau of Patents has verified that this patent has a lifetime of 17 years. As such, Fortune will incur royalty fees in each year the DIET plant is operational until May 4, 1998. Fortune Tobacco's preliminary discussions with AIRCO indicate that the royalty fees are expected to be 12 cents/pound of tobacco produced for the first 50 million pounds and 9 cents/pound for each pound produced thereafter. These amounts will, however, be subject to negotiation. Fortune produces approximately 13 million pounds of tobacco per year. Thus, assuming that a DIET plant could be operational by mid-1995, royalty costs are estimated at US$0.78 million for 1995, US$1.56 million for 1996 and 1997, US$0.65 for 1998, and zero in each year thereafter.

Other operating costs for carbon dioxide, energy, steam, compressed air, and nitrogen are expected to result in an increase of approximately US$0.78 million per year. Thus, total incremental annual operating costs are expected to be US$1.56 million for 1995, US$2.34 million for 1996 and 1997, US$1.56 million in 1998, and US$0.78 million a year thereafter. These figures do not consider process variables resulting in net incremental savings. Such offsetting benefits are considered next.

Annual offsetting benefits resulting from avoided use of CFC-11 and reduced use of water, HCFC-22, and maintenance total US$0.78 million in 1995, US$1.70 million in 1996, and US$1.83 million in 1997. Offsetting benefits will gradually increase after 1997 as the price of CFC-11 rises.

The final column of Exhibit 2 in Annex 2 shows the cashflow of net operating costs and savings. Given a discount rate of 10 percent, the net present value of this cashflow is a savings of US$4.02 million over the 15 year life of the project. Further details of operating costs and assumptions regarding the price of CFC-11 are provided in Annex 2.

BREAKDOWN OF OPERATING COSTS/SAVINGS (continued)

EXHIBIT 2

NET ANNUAL OPERATING COSTS/SAVINGS

Year	Price** (US$/KG based upon P25/$1)	Total CFC-11 Savings	Royalty Cost	Net Recurring Costs	Net Annual Operating Costs/(Savings)
1993	2.40	0	0	0	0
1994	3.20	0	0	0	0
1995*	4.00	$700,000	$778,800	$309,073	$387,872
1996	4.40	$1,540,000	$1,557,600	$618,143	$635,743
1997	4.80	$1,680,000	$1,557,600	$618,143	$495,743
1998	5.20	$1,820,000	$649,000	$618,143	($552,857)
1999	5.60	$1,960,000	0	$618,143	($1,341,847)
2000 and beyond	6.00	$2,100,000	0	$618,143	($1,481,857)

* Assuming project is fully implemented by mid-1995.
** Price estimates provided by the World Bank.

February 8, 1993

FORTUNE TOBACCO- PROJECT COSTS

Investment Costs

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b) Consider the depreciated value of existing CFC-11 assets. For example, if the equipment were depreciated 100% and Fortune was planning to install new CFC equipment next year, then the amount of incremental investment would be the difference between the investment for CO2 equipment, $ 11.81 million, and the amount for CFC equipment, $9 million. However, Fortune has only depreciated its assets by 40%, and was not planning to invest in new equipment for another nine years, thus only $ 3.6 million (40% of $ 9 million) can be deducted from the $11.81 million to arrive at the amount of incremental investment.

The values obtained by these two methods are almost identical and so the incremental investment required for this project was considered to be $8 million ($3.8 million less than the total investment).

BREAKDOWN OF INVESTMENT COSTS

Cold End (Impregnator)

Impregnator and auxiliaries	$1,350,000
Stainless steel process tank -- V-20	430,000
Steel high pressure recovery tank -- T-10	280,000
Stainless steel low pressure recovery tank -- T-8	220,000
CO_2 compressor skid and condenser -- CP-9, CP-11, CP-14, and HE-12	1,650,000
Recovery system control panel	375,000
Valving, instrumentation and stainless steel piping	1,200,000
Process pump -- P-22	40,000
Silencer -- S-26	15,000
Subtotal	$5,560,000

Hot End (Sublimator and Incinerator)

Flat band conveyor	$35,000
Transfer chute and support structure	150,000
Declumper M-30	85,000
Vibrabin and auxiliaries -- V-31	180,000
Weigh belt -- M-32 and auxiliaries	90,000
Support structure for V-31 and M-32	50,000
Sublimator and incinerator w/duct work, cyclone, rotary air locks, tangential separator and fans -- DE-33, HE-34, FU-90 SP-35, CP-95, CP-93	2,750,000
Support structure for sublimator w/access platforms	125,000
Vibrating conveyor w/trap door -- hooded	60,000
Band conveyors -- cooling (2) -- hooded	125,000
Moisture meter -- TM55 -- ME (1)	25,000
Reordering cylinder -- M-52 w/3 spay zones and auxiliaries	240,000
Control panels -- Process CP-1 and CP-2, Burner CP-3, Remote CP-4 and CP-5 for impregnator doors	1,025,000
Subtotal	$4,940,000

Required Major Additional Equipment

Main CO_2 storage tank	$150,000
CO_2 pump system	50,000
Spares	$800,000
Technical services	850,000
Freight (estimated)	250,000
Subtotal	$2,100,000
Grand Total	$12,600,000

Operating Costs/Savings

This section discusses incremental operating costs and savings realized by Fortune over the project's life. Those process variables resulting in net incremental costs are discussed first, followed by a discussion of the offsetting savings.

A key operating cost that Fortune will have to incur for the first few years of the project is patent royalties. There are two patents for DIET technology in the Philippines. Philip Morris was issued Philippines patent number 14295 on May 4, 1981 for the original DIET process and AIRCO was issued Philippines patent number 19801 on July 2, 1986 for improvements to the process. The patent applicable to Fortune's proposed project is patent number 14295. The Philippines Bureau of Patents has verified that this patent has a lifetime of 17 years. As such, Fortune will incur royalty fees in each year the DIET plant is operational until May 4, 1998. Fortune Tobacco's preliminary discussions with AIRCO indicate that the royalty fees are expected to be 12 cents/pound of tobacco produced for the first 50 million pounds and 9 cents/pound for each pound produced thereafter. These amounts will, however, be subject to negotiation. Fortune produces approximately 13 million pounds of tobacco per year. Thus, assuming that a DIET plant could be operational by mid-1995, royalty costs are estimated at US$0.78 million for 1995, US$1.56 million for 1996 and 1997, US$0.65 for 1998, and zero in each year thereafter.

Other operating costs for carbon dioxide, energy, steam, compressed air, and nitrogen are expected to result in an increase of approximately US$0.78 million per year. Thus, total incremental annual operating costs are expected to be US$1.56 million for 1995, US$2.34 million for 1996 and 1997, US$1.56 million in 1998, and US$0.78 million a year thereafter. These figures do not consider process variables resulting in net incremental savings. Such offsetting benefits are considered next.

Annual offsetting benefits resulting from avoided use of CFC-11 and reduced use of water, HCFC-22, and maintenance total US$0.78 million in 1995, US$1.70 million in 1996, and US$1.83 million in 1997. Offsetting benefits will gradually increase after 1997 as the price of CFC-11 rises.

The final column of Exhibit 2 in Annex 2 shows the cashflow of net operating costs and savings. Given a discount rate of 10 percent, the net present value of this cashflow is a savings of US$4.02 million over the 15 year life of the project. Further details of operating costs and assumptions regarding the price of CFC-11 are provided in Annex 2.

BREAKDOWN OF OPERATING COSTS/SAVINGS

EXHIBIT 1

CONSTANT RECURRING COSTS AND SAVINGS
(i.e., exclusive of CFC Costs and Royalties)

Variable	Unit Price (US$)	Existing G-13 Plant	Proposed DIET Plant	Incremental Costs and (Savings) (US$)
CO_2	$0.32/kg	0	172,350kg/mo	$661,824/yr
Energy	$0.09/kwh	675kw	750 kw	$20,250/yr
Steam	$0.01/kg	1,590.91kg/hr	1,818kg/hr	$6,810/yr
Cooling Water	$0.40/$m^3$	34m^3/hr	10m^3/hr	($28,800/yr)
Potable Water	$0.40/$m^3$	13.96m^3/hr	0.18m^3/hr	($16,536/yr)
Compressed Air	$0.21/$m^3$	153m^3/hr	290m^3/hr	$86,310/yr
HCFC-22	$3.38/kg	40kg/mo	0	($1,622/yr)
Nitrogen	$1.44/$m^3$	0	6.37m^3/day	$2,293/yr
Maintenance	0	$322,386/yr	$210,000/yr	($112,386/yr)
Labor	$1/manhour	48 persons per 2 shifts	48 persons per 2 shifts	0
NET RECURRING COSTS	--	--	--	$618,143

BREAKDOWN OF OPERATING COSTS/SAVINGS (continued)

EXHIBIT 2

NET ANNUAL OPERATING COSTS/SAVINGS

Year	Price** (US$/KG based upon P25/$1)	Total CFC-11 Savings	Royalty Cost	Net Recurring Costs	Net Annual Operating Costs/(Savings)
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* Assuming project is fully implemented by mid-1995.
** Price estimates provided by the World Bank.

The Montreal Protocol on Substances that Deplete the Ozone Layer

Philippines ODS Phase Out Investment Program

Project Cover Sheet

COUNTRY:	Philippines
PROJECT TITLE:	Application of a Reduced CFC Blowing Agent and Non-CFC Application preparation at Philippines Appliance Corporation (Philacor) (Phase I)
SECTORS COVERED:	Rigid Polyurethane Foam
ODS CONSUMPTION IN SECTOR (1991):	375 MT CFC-11 (285 MT used for appliance insulation)
PROJECT IMPACT:	Phaseout 120 MT CFC-11 per year
PROJECT DURATION:	2.5 years
TOTAL PROJECT COST:	Phase I US$ 3.2 million Investment US$ (0.7 million) Operating
PROPOSED OTF FINANCING:	US$ 1.77 million
COST EFFECTIVENESS:	$6.40/kg ODP/year[1] ($5.90/kg ODP/yr estimated for Phase I-III)
NATIONAL COORDINATING AGENCY:	Department of Environment and Natural Resources (DENR)
IMPLEMENTING AGENCY:	The World Bank
APPRAISAL DATE:	June 1993

PROJECT SUMMARY

This OTF request is for funding Phase I of a three phase program that will lead to the phase out of over 200 MT of CFC blowing agents for production of the polyurethane insulation in the refrigerator cabinets manufactured at Philacor. In Phase I, Philacor's foam formulation will be adjusted to reduce CFC-11 consumption by up to 50% resulting in elimination of 120 MT CFC-11 consumption p.a. In addition, its foaming operations will be converted to equipment capable of processing high pressure foam formulations. The high pressure equipment improves performance of the low CFC formulation and will be required in the future phases to a complete phaseout of ODS in foam production. Following the availability of HCFC-22 foam formulations, Phase I will also include batch testing with one in preparation for a complete CFC phaseout in a subsequent Phase II project. As HCFC consumption is controlled by MP, the final phase of the project will be conversion to a non-ODS, such as HFC-134a, that requires high pressure handling.

[1] Investment costs annualized over 4 years at 10% discount rate.

BACKGROUND

Five enterprises used approximately 285 MT of CFC-11 in the Philippines to manufacture insulating foams for 400,000 refrigerators and other household appliances in 1991, with the typical refrigerator containing approximately 0.6 kg of CFC-11 in its insulating foam. Philacor is the largest consumer, using 200 MT per year. Proposals for 50% foam projects to be executed at four of the five enterprises are being simultaneously submitted to the EC for funding approval. The fifth firm, Precision Electronics with 32 MT CFC-11 consumption is 80% foreign owned and is expected to phaseout without MP assistance. Approximately 90 percent of Filipino manufactured refrigerators are for the domestic market; the remainder are exported. Since 1987, demand for household appliances in the Philippines has been increasing at an annual rate of 15 to 25 percent. During 1992, Philacor produced 34 models of domestic refrigerators, 85% going to the domestic market, with total production of 362,000 units (78% market share). Production capacity is 432,000. The company is 61% Filipino owned. General Electric owns the other 39%. A program to phaseout CFC-12 use as the working fluid in Philacor's refrigerators is under preparation.

PROJECT OBJECTIVES

The objective of this project is to enable Philacor to achieve an immediate reduction in its consumption of CFC-11 and, ultimately, to convert blowing agents from CFC-11 to an alternative that does not deplete stratospheric ozone.

PROJECT DESCRIPTION

All domestic refrigerators manufactured by Philacor use CFC-11 as the blowing agent to form insulating foam. The company is prepared to cease production of ozone depleting substance (ODS) containing refrigerators as soon as it can perfect manufacturing procedures for using non-ODS materials. To this end, Philacor has developed a three phase program to eliminate ODS use in foam making. The plan for Phase I, for which funding is requested, is to first reduce CFC-11 usage by up to 50% using available technology and convert foaming operations to high pressure equipment. Low CFC-11 technology is proven and has been in use in Western Europe for 4 years. This plan includes selection of a chemical supplier and trail runs to optimize production with new high pressure injection equipment. From these trial runs, polyurethane foam samples will be tested for all relevant parameters. Similarly, sample foam cabinets will be tested for heat leakage and cabinet strength, and will be subjected to temperature shock tests. Finally, about 30 foamed cabinets per size/model will be assembled and completed as working refrigerators, field tested, retrieved, and retested for cooling performance and cabinet heat leakage. Employees will be trained by equipment and chemical suppliers through workshops on the use of new equipment and handling of new chemicals.

Philacor's three foam-blowing operations will be converted from low pressure to high pressure equipment in sequence. High-pressure equipment is preferable to low-pressure equipment because the former allows better control of various foam-blowing process characteristics and results in smaller cell sizes in the foam, which improve the foam's insulating ability. In addition, high pressure equipment will be required when CFC-11 is replaced with HCFC-22 as an intermediate step. New Montreal Protocol controls on CFC production may cause supply shortages for the Philippines which relies on imports. To minimize the risk of potential supply disruption, testing of HCFC-22 as a substitute blowing agent is included in this project. These tests will proceed as soon as the chemical technology is available. Of the interim non-CFC substitute options, HCFC-22 is the only candidate chemical that has been commercially available for years and it is being adopted as the interim blowing agent choice for about half of European refrigerator manufacturers. Thus, as part of Phase I, Philacor has committed to testing HCFC-22 foam formulations for integration into the firm's manufacturing process. In Phase II (1996-97), all foam operations would be converted to HCFC-22 as blowing agent. Technologies for application of non-ODS blowing agents (e.g. HFC-134a) are under development, but when available will need to be adapted for local manufacturing conditions. The conversion to a non-ODS blowing agent will be Phase III (1998-99) of Philacor's ODS elimination program for foams. The activities and dates for the three phases of this project are consistent with OORG guidelines for this sector.

PROJECT COSTS

The total project incremental cost of US$ 2.47 million was calculated as the economic investment costs plus the net incremental operating costs for three years discounted at 10%. We assumed that the firm would adopt HCFC-22 as its blowing agent in the fourth year and any additional incremental costs resulting from that conversion, which are expected to be minor since no further equipment changes would be required, would be submitted as a subsequent Phase II project for EC funding approval.

Investment costs of US$ 3.18 million include capital investment in high pressure foaming equipment, training, test instruments for assessing foam and cabinets following trial runs and trial production costs for reduced CFC foam and HCFC-22 foam production. The OORG reviewer's comments on costs will be considered during appraisal

Net incremental operating savings of US$ 710,000 vary from year to year based on planned production increases (all within current plant capacity) and projected price increases for CFC-11. In each year, the expense for increased amounts of polyol and isocyante are offset by the savings accrued by reducing CFC consumption.

Local ownership fraction of 61% was considered to determine the amount of eligible OTF grant financing. The total project incremental cost was multiplied by the fraction of local ownership to determine the proposed grant amount.

Other costs. An additional US$ 45,000 (3%) was added to the grant request to cover the fee for services of the financial institution (FI) that will appraise the projects, oversee procurement, disbursement and audits. A 15% contingency was also included.

PROJECT IMPLEMENTATION

Management: The Ozone Desk under DENR will coordinate with the financial institution (FI) to oversee and supervise implementation of this project. The FI is expected to appraise the project in June, following initial training, and signing of the grant agreement for transferring funds to the Philippines is expected in August.

Schedule

TASK	Year 1	Year 2	Year 3	Year 4
Phase I: Equipment Modification	xxxx	xxxx		
Production Trial of Low-CFC Foam	xxxx			
Production with Low-CFC Foam	xx	xxxx	xxxx	xxxx
Production Trial of HCFC-22				xxxx

ESTIMATED DISBURSEMENT: 30 % in 1993, 55% in 1994, and 15% in 1995.

TECHNICAL ASSESSMENT

Support for this project on its technical merits and cost effectiveness was endorsed by the OORG reviewer Dr. Michael Jeffs. A copy of his review for the four 50% foam projects that are being simultaneously submitted is attached.

PHILACOR

BREAKDOWN OF INVESTMENT COSTS

Retroactive Costs (Incured Prior to Project Submission)

1.	Production trial on low-CFC foam run in December 1991		
	a. Cost of materials and labor	$3,600	
	b. Cost of production, design, and engineering personnel	$2,220	
	Sub-total		$5,820
2.	Production trial at Meg Acma 90 and 20 in December 1992 (trials will be conducted for four models, 50 units per model)		
	a. Cost of materials and labor	$49,464	
	b. Cost of production, design, and engineering personnel	$2,220	
	Sub-total		$51,684
	Total Retroactive Costs		$57,504

Phase 1 (1993-1996)

3.	One-time equipment modifications costs		
	a. Easy-froth metering system	$113,000	
	b. Foam injection machine (for cabinet)	$182,000	
	c. High pressure storage tanks (3)	$10,000	
	d. Piping for blowing agent	$5,000	
	e. Jigs for cabinet foam (14)	$1,778,000	
	f. Jigs for door foam (16)	$800,000	
	g. Foam injection machine (for doors)	$140,000	
	h. K-factor machine	$53,427	
	i. Model PM 2500 analytical balance	$1,920	
	j. Model AJ150 analytical balance	$3,600	
	k. Viscometer	$5,327	
	l. Grant water bath	$2,078	
	m. Gas chromatograph	$17,700	
	n. Pycnometers (4)	$400	
	o. Compressive strength tester	$20,000	
	Sub-total		$3,132,452
4.	Cost of training		
	a. Number of employee days of training	15	
	b. Cost per day	$60	
	Sub-total		$900
	Total Investment Costs at Start of Phase I		$3,133,352

Phase II (1997-1998)

No investment costs.

Phase III (1999 and Onwards)

8.	Production trial at Meg Acma 90 and 20 (trials will be conducted for four models, 50 units per model)		
	a. Cost of materials and labor	$49,464	
	b. Cost of production, design, and engineering personnel	$2,220	
	Sub-total		$51,684
9.	Cost of training		
	a. Number of employee days of training	15	
	b. Cost per day	$60	
	Sub-total		$900
	Total Investment Costs in Phase III		$52,584

UNIT ABATEMENT COST CALCULATION FORMULA

$$A = \frac{C(F) + (OC-OS)}{W}$$

WHERE:

A - Unit abatement cost, $/kg ODP saved/year (at full operation)

C - Incremental capital cost, including all initial one time costs such as technology, training

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

OC - Annual Operating Costs at full operation

OS - Annual Operating benefits at full operation

W - Quantity of ODS saved annually expressed as ODP units

PHILACOR - COST EFFECTIVENESS CALCULATION (unit abatement cost)

Discount Rate 0.1

Project	Total Cost $1,000	Economic Life	C(F) $1,000	IOC $1,000	IOS $1,000	C(F)+(IOC-IOS) $1,000	ODP Yr Reduction metric ton	UAC $1,000/ton per year	UAC $/kgODP/yr
Philacor Foam Phase I	3177	4	1002.25		237	$765.58	120	$6.38	$6.38

Total Cost= Total ODS reduction Project Cost or "Incremental Cost"

IOC= Annual Incremental Operating Cost at First Year Full Operation

IOS= Annual Incremental Operating Benefits or Incremental Revenue at First Full Year of Project Operation

REFRIGERATOR FOAM BLOWING PROJECTS PHILIPPINES

RECOMMENDATION

The four foam blowing projects (at Philacor, Federal Electric, Sanyo and Concepcion) are supported. There should, however, be further detailed scrutiny of the expenditure items listed under the Cost Effectiveness heading.

The four projects follow the guidelines given in the draft policy document "Short-Medium Term Policy on the Reduction of the use of ODS in Refrigerator and Freezer Insulating Foam" in that they propose a rapid transition to reduced CFC 11 foam in Phase I whilst preparing for full CFC elimination.

RELEVANCY AND ADEQUACY OF INFORMATION

Further information was sought for all four projects and in most, but not all cases, the relevant information was obtained. Questions were related to major expenditure items and are referred to under the cost effectiveness heading.

TECHNICAL SOUNDNESS

Phase I of each project covers the well established route of conversion to reduced CFC 11 foam technology, thereby saving 50% of CFC 11 used. This is well proven technology, being in use in W. Europe since the beginning of 1989.

In the Philacor project there is reference to an increase in energy consumption of 8.7% with such technology. This is on the basis of one trial and is not supported by other experience. Hence, it should not be taken as the norm.

All projects choose HCFC 22 as the follow on Phase II technology. This type of technology is being implemented in some parts of the developed world but is, in fact, based on HCFC 22 / HCFC 142b - the latter being included in the blend to reduce thermal conductivity ageing. This is a valid follow-on option but the "tentative" nature of the choice is noted.

The project descriptions are too negative on the prospects for HCFC 141b technology. Currently, it is being implemented in the USA and in other parts of the world. Although its ODP at 0.11 (not 0.12 as in the descriptions) is higher than the 0.06 for the blend of HCFC 22 / HCFC 142b, toxicology results do not appear to be an inhibition to its use. The availability would also appear to be adequate - note that HCFC 142b, likely to be used in Phase II, is often produced on the same plants as HCFC 141b.

The possibility to move to HFC 134a is correctly stated.

The use of high pressure dispenses is supported. Note that this is different from the use of gaseous or low boiling blowing agents. Additional equipment (eg. Cannon Easy Froth) is required to dispense these into the foam chemicals.

LESSONS FROM EXPERIENCE

For major items there should be copies of quotations received from suppliers attached as appendices - or at least to be held by the Bank.

ENVIRONMENTAL ISSUES

The technology change in Phase I of each project will eliminate 50% of the CFC used giving a total saving of 155 tes of CFC 11 per year. Approximately the same amount of CFC 11 will still be used on an annual basis but subsequent phases allow for the elimination of all ODSs.

The use of high pressure dispensers will eliminate the need for cleaning solvents (to clean the mixing heads) such as methylene chloride.

The tentative choice of HCFC 22 / HCF 142b technology is the lowest ODP HCFC option practically available.

SAFETY ISSUES

Provided training and service back-up is provided by the high pressure dispenser suppliers there are no additional safety issues in Phase I.

COST EFFECTIVENESS

Philacor

Because of the factory's throughout and high ODS use this project would be cost effective in Phase I but for the proposed purchase of several major items.

The major item of new cabinet and door jigs - 30 jigs costs $ 2,588,000 needs detailed justification before proceeding. The cost per jig is also high. The foam injection machine costs at $ 140,000 (door) and $ 182,000 (cabinet) are also high. The recently reviewed Ecuador project dispensers were quoted at ca. $ 120,000 and in the reviewer's experience the current price of a basic high pressure dispensing machine is less than $ 100,000 without accessories.

There is no dispensing machine earmarked for the second cabinet line.

The funds for the purchase of the Easy Froth metering system should be delayed to near the end of Phase I when a better view of Phase II technology should be available.

FEDERAL ELECTRIC

Cost effectiveness per ODS kg saved is low because of the low factory throughout and ODS use. The principle of pilot line facilities is approved, basic testing facilities should be available. However, $ 300,000 would appear to be excessive without a detailed breakdown.

The funds for the purchase of equipment to operate with HCFC 22 / HCFC 142b should be delayed, as in the Philacor case to near the end of Phase I. The remarks apply, as for Philacor, on the price of the dispensing machine.

SANYO

Comments as for Federal Electric apply.

Additionally, there is no apparent reason for the higher requested funds of $ 500,000 for the pilot line. Breakdown is required before fund allocation.

CONCEPCION

Comments as for Federal Electric and Sanyo apply.

The lower cost of the dispensing machine is noted.

OTHER

No additional comments.

G. M. F. Jeffs
GMFJ/kd/13/1/93

The Montreal Protocol on Substances that Deplete the Ozone Layer

Philippines ODS Phase Out Investment Program

Project Cover Sheet

COUNTRY:	Philippines
PROJECT TITLE:	Application of a Reduced CFC Blowing Agent and Non-CFC Application preparation at Concepcion Industries (Phase I)
SECTORS COVERED:	Rigid Polyurethane Foam
ODS CONSUMPTION IN SECTOR (1991):	375 MT CFC-11 (285 MT used for appliance insulation)
PROJECT IMPACT:	Phaseout 35 MT CFC-11 per year
PROJECT DURATION:	2.5 years
TOTAL PROJECT COST:	Phase I US$ 0.8 million Investment US$ (0.1 million) Operating
PROPOSED OTF FINANCING:	US$ 790,000
COST EFFECTIVENESS:	$5.94/kg ODP/year[1] ($6.98/kg ODP/yr estimated for Phase I-III)
NATIONAL COORDINATING AGENCY:	Department of Environment and Natural Resources (DENR)
IMPLEMENTING AGENCY:	The World Bank
APPRAISAL DATE:	June 1993

PROJECT SUMMARY

This OTF request is for funding Phase I of a three phase program that will lead to the phaseout of over 65 MT of CFC blowing agents p.a. for production of the polyurethane insulation in the refrigerator cabinets manufactured at Concepcion. In Phase I, Concepcion's foam formulation will be adjusted to reduce CFC-11 consumption by up to 50% resulting in elimination of 35 MT CFC-11 consumption p.a. In addition, its foaming operations will be converted to equipment capable of processing high pressure foam formulations. The high pressure equipment improves performance of the low CFC formulation and will be required in the future phases to a complete phaseout of ODS in foam production. Following the availability of HCFC-22 foam formulations, Phase I will also include batch testing of with one in preparation for a complete CFC phaseout in a subsequent Phase II project. As HCFC consumption is controlled by MP, the final phase of the project will be conversion to a non-ODS, such as HFC-134a, that requires high pressure handling.

[1] Investment costs annualized over 4 years using 10% discount rate.

BACKGROUND

Five enterprises used approximately 285 MT of CFC-11 in the Philippines to manufacture insulating foams for 400,000 refrigerators and other household appliances in 1991, with the typical refrigerator containing approximately 0.6 kg of CFC-11 in its insulating foam. Concepcion is the second largest consumer, using 40-50 MT per year. Proposals for 50% foam projects to be executed at four of the five enterprises are being simultaneously submitted to the EC for funding approval. The fifth firm, Precision Electronics with 32 MT CFC-11 consumption is 80% foreign owned and is expected to phaseout without MP assistance. Approximately 90 percent of Filipino manufactured refrigerators are for the domestic market; the remainder are exported. Since 1987, demand for household appliances in the Philippines has been increasing at an annual rate of 15 to 25 percent. During 1992, Concepcion produced 70,000 units (15% market share). Production capacity is 165,000. The company is 100% Filipino owned. A program to phaseout CFC-12 use as the working fluid in Concepcion's refrigerators is under preparation.

PROJECT OBJECTIVES

The objective of this project is to enable Concepcion to achieve an immediate reduction in its consumption of CFC-11 and, ultimately, to convert blowing agents from CFC-11 to an alternative that does not deplete stratospheric ozone.

PROJECT DESCRIPTION

All domestic refrigerators manufactured by Concepcion use CFC-11 as the blowing agent to form insulating foam. The company is prepared to cease production of ozone depleting substance (ODS) containing refrigerators as soon as it can perfect manufacturing procedures for using non-ODS materials. To this end, Concepcion has developed a three phase program to eliminate ODS use in foam making. The plan for Phase I, for which funding is requested, is to first reduce CFC-11 usage by up to 50% using available technology and convert foaming operations to high pressure equipment. Low CFC-11 technology is proven and has been in use in Western Europe for 4 years. This plan includes selection of a chemical supplier and trail runs to optimize production with new high pressure injection equipment. From these trial runs, polyurethane foam samples will be tested for all relevant parameters. Similarly, sample foam cabinets will be tested for heat leakage and cabinet strength, and will be subjected to temperature shock tests. Finally, refrigerators will be field tested. Employees will be trained by equipment and chemical suppliers through workshops on the use of new equipment and handling of new chemicals.

Concepcion only has one foam-blowing line, so the existing low-pressure equipment will remain on-line while high pressure equipment is installed parallel to the existing equipment. After installation, production will switch to the new equipment. High-pressure equipment is preferable to low-pressure equipment because the former allows better control of various foam-blowing process characteristics and results in smaller cell sizes in the foam, which improve the foam's insulating ability. In addition, high pressure equipment will be required when CFC-11 is replaced with HCFC-22 as an intermediate step. New Montreal Protocol controls on CFC production may cause supply shortages for the Philippines which relies on imports. To minimize the risk of potential supply disruption, testing of HCFC-22 as a substitute blowing agent is included in this project. These tests will proceed as soon as the chemical technology is available. Of the interim non-CFC substitute options, HCFC-22 is the only candidate chemical that has been commercially available for years and it is being adopted as the interim blowing agent choice for about half of European refrigerator manufacturers. Thus, as part of Phase I, Concepcion has committed to testing HCFC-22 foam formulations for integration into the firm's manufacturing process. In Phase II (1996-97), all foam operations would be converted to HCFC-22 as blowing agent. Technologies for application of non-ODS blowing agents (e.g. HFC-134a) are under development, but when available will need to be adapted for local manufacturing conditions. The conversion to a non-ODS blowing agent will be Phase III (1998-99) of Concepcion's ODS elimination program for foams. The activities and dates for the three phases of this project are consistent with OORG guidelines for this sector.

PROJECT COSTS

The total project incremental cost of US$ 667,000 was calculated as the economic investment costs plus the net incremental operating costs for three years discounted at 10%. We assumed that the firm would adopt HCFC-22 as its blowing agent in the fourth year and any additional incremental costs resulting from that conversion, which are expected to be minor since no further equipment changes would be required, would be submitted as a subsequent Phase II project for EC funding approval.

Investment costs of US$ 800,000 include capital investment in high pressure foaming equipment, training, test instruments for assessing foam and cabinets following trial runs and trial production costs for reduced CFC foam and HCFC-22 foam production. The OORG reviewer's comments on costs will be considered during appraisal

Net incremental operating savings of US$ 133,000 vary from year to year based on planned production increases (all within current plant capacity) and projected price increases for CFC-11. In each year, the expense for increased amounts of polyol and isocyante are offset by the savings accrued by reducing CFC consumption.

Other costs. An additional US$ 20,000 (3%) was added to the grant request to cover the fee for services of the financial institution (FI) that will appraise the projects, oversee procurement, disbursement and audits. A 15% contingency was also included.

PROJECT IMPLEMENTATION

Management: The Ozone Desk under DENR will coordinate with the financial institution (FI) to oversee and supervise implementation of this project. The FI is expected to appraise the project in June, following initial training, and signing of the grant agreement for transferring funds to the Philippines is expected in August.

Schedule

TASK	Year 1	Year 2	Year 3	Year 4
Phase I: Equipment Modification	xxxx	xxxx		
Production Trial of Low-CFC Foam	xxxx			
Production with Low-CFC Foam	xx	xxxx	xxxx	xxxx
Production Trial of HCFC-22				xxxx

ESTIMATED DISBURSEMENT: 30 % in 1993, 55% in 1994, and 15% in 1995.

TECHNICAL ASSESSMENT

Support for this project on its technical merits and cost effectiveness was endorsed by the OORG reviewer Dr. Michael Jeffs. A copy of his review for the four 50% foam projects that are being simultaneously submitted is attached.

CONCEPCION

BREAKDOWN OF INVESTMENT COSTS

Phase 1 (1993-1996)

1. One-time equipment modifications costs

a. Mixing and metering machines	$80,000	
b. Foam injection machines	$150,000	
c. Lab testing foaming fixture	$150,000	
d. High pressure storage tanks (3)	$30,000	
e. Piping for blowing agent	$5,000	
f. Insulation conductivity tester	$15,000	
g. Pilot line equipment for testing and manufacturing development	$300,000	
Sub-total		$730,000

2. One-time testing, technology transfer, and training costs

a. Production trials		
-- Number of models requiring trials	8	
-- Number of units per trial	2	
-- Average material costs per unit	$250	
Sub-total		$4,000
b. Training of personnel		
-- Number of days training	16	
-- Cost per day	$1,300	
Sub-total		$20,800
c. Testing and development		
-- Number of days	30	
-- Cost per day	$500	
Sub-total		$15,000

Total Investment Costs at start of Phase I $769,800

CONCEPCION INVESTMENT COST BREAKDOWN (continued)

Phase I (continued)

3. One-time testing, technology transfer, and training costs

a. Production trials		
-- Number of models requiring trials	8	
-- Number of units per trial	2	
-- Average material costs per unit	$250	
Sub-total		$4,000
b. Training of personnel		
-- Number of days training	16	
-- Cost per day	$1,300	
Sub-total		$20,800
c. Testing and development		
-- Number of days	30	
-- Cost per day	$500	
Sub-total		$15,000
Total Investment Costs at End of Phase I		$39,800

UNIT ABATEMENT COST CALCULATION FORMULA

$$A = \frac{C(F) + (OC-OS)}{W}$$

WHERE:

A = Unit abatement cost, $/kg ODP saved/year (at full operation)

C = Incremental capital cost, including all initial one time costs such as technology, training

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

OC = Annual Operating Costs at full operation

OS = Annual Operating benefits at full operation

W = Quantity of ODS saved annually expressed as ODP units

CONCEPCION - COST EFFECTIVENESS CALCULATION (UNIT ABATEMENT COST)

Discount Rate 0.1

Project	Total Cost $1,000	Economic Life	C(F) $1,000	IOC $1,000	IOS $1,000	C(F)+(IOC-IOS) $1,000	ODP Yr Reduction metric ton	UAC $1,000/ton per year	UAC $/kgODP/yr
Concepcion Foam Phase I	800	4	252.38		44	$208.04	35	$5.94	$5.94

Total Cost= Total ODS reduction Project Cost or "Incremental Cost"

IOC= Annual Incremental Operating Cost at First Year Full Operation

IOS= Annual Incremental Operating Benefits or Incremental Revenue at First Full Year of Project Operation

The Montreal Protocol on Substances that Deplete the Ozone Layer

Philippines ODS Phase Out Investment Program

Project Cover Sheet

COUNTRY:	Philippines
PROJECT TITLE:	Application of a Reduced CFC Blowing Agent and Non-CFC Application preparation at Sanyo Philippines (Phase I)
SECTORS COVERED:	Rigid Polyurethane Foam
ODS CONSUMPTION IN SECTOR (1991):	375 MT CFC-11 (285 MT used for appliance insulation)
PROJECT IMPACT:	Phaseout 9 MT CFC-11 per year
PROJECT DURATION:	2.5 years
TOTAL PROJECT COST:	Phase I US$ 0.8 million Investment US$ (0.01 million) Operating
PROPOSED OTF FINANCING:	US$ 660,000
COST EFFECTIVENESS:	$28/kg ODP/year[1] ($9.25/kg ODP/yr estimated for Phase I-III)
NATIONAL COORDINATING AGENCY:	Department of Environment and Natural Resources (DENR)
IMPLEMENTING AGENCY:	The World Bank
APPRAISAL DATE:	June 1993

PROJECT SUMMARY

This OTF request is for funding Phase I of a three phase program that will lead to the phaseout of over 20 MT of CFC blowing agents p.a. for production of the polyurethane insulation in the refrigerator cabinets manufactured at Sanyo. In Phase I, Sanyo Philippines's (Sanyo) foam formulation will be adjusted to reduce CFC-11 consumption by up to 50% resulting in elimination of 9 MT CFC-11 consumption p.a. In addition, its foaming operations will be converted to equipment capable of processing high pressure foam formulations. The high pressure equipment improves performance of the low CFC formulation and will be required in the future phases to a complete phaseout of ODS in foam production. Following the availability of HCFC-22 foam formulations, Phase I will also include batch testing with one in preparation for a complete CFC phaseout in a subsequent Phase II project. As HCFC consumption is controlled by MP, the final phase of the project will be conversion to a non-ODS, such as HFC-134a, that requires high pressure handling.

[1] Investment costs were annualized over 4 years using 10% discount rate.

BACKGROUND

Five enterprises used approximately 285 MT of CFC-11 in the Philippines to manufacture insulating foams for 400,000 refrigerators and other household appliances in 1991, with the typical refrigerator containing approximately 0.6 kg of CFC-11 in its insulating foam. Sanyo is the fourth largest, using 13 MT CFC-11 in 1991. Proposals for 50% foam projects to be executed at four of the five enterprises are being simultaneously submitted to the EC for funding approval. The fifth firm, Precision Electronics with 32 MT CFC-11 consumption is 80% foreign owned and is expected to phaseout without MP assistance. Approximately 90 percent of Filipino manufactured refrigerators are for the domestic market; the remainder are exported. Since 1987, demand for household appliances in the Philippines has been increasing at an annual rate of 15 to 25 percent. During 1992, Sanyo produced 24,000 domestic refrigerators with production capacity 62,000. The company is 70% Filipino owned. Japanese own the other 30%. A program to phaseout CFC-12 use as the working fluid in Sanyo's refrigerators is under preparation.

PROJECT OBJECTIVES

The objective of this project is to enable Sanyo to achieve an immediate reduction in its consumption of CFC-11 and, ultimately, to convert blowing agents from CFC-11 to an alternative that does not deplete stratospheric ozone.

PROJECT DESCRIPTION

All domestic refrigerators manufactured by Sanyo use CFC-11 as the blowing agent to form insulating foam. The company is prepared to cease production of ozone depleting substance (ODS) containing refrigerators as soon as it can perfect manufacturing procedures for using non-ODS materials. To this end, Sanyo has developed a three phase program to eliminate ODS use in foam making. The plan for Phase I, for which funding is requested, is to first reduce CFC-11 usage by up to 50% using available technology and convert foaming operations to high pressure equipment. Low CFC-11 technology is proven and has been in use in Western Europe for 4 years. This plan includes training of plant personnel, technology testing and manufacturing development for both reduced CFC foam formulations and high pressure HCFC technologies. Employee training will be undertaken in the form of workshops and seminars, including training to be provided by Sanyo Japan, under technology transfer agreements. Following optimization of manufacturing process with reduced CFC formulation, the plant will converted to its use by 1994.

Sanyo's single cabinet and door foam-blowing operations will be converted from low pressure to high pressure equipment in 1994. The existing low-pressure equipment will remain on-line while high pressure equipment is installed parallel to the existing equipment. After installation, production will switch to the new equipment. High-pressure equipment is preferable to low-pressure equipment because the former allows better control of various foam-blowing process characteristics and results in smaller cell sizes in the foam, which improve the foam's insulating ability. In addition, high pressure equipment will be required when CFC-11 is replaced with HCFC-22 as intermediate step. New Montreal Protocol controls on CFC production may cause supply shortages for the Philippines which relies on imports. To minimize the risk of potential supply disruption, testing of HCFC-22 as a substitute blowing agent is included in this project. These tests will proceed as soon as the chemical technology is available. Of the interim non-CFC substitute options, HCFC-22 is the only candidate chemical that has been commercially available for years and it is being adopted as the interim blowing agent choice for about half of European refrigerator manufacturers. Thus, as part of Phase I, Sanyo has committed to testing HCFC-22 foam formulations for integration into the firm's manufacturing process. In Phase II (1996-97), all foam operations would be converted to HCFC-22 as blowing agent. Technologies for application of non-ODS blowing agents (e.g. HFC-134a) are under development, but when available will need to be adapted for local manufacturing conditions. The conversion to a non-ODS blowing agent will be Phase III (1998-99) of Sanyo's ODS elimination program for foams. The activities and dates for the three phases of this project are consistent with OORG guidelines for this sector.

PROJECT COSTS

The total project incremental cost of US$ 0.8 million was calculated as the economic investment costs plus the net incremental operating costs for three years discounted at 10%. We assumed that the firm would adopt HCFC-22 as its blowing agent in the fourth year and any additional incremental costs resulting from that conversion, which are expected to be minor since no further equipment changes would be required, would be submitted as a subsequent Phase II project for EC funding approval.

Investment costs of US$ 810,000 include capital investment in high pressure foaming equipment, training, test instruments for assessing foam and cabinets following trial runs and trial production costs for reduced CFC foam and HCFC-22 foam production. The OORG reviewer's comments on costs will be considered during appraisal

Net incremental operating savings of US$ 9,000 vary from year to year based on planned production increases (all within current plant capacity) and projected price increases for CFC-11. In each year, the expense for increased amounts of polyol and isocyante are offset by the savings accrued by reducing CFC consumption.

Local ownership fraction of 70% was considered to determine the amount of eligible OTF grant financing. The total project incremental cost was multiplied by the fraction of local ownership to determine the proposed grant amount.

Other costs. An additional US$ 20,000 (3%) was added to the grant request to cover the fee for services of the financial institution (FI) that will appraise the projects, oversee procurement, disbursement and audits. A 15% contingency was also included.

PROJECT IMPLEMENTATION

Management: The Ozone Desk under DENR will coordinate with the financial institution (FI) to oversee and supervise implementation of this project. The FI is expected to appraise the project in June, following initial training, and signing of the grant agreement for transferring funds to the Philippines is expected in August.

Schedule

TASK	Year 1	Year 2	Year 3	Year 4
Phase I: Equipment Modification	xxxx	xxxx		
Production Trial of Low-CFC Foam	xxxx			
Production with Low-CFC Foam	xx	xxxx	xxxx	xxxx
Production Trial of HCFC-22				xxxx

ESTIMATED DISBURSEMENT: 30 % in 1993, 55% in 1994, and 15% in 1995.

TECHNICAL ASSESSMENT

Support for this project on its technical merits and cost effectiveness was endorsed by the OORG reviewer Dr. Michael Jeffs. A copy of his review for the four 50% foam projects that are being simultaneously submitted is attached.

SANYO

~~ANNEX~~ 1 : ~~Breakdown of Investment Cost~~

Phase I : ¥1,027,500

1. One-time equipment costs for process modifications, and pilot line for testing and manufacturing development (procurement negotiations starting 1993-1994)

a)	**Pilot line equipment for testing and manufacturing development**	~~$ 500,000.00~~ ¥400,000
b)	**Easy-froth mixing and metering system**	$ 113,000.00
c)	**Foam injection machine**	$ 182,000.00
d)	**Lab testing foaming fixture & other testing equipment**	$ 120,000.00
e)	**High pressure storage tanks (3)**	$ 10,000.00
f)	**Piping for blowing agent**	$ 5,000.00
g)	**Cabinet Foaming Jig & Fixtures**	$ 50,000.00
	Total	~~$ 980,000.00~~ ¥780,000

2. One-time testing, technology transfer, and training costs (For low-CFC Foam, 1993)

a) Technical assistance from suppliers

- - Number of days assistance	3
- - Cost per day	$ 400.00
[redacted]	$ 1,200.00

b) Training of personnel

- - Number of persons to be trained	8
- - Number of days training	15
- - Cost per day	$ 300.00
Sub Total	$ 4,500.00
~~Total~~ a+b+c	[redacted]

c) Production trials

- - Number of models requiring trials	3
- - Number of units requiring plant trial per model	10
- - Average loss of revenue per unit tried	$ 335.00
Sub Total	$ 10,050.00

SANYO BREAKDOWN OF INVESTMENT COSTS (continued)

3. One-time testing, technology transfer, and training costs (For HCFC-22, 1996)

a) Technical assistance from suppliers

- - Number of days assistance	3
- - Cost per day	$ 500.00
Sub Total	$ 1,500.00

b) Training of personnel

- - Number of persons to be trained	6
- - Number of days training	15
- - Cost per day	$ 400.00
Sub Total	$ 6,000.00
Total a+b+c	~~$ 19,500.00~~

c) Production trials

- - Number of models requiring trials	3
- - Number of unit requiring trial per model	10
- - Average loss of revenue per unit tried	$ 400.00
Sub Total	$ 12,000.00

UNIT ABATEMENT COST CALCULATION FORMULA

$$A = \frac{C(F) + (OC-OS)}{W}$$

WHERE:

A - Unit abatement cost, $/kg ODP saved/year (at full operation)

C - Incremental capital cost, including all initial one time costs such as technology, training

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

OC - Annual Operating Costs at full operation

OS - Annual Operating benefits at full operation

W - Quantity of ODS saved annually expressed as ODP units

SANYO - COST EFFECTIVENESS CALCULATION (unit abatement cost)

Discount Rate 0.1

Project	Total Cost $1,000	Economic Life	C(F) $1,000	IOC $1,000	IOS $1,000	C(F)+(IOC-IOS) $1,000	ODP Yr Reduction metric ton	UAC $1,000/ton per year	UAC $/kgODP/yr
Sanyo Foam Phase I	810	4	255.53		3	$252.53	9	$28.06	$28.06

Total Cost= Total ODS reduction Project Cost or "Incremental Cost"

IOC= Annual Incremental Operating Cost at First Year Full Operation

IOS= Annual Incremental Operating Benefits or Incremental Revenue at First Full Year of Project Operation

The Montreal Protocol on Substances that Deplete the Ozone Layer

Philippines ODS Phase Out Investment Program

Project Cover Sheet

COUNTRY:	Philippines
PROJECT TITLE:	Application of a Reduced CFC Blowing Agent and Non-CFC Application preparation at Federal Electric Company (Phase I)
SECTORS COVERED:	Rigid Polyurethane Foam
ODS CONSUMPTION IN SECTOR (1991):	375 MT CFC-11 (285 MT used for appliance insulation)
PROJECT IMPACT:	Phaseout 5 MT CFC-11 per year
PROJECT DURATION:	2.5 years
TOTAL PROJECT COST:	Phase I US$ 0.66 million Investment US$ (0.1 million) Operating
PROPOSED OTF FINANCING:	US$ 770,000
COST EFFECTIVENESS:	$40.60/kg ODP/year[1] ($13.40/kg ODP/yr estimated for Phase I-III)
NATIONAL COORDINATING AGENCY:	Department of Environment and Natural Resources (DENR)
IMPLEMENTING AGENCY:	The World Bank
APPRAISAL DATE:	June 1993

PROJECT SUMMARY

This OTF request is for funding Phase I of a three phase program that will lead to the phaseout of over 10 MT of CFC blowing agents p.a. for production of the polyurethane insulation in the refrigerator cabinets manufactured at Federal Electric. In Phase I, Federal Electric's foam formulation will be adjusted to reduce CFC-11 consumption by up to 50% resulting in elimination of 5 MT CFC-11 consumption p.a. In addition, its foaming operations will be converted to equipment capable of processing high pressure foam formulations. The high pressure equipment improves performance of the low CFC formulation and will be required in the future phases to a complete phaseout of ODS in foam production. Following the availability of HCFC-22 foam formulations, Phase I will also include batch testing with one in preparation for a complete CFC phaseout in a subsequent Phase II project. As HCFC consumption is controlled by MP, the final phase of the project will be conversion to a non-ODS, such as HFC-134a, that requires high pressure handling.

[1] Investment costs were annualized over 4 years using 10% discount rate.

BACKGROUND

Five enterprises used approximately 285 MT of CFC-11 in the Philippines to manufacture insulating foams for 400,000 refrigerators and other household appliances in 1991, with the typical refrigerator containing approximately 0.6 kg of CFC-11 in its insulating foam. Proposals for 50% foam projects to be executed at four of the five enterprises are being simultaneously submitted to the EC for funding approval. The fifth firm, Precision Electronics with 32 MT CFC-11 consumption is 80% foreign owned and is expected to phaseout without MP assistance. Approximately 90 percent of Filipino manufactured refrigerators are for the domestic market; the remainder are exported. Since 1987, demand for household appliances in the Philippines has been increasing at an annual rate of 15 to 25 percent. During 1992, Federal Electric produced about 8,000 units. Production capacity is 50,000 and production reached 30,000 in 1988 and 1989. In 1990 the factory was closed due to labor disputes. A new contract recently signed with Admiral USA to produce their brand starting in January 1993 is expected to result in a steady increase in production. The company is 100% Filipino owned. A program to phaseout CFC-12 use as the working fluid in Federal Electric's refrigerators is under preparation.

PROJECT OBJECTIVES

The objective of this project is to enable Federal Electric to achieve an immediate reduction in its consumption of CFC-11 and, ultimately, to convert blowing agents from CFC-11 to an alternative that does not deplete stratospheric ozone.

PROJECT DESCRIPTION

All domestic refrigerators manufactured by Federal Electric use CFC-11 as the blowing agent to form insulating foam. The company is prepared to cease production of ozone depleting substance (ODS) containing refrigerators as soon as it can perfect manufacturing procedures for using non-ODS materials. To this end, Federal Electric has developed a three phase program to eliminate ODS use in foam making. The plan for Phase I, for which funding is requested, is to first reduce CFC-11 usage by up to 50% using available technology and convert foaming operations to high pressure equipment. Low CFC-11 technology is proven and has been in use in Western Europe for 4 years. This plan includes selection of a chemical supplier and trail runs to optimize production with new high pressure injection equipment. From these trial runs, polyurethane foam samples will be tested for all relevant parameters. Similarly, sample foam cabinets will be tested for heat leakage and cabinet strength, and will be subjected to temperature shock tests. Finally, refrigerators will be field tested. Employees will be trained by equipment and chemical suppliers through workshops on the use of new equipment and handling of new chemicals.

Federal Electric only has one foam-blowing line, so the existing low-pressure equipment will remain on-line while high pressure equipment is installed parallel to the existing equipment. After installation, production will switch to the new equipment. High-pressure equipment is preferable to low-pressure equipment because the former allows better control of various foam-blowing process characteristics and results in smaller cell sizes in the foam, which improve the foam's insulating ability. In addition, high pressure equipment will be required when CFC-11 is replaced with HCFC-22 as an intermediate step. New Montreal Protocol controls on CFC production may cause supply shortages for the Philippines which relies on imports. To minimize the risk of potential supply disruption, testing of HCFC-22 as a substitute blowing agent is included in this project. These tests will proceed as soon as the chemical technology is available. Of the interim non-CFC substitute options, HCFC-22 is the only candidate chemical that has been commercially available for years and it is being adopted as the interim blowing agent choice for about half of European refrigerator manufacturers. Thus, as part of Phase I, Federal Electric has committed to testing HCFC-22 foam formulations for integration into the firm's manufacturing process. In Phase II (1996-97), all foam operations would be converted to HCFC-22 as blowing agent. Technologies for application of non-ODS blowing agents (e.g. HFC-134a) are under development, but when available will need to be adapted for local manufacturing conditions. The conversion to a non-ODS blowing agent will be Phase III (1998-99) of Federal Electric's ODS elimination program for foams. The activities and dates for the three phases of this project are consistent with OORG guidelines for this sector.

PROJECT COSTS

The total project incremental cost of US$ 644,000 was calculated as the economic investment costs plus the net incremental operating costs for three years discounted at 10%. We assumed that the firm would adopt HCFC-22 as its blowing agent in the fourth year and any additional incremental costs resulting from that conversion, which are expected to be minor since no further equipment changes would be required, would be submitted as a subsequent Phase II project for EC funding approval.

Investment costs of US$ 657,000 include capital investment in high pressure foaming equipment, training, test instruments for assessing foam and cabinets following trial runs and trial production costs for reduced CFC foam and HCFC-22 foam production. The OORG reviewer's comments on costs will be considered during appraisal

Net incremental operating savings of US$ 13,000 vary from year to year based on planned production increases (all within current plant capacity) and projected price increases for CFC-11. In each year, the expense for increased amounts of polyol and isocyante are offset by the savings accrued by reducing CFC consumption.

Other costs. An additional US$ 20,000 (3%) was added to the grant request to cover the fee for services of the financial institution (FI) that will appraise the projects, oversee procurement, disbursement and audits.

PROJECT IMPLEMENTATION

Management: The Ozone Desk under DENR will coordinate with the financial institution (FI) to oversee and supervise implementation of this project. The FI is expected to appraise the project in June, following initial training, and signing of the grant agreement for transferring funds to the Philippines is expected in August.

Schedule

TASK	Year 1	Year 2	Year 3	Year 4
Phase I: Equipment Modification	xxxx	xxxx		
Production Trial of Low-CFC Foam	xxxx			
Production with Low-CFC Foam	xx	xxxx	xxxx	xxxx
Production Trial of HCFC-22				xxxx

ESTIMATED DISBURSEMENT: 30 % in 1993, 55% in 1994, and 15% in 1995.

TECHNICAL ASSESSMENT

Support for this project on its technical merits and cost effectiveness was endorsed by the OORG reviewer Dr. Michael Jeffs. A copy of his review for the four 50% foam projects that are being simultaneously submitted is attached.

FEDERAL ELECTRIC

BREAKDOWN OF INVESTMENT COSTS

Phase 1 (1933-1994)

1. One-time equipment modifications costs

a. Easy-froth metering system	$113,000	
b. Foam injection machine	$182,000	
c. Lab testing foaming fixture	$1,000	
d. High pressure storage tanks (3)	$10,000	
e. Piping for blowing agent	$1,500	
f. Insulation conductivity tester	$2,500	
g. Cabinet foaming jigs (6)	$35,000	
h. Pilot line equipment for testing and and manufacturing development	$300,000	
Sub-total		$645,000

2. One-time testing, technology transfer, and training costs

a. Production trials for low CFC-11		
-- Number of models requiring trials	6	
-- Number of models per trial	2	
-- Average material costs per model	$250	
Sub-total		$3,000
b. Training of personnel		
-- Number of days training	10	
-- Cost per day	$400	
Sub-total		$4,000
Total Investment Costs at Start of Phase I		$652,000

3. One-time testing, technology transfer, and training costs

a. Production trials for HCFC-22		
-- Number of models requiring trials	6	
-- Number of models per trial	2	
-- Average material costs per model	$250	
Sub-total		$3,000

FEDERAL ELECTRIC BREAKDOWN OF COSTS (Continued)

b. Training of personnel		
-- Number of days training	10	
-- Cost per day	$400	
Sub-total		$4,000
Total Investment Costs at End of Phase I		$7,000

UNIT ABATEMENT COST CALCULATION FORMULA

$$A = \frac{C(F) + (OC-OS)}{W}$$

WHERE:

A = Unit abatement cost, $/kg ODP saved/year (at full operation)

C = Incremental capital cost, including all initial one time costs such as technology, training

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

OC = Annual Operating Costs at full operation

OS = Annual Operating benefits at full operation

W = Quantity of ODS saved annually expressed as ODP units

FEDERAL ELECTRIC - COST EFFECTIVENESS CALCULATION (unit abatement cost)

Discount Rate 0.1

Project	Total Cost $1,000	Economic Life	C(F) $1,000	IOC $1,000	IOS $1,000	C(F)+(IOC-IOS) $1,000	ODP Yr Reduction metric ton	UAC $1,000/ton per year	UAC $/kgODP/yr
Federal Elec Foam Phase I	657	4	207.26		4	$202.93	5	$40.59	$40.59

Total Cost= Total ODS reduction Project Cost or "Incremental Cost"

IOC= Annual Incremental Operating Cost at First Year Full Operation

IOS= Annual Incremental Operating Benefits or Incremental Revenue at First Full Year of Project Operation

The Montreal Protocol on Substances that Deplete the Ozone Layer

Philippines ODS Phase Out Investment Program

Project Cover Sheet

COUNTRY:	Philippines
PROJECT TITLE:	Conversion to Semi-Aqueous and Aqueous Cleaning Solvents at Ionics Circuits, Inc.
SECTORS COVERED:	Solvent Cleaning
ODS CONSUMPTION IN SECTOR (1991):	445 MT ODP (253 MT CFC-113 & 1,459 MT TCA)
PROJECT IMPACT:	Phaseout 114 MT ODP per year (98 MT CFC-113 & 73 MT TCA)
PROJECT DURATION:	6 months
TOTAL PROJECT COST:	US$ 0.51 million Investment US$ 0.24 million Operating
PROPOSED OTF FINANCING:	US$ 790,000
COST EFFECTIVENESS:	$1.40/kg ODP/year[1]
NATIONAL COORDINATING AGENCY:	Department of Environment and Natural Resources (DENR)
IMPLEMENTING AGENCY:	The World Bank
APPRAISAL DATE:	June 1993

PROJECT SUMMARY

This project will eliminate the use of CFC-113 and TCA in the cleaning of electronic circuit cards, computer disk drives, and associated electronic equipment at Ionics Circuits Incorporated (Ionics). The phaseout will be accomplished by dismantling existing vapor degreasers and installing aqueous and semi-aqueous cleaning equipment. Ionics currently uses eight batch vapor degreasers in its cleaning operations. The project will replace these eight cleaning machines with one in-line aqueous cleaning machine and four batch semi-aqueous cleaning machines. The project also provides for engineering support and training, exhaust system improvements, and appropriate wastewater treatment facilities. The conversion to non-ozone depleting technology will eliminate annual consumption of 98 MT of CFC-113 and 73 MT of TCA. This represents a reduction in national consumption levels of almost 40 percent and 5 percent, respectively.

[1] Investment costs were annualized over 10 years using 10%.

BACKGROUND

CFC-113 and 1,1,1-trichloroethane (TCA), are widely used by 40-50 electronics firms in cleaning applications in the Philippines. About one-quarter of these companies are partly or wholly Philippine owned while the remainder are owned by multinational firms. In addition, ODS cleaning solvents are used in the manufacture of automotive parts, textiles, and garment. Carbon tetrachloride (CTC) is also used in some of these applications. In 1991, a total of 253 MT of CFC-113, 1,459 MT of TCA and 100 MT of CTC were consumed.

Ionics, which is 90% Philippine and 10% Taiwanese owned, is a contract manufacturer of mixed-technology (surface mount and plated through hole) circuit-card assemblies (CCA). Ionics currently manufactures approximately 260,000 CCAs per month on its seven production lines. Ionics currently cleans all of its parts using eight batch vapor degreasers, six using 98 MT of CFC-113 and two using 73 MT of TCA. A ninth batch vapor degreaser serves as a spare and is used when other units are taken out of service for maintenance. Due to the nature of the products manufactured, and the requirements of two of Ionics' larger customers, isolated manufacturing processes must be maintained for two customers. This implies that each of the isolated production lines must have its own cleaning equipment and operators.

PROJECT OBJECTIVES

The objective of this project is to eliminate the use of CFC-113 and TCA as a cleaning solvent through the use of aqueous and semi-aqueous cleaning technologies.

PROJECT DESCRIPTION

Ionics will eliminate its use of CFC-113 and TCA by dismantling and removing its existing vapor degreasers and installing aqueous and semi-aqueous cleaning equipment. One of the existing batch CFC-113 vapor degreasers will be replaced with a small in-line aqueous cleaning machine, while the seven remaining batch vapor degreasers will be replaced with four batch semi-aqueous machines. The ninth batch vapor degreaser (currently used as a spare) will be discarded and not replaced. The equipment proposed by Ionics will increase the production capacity of the facility from 400 CCA/hr to 1,250 CCA/hr. Ionics believes that it is important to use the selected equipment since it has already been approved by Ionics' largest customer. Furthermore, Ionics believes that four machines are needed in order to maintain isolated production lines for several customers. Ionics believes that the units being proposed are the smallest currently available. The project consists of the following elements:

- Process development and material compatibility testing
- Deionized water system installation
- Aqueous cleaning machine installation
- Batch semi-aqueous cleaning machines installation
- Water recycling system installation
- Wastewater treatment system installation
- Improvements to five current exhaust and ventilation systems

As these activities will result in several changes in operating practices, the project allows for system design and employee training.

PROJECT COSTS

The total project incremental cost of US$ 0.75 million was calculated as the economic investment costs plus the net incremental operating costs for four years discounted at 10%.

Investment costs of US$ 514,000 include capital investment in aqueous and semi-aqueous cleaning equipment, safety and environmental systems and engineering and training expenses.

Net incremental operating costs of US$ 236,000 are positive primarily because semi-aqueous solvent is more expensive than ozone-depleting solvents currently applied.

Local ownership fraction of 90% was considered to determine the amount of eligible OTF grant financing. The total project incremental cost was multiplied by the fraction of local ownership to determine the proposed grant amount.

Other costs. An additional US$ 20,000 (3%) was added to the grant request to cover the fee for services of the financial institution (FI) that will appraise the projects, oversee procurement, disbursement and audits. A 15% contingency was also included.

Ionics exports a large percentage of its production to developed countries, however, as the company is largely Filipino owned, unlike most electronic firms in the Philippines, it has no multinational parent company from whom it can obtain technical assistance or funding to aid it in eliminating CFC-113 and TCA in its production processes. The firm is not located in a "free-zone" and provides important jobs and revenue to the Philippines. In accordance with UNEP/OzL.Pro/ExCom/7/24/Corr.1, "Should the Fund Finance Activities Relating to Enterprises that are Wholly or Partly Owned by Transnational Corporations", this project should be considered for grant funding to "the local share of ownership" as requested.

PROJECT IMPLEMENTATION

Management: The Ozone Desk under DENR will coordinate with the financial institution (FI) to oversee and supervise implementation of this project. The FI is expected to appraise the project in June, following initial training, and signing of the grant agreement for transferring funds to the Philippines is expected in August.

ESTIMATED DISBURSEMENT: 30 % in 1993, and 70% in 1994.

TECHNICAL ASSESSMENT

Support for this project on its technical merits and cost effectiveness was endorsed by the OORG reviewer Mr. Art Fitzgerald. A copy of his review of the five solvents cleaning projects that are being simultaneously submitted is attached.

IONICS CIRCUITS

BREAKDOWN OF INVESTMENT COSTS

Estimated Costs in US Dollars

Training and Engineering:	
Material Compatibility, Safety and Process Development (500 hours)	$2,500
Equipment Training (500 hours)	$2,500
Equipment Installation -- Ionics Staff (500 hours)	$2,500
Consulting Engineering Support (material compatibility studies, installation assistance, and follow up)	$20,000
Water Supply:	
1 Deionized Water System, High Capacity (e.g. Culligan)	$97,000
Piping for Water Distribution	$1,000
Aqueous Cleaning System:	
1 In-line Aqueous Cleaning System (e.g. Thermoplus - Singapore)	$100,000
1 Reverse-Osmosis Water Recycling System (e.g. Separation Technologists Aquacycler)	$30,000
Equipment Installation -- Supplier Staff	$5,000
Semi-Aqueous Cleaning System:	
4 Batch Semi-Aqueous Cleaning Machines (e.g. Arakawa)	$129,000
Equipment Installation -- Supplier Staff	$20,000

IONICS CIRCUITS BREAKDOWN OF INVESTMENT COSTS (Continued)

Improvements to Safety and Environmental Systems	
Water Treatment System (includes equipment for treatment of solution used to clean and reactivate adsorption columns in water recycling equipment)	$50,000
5 Exhaust System Improvements	$10,000
Environmental Permit/Building Approvals	$4,000
Transportation:	
Shipping and Insurance	$40,000
TOTAL	$513,500

IONICS CIRCUITS- SCHEDULE

Quarter 1	Quarter 2	Quarter 3
- Evaluate alternative equipment models. - Evaluate alternative materials, including flux and solder (if necessary). - Evaluate alternative cleaning solutions to be used in the new equipment. - Run compatibility tests with selected equipment, materials, and cleaners to ensure adequate cleaning performance prior to purchase. - Secure necessary environmental and building permits. - Place orders for equipment and materials to be purchased.	- Dismantle and remove equipment which is to be replaced. - Receive and install new equipment. - Install piping system for distribution of deionized water from one source to five cleaning machines. - Make exhaust system improvements prior to operating newly installed equipment. - Install and test wastewater treatment equipment prior to operating new equipment. - Test new equipment performance and make necessary process changes to optimize cleaning process. - Train workers in the use of new equipment.	- Initiate use of new cleaning procedures. - Continuously monitor performance of new equipment and adjust as necessary.

Jessica Poppele
Consultant
The World Bank,
1818 H Street, NW,
Washington, DC
20433

Ref.: Philippine proposals for alternatives to ozone depleting substances

Dear Jessica,

I've completed my review of the five solvent proposals and the one tobacco industry proposal and make the following comments:

Electronic Assemblies

I note that provisions have been made for the use of surfactants or saponifiers in the in-line aqueous system in the body of the proposal and in the cost estimates. However, the Environmental Assessment in Annex 4 states that cleaning will be done without the aid of chemicals. This needs some clarification since the use of surfactants can impact the environment if waste water treatment facilities are not designed to treat them or in the event that treatment facilities are out of service.

Waste water treatment facilities (RO equipment) should incorporate facilities to handle any contaminated effluents in the event that the treatment facilities are inoperable.

I see no mention of the costs for nitrogen or nitrogen facilities in the estimates. They may be negligible but reference could be included.

Integrated Microelectronics

I have concerns about the proposed use of trichloroethylene or methylene chloride. Although controls are proposed to control emissions both chemicals will pose a continuing threat to employee health during the whole sequence of chemical receiving, storage, movement and handling. As well, there is a substantial risk posed to soil and ground water at the site. My personal involvement in site remediation efforts where soil and, in particular, ground water have been contaminated with these and similar solvents demonstrate that a few liters of accidentally spilled solvent have

resulted in millions of dollars of clean-up. I recommend that a safer alternative be considered which would substantially reduce risks associated with these solvents and the hazardous wastes that will be generated.

I note that no surfactants or saponifiers are proposed - this raises the question of whether these are required in the case of the Electronics Assemblies operations?

Ionics Circuits

Again there are no surfactants or saponifiers proposed - same question arises as in the previous paragraph.

Also, as with the Electronic Assemblies proposal, there is no reference to nitrogen costs and facilities.

Pacific Semiconductors

I have the same concerns here as I have with Integrated Microelectronics - perchloroethylene or methylene chloride from a safety and/or risk of contaminated soil and/or ground water. Efforts should be made to find alternatives that minimize these aspects and the issues attached to hazard waste management and disposal.

Solid Circuits

I don't have anything in particular for comments regarding this proposal.

General

While conversion costs per kilogram are quite high in the case of Electronic Assemblies ($27.05/kg) and relatively high in the case of Pacific Semiconductors ($13.97/kg) the average cost of converting the five companies is quite reasonable at $3.77/kg. It is interesting to note that the requested monies will eliminate approximately two-thirds of the CFC-113 use in the Philippines, and this is good.

I note that an ODP of 0.8 has been used throughout. Although I don't have reference documents with me at the moment I believe a

higher number has been in use since the 1990 amendments to the Protocol. Perhaps someone could check this.

I regret that I'm unable to offer much by way of comments on the proposal to displace CFC-11 from the tobacco processing operations. The consultant has confirmed that the monies requested are substantial but that the unit cost for conversion is attractive - I agree with these points. The requested monies would appear to use a substantial portion of the Protocol funds for a single project.

Regards,
Art FitzGerald

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To JESSICA POPPELE	From ABYD KARMALI
Co. WORLD BANK	Co.
Dept.	Phone #
Fax # 477 0685	Fax #

January 7, 1993

MEMORANDUM

TO: Jessica Poppele

FROM: Abyd Karmali and Peter Linquiti

SUBJECT: Responses to Art Fitzgerald's Queries

Mark forwarded us the complete set of comments on the Philippines feasibility studies. Based on the comments provided by both Mike Jeffs and Art Fitzgerald, we wish to confirm that there are no substantive issues that remain unresolved regarding Fortune Tobacco's proposal. The following information addresses each of Art Fitzgerald's comments regarding the solvents projects.

Electronic Assemblies, Inc. (EAI)

- The aqueous cleaning system will be designed for use with surfactants and will include an adequate combination of filters and membranes to achieve water cleanliness. The Environmental Assessment should be modified to include the use of surfactants as a part of the aqueous cleaning system.

- Two reverse osmosis machines are already being utilized at this facility. A third unit would be redundant. From a technical standpoint, therefore, we do not believe an additional unit is necessary. From a policy perspective, however, the World Bank must decide if backup equipment should be included in the investment proposal.

- Nitrogen costs, as well as the cost for water (estimated to be approximately $2 per year), are negligible, and therefore not included.

Integrated Microelectronics Inc. (IMI)

- We believe that, when all aspects are considered, TCE or methylene chloride are good candidates for use at IMI. The cleaning operation in question at IMI is primarily the precision cleaning of hard disc drives. The types of materials used in this operation are very susceptible to corrosion and are not good candidates for water-based cleaning. An alternative to TCE could be isopropanol, however this would introduce unwanted flammability concerns. The use of TCE or methylene chloride is preferred because IMI has tight equipment in place, the fact that the cleaning operation is in a remote room, and that the cleaning process will be automated. Additionally, room ventilation is to be increased and distillation and reuse of the solvent will be performed. The company handles many different chemicals on a daily basis in more than 5 different production

divisions. Proper training of the maintenance personnel will easily ensure that worker and environmental safety is not compromised. Finally, the U.S. EPA has recently endorsed the use of chlorinated solvents as replacements for ozone depleting solvents as long as the handling of the solvents meets all of the requirements of safe chemical handling. This is an aspect that DENR's EMB should be encouraged to monitor.

- Surfactants or saponifiers are not specified for use in the aqueous cleaning process because this company believes that it can achieve its cleaning goals without the use of such additives. The application in which the pure water is to be used is generally a cleaning operation to remove particulates and very light finger oils. Pure water has been demonstrated to remove these types of contaminants.

Ionics Circuits Inc. (Ionics)

- Surfactants or saponifiers are not specified for use in the cleaning of these components because Ionics' customer has specified that only pure water be used on the assemblies. Since the application is to remove flux form circuit-card assemblies, it is possible that the use of pure water may not be completely effective. This, however, is a matter that Ionics must ultimately resolve with its customer.

- As discussed under EAI, nitrogen and water costs are negligible.

Pacific Semiconductors, Inc. (Pacific)

- The response provided under IMI is also applicable here.

Solid Circuits, Inc. (Solid)

- No comments.

General

An ODP of 0.8 was used at DENR's request from the beginning of the study. Now that the Copenhagen meeting has confirmed the revised ODPs, the Bank may decide that it is more appropriate to use the revised ODPs.

* * * * *

Please give us a call if you have any other questions or comments.

The Montreal Protocol on Substances that Deplete the Ozone Layer

Philippines ODS Phase Out Investment Program

Project Cover Sheet

COUNTRY:	Philippines
PROJECT TITLE:	Conversion to Low-Emission Processing and Organic Solvents at Pacific Semiconductors, Inc.
SECTORS COVERED:	Solvent Cleaning
ODS CONSUMPTION IN SECTOR (1991):	445 MT ODP (253 MT CFC-113 & 1,459 MT TCA)
PROJECT IMPACT:	Phaseout 15 MT ODP per year (12 MT CFC-113 & 13 MT TCA)
PROJECT DURATION:	6 months
TOTAL PROJECT COST:	US$ 0.59 million Investment US$ 0.16 million Operating
PROPOSED OTF FINANCING:	US$710,000
COST EFFECTIVENESS:	$9.80/kg ODP/year[1]
NATIONAL COORDINATING AGENCY:	Department of Environment and Natural Resources (DENR)
IMPLEMENTING AGENCY:	The World Bank
APPRAISAL DATE:	June 1993

PROJECT SUMMARY

This project will eliminate the use of CFC-113 and TCA in the cleaning of electronic components, metallic lead frames, and other metal parts at Pacific Semiconductors Incorporated (Pacific). The phaseout will be accomplished by dismantling existing vapor degreasers and installing low-emissions vapor degreasers. Pacific currently uses two in-line CFC-113 vapor degreasers and three batch TCA vapor degreasers. The project will replace these five cleaning machines with five batch low-emission vapor degreasers. The cleaning solvent chosen for use in the machines will likely be perchloroethylene, dichloromethane, or another organic solvent. The project also provides for an automatic hoist and programmable controller for each vapor degreaser, engineering support and training, and exhaust system improvements. The conversion to non-ozone depleting technology will eliminate annual consumption of 12 MT of CFC-113 and 13 MT of TCA. This represents a reduction in national consumption levels of almost 5 percent and 0.9 percent, respectively.

[1] Investment costs were annualized over 10 years using 10% discount rate.

BACKGROUND

CFC-113 and 1,1,1-trichloroethane (TCA), are widely used by 40-50 electronics firms in cleaning applications in the Philippines. About one-quarter of these companies are partly or wholly Philippine owned while the remainder are owned by multinational firms. In addition, ODS cleaning solvents are used in the manufacture of automotive parts, textiles, and garment. Carbon tetrachloride (CTC) is also used in some of these applications. In 1991, a total of 253 MT of CFC-113, 1,459 MT of TCA and 100 MT of CTC were consumed.

Pacific, which is 80% Filipino and 20% Canadian-owned, manufactures circuit card assemblies (CCAs) and semiconductor products. Pacific currently uses five vapor degreasers in its cleaning operations. Two of these vapor degreasers are in-line and use CFC-113 as a cleaning solvent to clean electronic components, while the remaining three are batch and use TCA to clean metallic lead frames and other metal parts. In 1991, Pacific consumed 12 metric tons (MT) of CFC-113 and 13 MT of TCA. The company expects that its cleaning requirements will remain constant over the next few years.

PROJECT OBJECTIVES

The objective of this project is to eliminate the use of CFC-113 and 1,1,1-trichloroethane (TCA) in cleaning operations through the use of low-emission vapor degreasers and non-ozone depleting cleaning solvents.

PROJECT DESCRIPTION

For this project, Pacific Semiconductors will eliminate its use of CFC-113 and TCA by removing existing vapor degreasers and replacing them with low-emissions vapor degreasers. The capacity of the equipment to be purchased is approximately the same as the existing CFC-113 and TCA vapor degreasers. The conversion to non-ozone depleting technology consists of the following elements:

- Process development and material compatibility tests
- Low-emission vapor degreasers and control installation
- Exhaust system improvements
- Employee training

Prior to the purchase of new cleaning equipment, Pacific Semiconductor will perform material compatibility and process development tests to select the optimal cleaning equipment and cleaning solvents. The company will evaluate items such as changes in worker function and compatibility of materials with the new solvents. In addition, the company will compare the effectiveness of the single solvent system, where only one solvent is necessary to clean and dry parts, with that of the cosolvent system, where a primary solvent cleans the parts and a secondary solvent is used for rinsing and drying. Solvents that have been used effectively as substitutes for CFC-113 and TCA in cleaning include perchloroethylene, methylene chloride, fluorinated hydrocarbons, and other organic solvents. After the new cleaning equipment has been purchased and installed, additional tests may have to be performed to optimize the cleaning process.

In order to reduce its employees' exposure to solvent vapors and to reduce the quantity of solvent lost through evaporation, Pacific Semiconductor will purchase a robot hoist and associated control equipment for each of the low-emission vapor degreasers. The use of the robot arm minimizes agitation to the vapor blanket within the degreaser, thus reducing solvent loss. Improvements to the existing exhaust and ventilation system will also be made in the five vapor degreasing operations. This will serve to enhance worker safety and improve environmental practices.

PROJECT COSTS

The total project incremental cost of US$ 0.6 million was calculated as the economic investment costs plus the net incremental operating costs for four years discounted at 10%.

Investment costs of US$ 585,000 include capital investment in low-emission vapor degreasers, safety and environmental systems and engineering and training expenses.

Net incremental operating costs of US$ 163,000 are positive primarily because the degreasing solvent is more expensive than ozone-depleting solvents currently applied.

Local ownership fraction of 80% was considered to determine the amount of eligible OTF grant financing. The total project incremental cost was multiplied by the fraction of local ownership to determine the proposed grant amount.

Other costs. An additional US$ 20,000 (3%) was added to the grant request to cover the fee for services of the financial institution (FI) that will appraise the projects, oversee procurement, disbursement and audits. A 15% contingency was also included.

Pacific exports a large percentage of its production to developed countries, however, as the company is largely Filipino owned, unlike most electronic firms in the Philippines, it has no multinational parent company from whom it can obtain technical assistance or funding to aid it in eliminating CFC-113 and TCA in its production processes. The firm is not located in a "free-zone" and provides important jobs and revenue to the Philippines. In accordance with UNEP/OzL.Pro/ExCom/7/24/Corr.1, "Should the Fund Finance Activities Relating to Enterprises that are Wholly or Partly Owned by Transnational Corporations", this project should be considered for grant funding to "the local share of ownership" as requested.

PROJECT IMPLEMENTATION

Management: The Ozone Desk under DENR will coordinate with the financial institution (FI) to oversee and supervise implementation of this project. The FI is expected to appraise the project in June, following initial training, and signing of the grant agreement for transferring funds to the Philippines is expected in August.

ESTIMATED DISBURSEMENT: 30 % in 1993, and 70% in 1994.

TECHNICAL ASSESSMENT

Support for this project on its technical merits and cost effectiveness was endorsed by the OORG reviewer Mr. Art Fitzgerald. A copy of his review of the five solvents cleaning projects that are being simultaneously submitted is attached. Mr. Fitzgerald's environmental queries are addressed in an attached memo prepared by the consulting firm, ICF, that assisted in preparation of the projects.

PACIFIC SEMICONDUCTORS

BREAKDOWN OF INVESTMENT COSTS

Estimated Costs in US Dollars

Training and Engineering:	
Material Compatibility, Safety and Process Development (500 hours)	$2,500
Equipment Training (500 hours)	$2,500
Equipment Installation -- Pacific Staff (250 hours)	$1,250
Consulting Engineering Support (material compatibility testing, installation assistance and follow up)	$17,000
Low Emission Vapor Degreasers:	
5 Low emission units with spray lance, direct cooling systems, and work platform	$375,000
5 Automatic Hoists and Programmable Controllers	$100,000
Equipment Installation -- Supplier Staff	$25,000
Improvements to Safety and Environmental Systems:	
5 Exhaust System Improvements	$10,000
Environmental Permit/Building Approvals	$2,000
Transportation:	
Shipping and Insurance	$50,000
TOTAL	$585,250

PACIFIC SEMICONDUCTORS- SCHEDULE

Quarter 1	Quarter 2	Quarter 3
- Evaluate alternative low-emission vapor degreaser models. - Evaluate alternative solvents being considered for use in the new vapor degreasers. - Run compatibility tests with selected equipment, materials, and solvents to ensure adequate cleaning performance prior to purchase. - Determine whether the new systems willbe run using a single solvent or a co-solvent system. - Secure necessary environmental and building permits. - Place orders for equipment and materials to be purchased.	- Dismantle and remove equipment which is to be replaced. - Receive and install new equipment. - Make exhaust system improvements prior to operating newly installed equipment. - Test new equipment performance and make necessary process changes to optimize cleaning process. - Train workers in the use of new equipment.	- Initiate use of new cleaning procedures. - Continuously monitor performance of new equipment and adjust as necessary.

The Montreal Protocol on Substances that Deplete the Ozone Layer

Philippines ODS Phase Out Investment Program

Project Cover Sheet

COUNTRY:	Philippines
PROJECT TITLE:	Conversion to Semi-Aqueous and Aqueous Cleaning Solvents at Electronic Assemblies, Inc.
SECTORS COVERED:	Solvent Cleaning
ODS CONSUMPTION IN SECTOR (1991):	445 MT ODP (253 MT CFC-113 & 1,459 MT TCA)
PROJECT IMPACT:	Phaseout 5 MT ODP per year (5 MT CFC-113)
PROJECT DURATION:	6 months
TOTAL PROJECT COST:	US$ 0.56 million Investment US$ 0.04 million Operating
PROPOSED OTF FINANCING:	US$ 710,000
COST EFFECTIVENESS:	$20.75/kg ODP/year[1]
NATIONAL COORDINATING AGENCY:	Department of Environment and Natural Resources (DENR)
IMPLEMENTING AGENCY:	The World Bank
APPRAISAL DATE:	June 1993

PROJECT SUMMARY

This project will eliminate the use of CFC-113 in the cleaning of electronic circuit cards at Electronic Assemblies Incorporated (EAI). The phaseout will be accomplished by dismantling existing vapor degreasers and installing aqueous and semi-aqueous cleaning equipment. EAI currently uses three batch CFC-113 vapor degreasers in its cleaning operations. The project will replace these three batch machines with one in-line aqueous cleaning machine and one in-line semi-aqueous cleaning machine. The project also provides for engineering support and training, exhaust system improvements, and appropriate wastewater treatment facilities. The conversion to non-ozone depleting technology will eliminate annual consumption of 4.8 MT of CFC-113. This represents a reduction in national consumption levels of almost 2 percent.

[1] Investment costs annualized over 10 years using 10% discount rate.

BACKGROUND

CFC-113 and 1,1,1-trichloroethane (TCA), are widely used by 40-50 electronics firms in cleaning applications in the Philippines. About one-quarter of these companies are partly or wholly Philippine owned while the remainder are owned by multinational firms. In addition, ODS cleaning solvents are used in the manufacture of automotive parts, textiles, and garment. Carbon tetrachloride (CTC) is also used in some of these applications. In 1991, a total of 253 MT of CFC-113, 1,459 MT of TCA and 100 MT of CTC were consumed.

EAI, which is 100% Filipino owned, manufactures mixed-technology and circuit-card assemblies (CCA). EAI currently manufactures approximately 95,000 CCAs per month, but expect production to grow to over 350,000 CCAs per month in 1993. The CCAs are used in manufacturing locally, as well as in Japan, France, and the United States. All of the CCAs manufactured by EAI are cleaned using CFC-113/alcohol blends in conventional vapor degreasing equipment. In 1991, EAI used approximately 5 MT of CFC-113 in its three batch vapor degreasing operations. Three MT of the CFC-113 were used in a high-volume vapor degreaser and 2 MT were used in two low-volume degreasers.

PROJECT OBJECTIVES

The objective of this project is to eliminate the use of CFC-113 as a cleaning solvent through the use of aqueous and semi-aqueous cleaning technologies.

PROJECT DESCRIPTION

As a part of this project, EAI will eliminate its use of CFC-113 by removing and dismantling its existing vapor degreasers and installing aqueous and semi-aqueous cleaning equipment. The high-volume batch vapor degreaser will be replaced with an in-line semi-aqueous cleaning machine and the two low-volume batch vapor degreasers will be replaced with an in-line aqueous machine. The proposed equipment will have approximately the same cleaning capacity as the existing equipment. The project consists of the following elements:

- Process development and material compatibility testing
- Delonized water system installation
- High-volume aqueous cleaning machine installation
- High-volume semi-aqueous cleaning machine installation
- Ionic contamination tester installation
- Water decanter installation
- Water recycling systems installation
- Wastewater treatment system installation
- Exhaust and ventilation system improvements
- Employee training

Process development and material compatibility testing will be performed by EAI prior to the purchase of cleaning equipment in order to choose the best equipment for a particular process. After the new cleaning equipment has been purchased and installed, additional process evaluation and compatibility testing may be required to optimize the cleaning process. A deionized water system will be purchased to provide pure water. To minimize wastewater, EAI will install a reverse-osmosis water recycling system with each of the aqueous and semi-aqueous cleaning machines. After the water has been through the recycling system, it is ready to be reused in the aqueous and semi-aqueous cleaning machines.

PROJECT COSTS

The total project incremental cost of US$ 0.6 million was calculated as the economic investment costs plus the net incremental operating costs for four years discounted at 10%.

Investment costs of US$ 585,000 include capital investment in low-emission vapor degreasers, safety and environmental systems and engineering and training expenses.

Net incremental operating costs of US$ 163,000 are positive primarily because the degreasing solvent is more expensive than ozone-depleting solvents currently applied.

Other costs. An additional US$ 20,000 (3%) was added to the grant request to cover the fee for services of the financial institution (FI) that will appraise the projects, oversee procurement, disbursement and audits. A 15% contingency was also included.

EAI exports a large percentage of its production to developed countries, however, as the company is 100% Filipino owned, unlike most electronic firms in the Philippines, it has no multinational parent company from whom it can obtain technical assistance or funding to aid it in eliminating CFC-113 and TCA in its production processes. The firm is not located in a "free-zone" and provides important jobs and revenue to the Philippines. In accordance with UNEP/OzL.Pro/ExCom/7/24/Corr.1, "Should the Fund Finance Activities Relating to Enterprises that are Wholly or Partly Owned by Transnational Corporations", this project should be considered for grant funding to "the local share of ownership" as requested.

PROJECT IMPLEMENTATION

Management: The Ozone Desk under DENR will coordinate with the financial institution (FI) to oversee and supervise implementation of this project. The FI is expected to appraise the project in June, following initial training, and signing of the grant agreement for transferring funds to the Philippines is expected in August.

ESTIMATED DISBURSEMENT: 30 % in 1993, and 70% in 1994.

TECHNICAL ASSESSMENT

Support for this project on its technical merits and cost effectiveness was endorsed by the OORG reviewer Mr. Art Fitzgerald. A copy of his review of the five solvents cleaning projects that are being simultaneously submitted is attached. Mr. Fitzgerald's environmental queries are addressed in an attached memo prepared by the consulting firm, ICF, that assisted in preparation of the projects.

ELECTRONIC ASSEMBLIES

BREAKDOWN OF INVESTMENT COSTS

Estimated Costs in US Dollars

Training and Engineering:	
Material Compatibility, Safety and Process Development (200 hours)	$1,000
Equipment Training (200 hours)	$1,000
Equipment Installation -- EAI Staff (200 hours)	$1,000
Consulting Engineering Support (material compatibility assistance, on-site installation support, project follow up)	$5,000
Water Supply:	
1 Deionized Water System, Medium Capacity (e.g. Culligan)	$25,000
Aqueous Cleaning System:	
1 In-Line Aqueous Cleaning Machine (e.g. Hollis)	$150,000
1 Reverse Osmosis Water Recycling Systems (e.g. Separation Technologists Aquacycler)	$30,000
Equipment Installation -- Supplier Staff	$5,000
Semi-Aqueous Cleaning System:	
1 In-Line Semi-Aqueous Cleaning Machine (e.g. Vitronics SA 3000)	$150,000
1 Water/Solvent Decanter (e.g. Simon)	$10,000
1 Reverse Osmosis Water Recycling Systems (e.g. Separation Technologists Aquacycler)	$70,000
Equipment Installation -- Supplier Staff	$5,000
Ionic Contamination Tester (e.g., Omegameter 600 SMD)	$15,000

ELECTRONIC ASSEMBLIES BREAKDOWN OF INVESTMENT COSTS (Continued)

Improvements to Safety and Environmental Systems:	
Water Treatment System (includes equipment for treatment of solution used to clean and reactivate adsorption columns in water recycling equipment)	$50,000
2 Exhaust System Improvements	$4,000
Environmental Permit/Building Approvals	$4,000
Transportation:	
Shipping and Insurance	$40,000
TOTAL	$566,000

ELECTRONIC ASSEMBLIES- SCHEDULE

Quarter 1	Quarter 2	Quarter 3
- Evaluate alternative equipment models. - Evaluate alternative materials, including flux and solder (if necessary). - Evaluate alternative cleaning solutions to be used in the new equipment. - Run compatibility tests with selected equipment, materials, and cleaners to ensure adequate cleaning performance prior to purchase. - Secure necessary environmental and building permits. - Place orders for equipment and materials to be purchased.	- Dismantle and remove equipment which is to be replaced. - Receive and install new equipment. - Make exhaust system improvements prior to operating newly installed equipment. - Install and test wastewater treatment equipment prior to operating new equipment. - Test new equipment performance and make necessary process changes to optimize cleaning process. - Train workers in the use of new equipment.	- Initiate use of new cleaning procedures. - Continuously monitor performance of new equipment and adjust as necessary.

The Montreal Protocol on Substances that Deplete the Ozone Layer

Philippines ODS Phase Out Investment Program

Project Cover Sheet

COUNTRY:	Philippines
PROJECT TITLE:	Conversion to High-Purity Water Cleaning at Integrated Microelectronics
SECTORS COVERED:	Solvent Cleaning
PROJECT DURATION:	Six months
PROJECT IMPACT:	20 MT ODP (19 MT CFC-113)
TOTAL PROJECT COST:	US$ 0.55 million Investment US$ (0.18) million Operating
COST EFFECTIVENESS:	$1.65/kg ODP/year[1]
PROPOSED OTF FINANCING:	US$ 430,000
NATIONAL COORDINATING AGENCY:	Department of Environment and Natural Resources (DENR)
IMPLEMENTING AGENCY:	The World Bank

PROJECT SUMMARY

This project will eliminate the use of CFC-113 in the cleaning of a wide variety of electronic devices and metal parts at Integrated Microelectronics Incorporated (IMI). Products manufactured by IMI include pulse transformers, coils, hard disk drives, and spare parts for disk drives. The phaseout will be accomplished using two distinct alternative processes. IMI currently uses one in-line CFC-113 vapor degreaser and one batch CFC-113 vapor degreaser in its cleaning operations. The project will replace the high volume in-line vapor degreaser with a high-volume in-line aqueous cleaning machine, while retrofitting the batch vapor degreaser for use with a non-ozone depleting chlorinated solvent. The chlorinated solvent to be used will most likely be methylene chloride or trichloroethylene, and the retrofits will aid in reducing emissions from the machine to extremely low levels. The project also provides for engineering support and training, exhaust system improvements, and appropriate wastewater treatment facilities. The conversion to non-ozone depleting technology will eliminate an annual consumption of 18.7 MT of CFC-113. This represents a reduction in national consumption levels of almost 8 percent. The OORG review for this project is attached.

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[1] Investment costs annualized over 10 years using 10% discount rate.

The Montreal Protocol on Substances that Deplete the Ozone Layer

Philippines ODS Phase Out Investment Program

Project Cover Sheet

COUNTRY:	Philippines
PROJECT TITLE:	Conversion to Semi-Aqueous Cleaning Solvents at Solid Circuits
SECTORS COVERED:	Solvent Cleaning
PROJECT DURATION:	Six months
PROJECT IMPACT:	4 MT ODP (4 MT CFC-113)
TOTAL PROJECT COST:	US$ 90,000 Investment US$ (34,000) Operating
COST EFFECTIVENESS:	$0.91/kg ODP/year[1]
PROPOSED OTF FINANCING:	US$ 70,000
NATIONAL COORDINATING AGENCY:	Department of Environment and Natural Resources (DENR)
IMPLEMENTING AGENCY:	The World Bank

PROJECT SUMMARY

This project will eliminate the use of CFC-113 in the cleaning of specialty electronic components at Solid Circuits Incorporated (Solid). The phaseout will be accomplished by dismantling Solid's existing batch CFC-113 vapor degreaser and installing a batch semi-aqueous cleaning machine. The project also provides for a closed-loop water rinsing system, a drying oven, exhaust system improvements, and engineering support and training. The conversion to non-ozone depleting technology will eliminate an annual consumption of 4 MT of CFC-113. This represents a reduction in national consumption levels of 1.5 percent. The OORG review for this project is attached.

[1] Investment costs annualized over 10 years using 10% discount rate.

The Montreal Protocol on Substances that Deplete the Ozone Layer

Philippines ODS Phase Out Investment Program

Project Cover Sheet

COUNTRY:	Philippines
PROJECT TITLE:	Establishment of Central Recycling Scheme in Metro Manila
SECTORS COVERED:	Refrigeration
PROJECT DURATION:	Two years
PROJECT IMPACT:	63 MT ODP (55 MT CFC-12 & 8 MT CFC-11)
TOTAL PROJECT COST:	US$ 415,000
PROPOSED OTF FINANCING:	This request is for **permission to proceed**; no funding is requested at this time. This project will be submitted to the EC at its next meeting for funding approval of about US$ 500,000.
NATIONAL COORDINATING AGENCY:	Department of Environment and Natural Resources (DENR)
IMPLEMENTING AGENCY:	The World Bank

PROJECT SUMMARY

This OTF request is for permission to proceed on final preparation of a project proposal to develop a central recycling scheme in Metro Manila. Although a sound technical scheme has been developed for this project, a detailed plan by the organization that will manage the project is still being prepared. The project will be ready for submission to the next EC meeting at which time funding will be requested. The Appliance Service Association of the Philippines (ASAP) would run the center by providing users with dedicated recovery cylinders for the collection of refrigerant. Recovered refrigerant will be bought by the scheme and reclaimed refrigerant will be sold to users for about 15% less than the market price for imported refrigerant. The OORG review for a preliminary version of this project is attached.

SIMONE MANAGEMENT INC.

7425 West Chester Pike
Upper Darby, PA 19082
(215) 352-4600

DATE: December31, 1992

TO: The World Bank Fax# 202-477-0685
Jessica Poppele
Consultant, Industry, Trade and Finance Division
Asia Technical Department

FROM: Simon Oulouhojian, OORC Member
Simone Managemant, Inc.

SUBJECT: Philippines Project Review

1) My chief concern is the way Mobile Air Conditioning repairs are done in most Asian countries. They have, for years, just topped off Mobile Air Conditioning Systems without fixing leaks. This program must address "leak detection". MACS shops should have leak detection equipment and serious training along with CFC handling and recycling.

2) Control overall refrigerant sales so that cross contamination can be avoided. The recycling machines cannot seperate mixed refrigerants.

3) Legislation and regulation - with duty or tax is key to the success of this project. I understand, currently duty is computed based on producer country cost. The current price for December 1992 is approximately .82 per pound. Without a higher price, I believe this project cannot succeed.

4) I cannot stress enough, the need for a strong training program to promote a higher proficiency level for MACS technicians.

CONCLUSION: With all the above being addressed, this could be a model program.
Legislation/Regulation
Duty/Price Increase
Leak Detection/Training/Repair
Control of Refrigerants/Avoiding Cross Contamination

The Montreal Protocol on Substances that Deplete the Ozone Layer

Philippines ODS Phase Out Investment Program

Project Cover Sheet

COUNTRY:	Philippines
PROJECT TITLE:	MAC Recycling Scheme
SECTORS COVERED:	Air-Conditioning
PROJECT DURATION:	Two years
PROJECT IMPACT:	60 MT CFC-12
TOTAL PROJECT COST:	US$ 490,000
PROPOSED OTF FINANCING:	This request is for **permission to proceed**; no funding is requested at this time. This project will be submitted to the EC at its next meeting for funding approval of about US$ 580,000.
NATIONAL COORDINATING AGENCY:	Department of Environment and Natural Resources (DENR)
IMPLEMENTING AGENCY:	The World Bank

PROJECT SUMMARY

This OTF request is for permission to proceed on final preparation of a project proposal to develop a mobile air-conditioning (MAC) recycling scheme for the Philippines. Although a sound technical scheme has been developed for this project, a detailed plan by the organization that will manage the project is still being prepared. The project will be ready for submission to the next EC meeting at which time funding will be requested. The Philippines Association of Suppliers and Parts Installers (PASAPI) will purchase 100 MAC refrigerant recovery machines and lease them at nominal rates to MAC service centers in the Philippines; seventy-five in the Metro Manila area and the rest split between Cebu and Davao. The operation of these units will be monitored and the data obtained will form the basis of promotion to the remaining MACs service centers in the country. The OORG review for a preliminary version of this project is attached.

The Montreal Protocol on Substances that Deplete the Ozone Layer

Philippines ODS Phase Out Investment Program

Project Cover Sheet

COUNTRY:	Philippines
PROJECT TITLE:	Conversion from CFC-12 to HFC-134a Refrigerant in Household Refrigerators at Philippines Appliance Corporation (Phase I)
SECTORS COVERED:	Refrigeration
PROJECT DURATION:	Two years
PROJECT IMPACT:	55 MT CFC-12 (upon full conversion to HFC-134a)
TOTAL PROJECT COST:	Phase I US$ 1,240,000 Investment
PROPOSED OTF FINANCING:	This request is for **permission to proceed**; no funding is requested at this time. Phase I of this project to the EC at its next meeting for funding approval of about US$ 890,000.
NATIONAL COORDINATING AGENCY:	Department of Environment and Natural Resources (DENR)
IMPLEMENTING AGENCY:	The World Bank

PROJECT SUMMARY

This OTF request is for permission to proceed on final preparation of a project proposal to develop HFC-134a refrigerator production capability at Philippines Appliances Corporation (Philacor - 61% Philippine owned). The technical program for the project, especially the technology transfer arrangements, are being completed by the enterprise in accordance with the OORG reviewer's comments. Phase I of the project will be ready for submission to the next EC meeting at which time funding will be requested. Phase I of the project would lead to the conversion of an existing CFC based refrigerator manufacturing facility at Philacor to production of refrigerators using HFC-134a as the working fluid. In Phase I, about 650 prototype and test refrigerators would be produced and recovery/reclamation procedures would be adopted for servicing in-plant defective CFC-12 refrigerators. Phase I would provide equipment needed to convert one of Philacor's three production lines to the manufacturer of HFC-134a units. Equipment for the remaining two lines and the incremental operating costs for production of HFC-134a refrigerators would be included in a Phase II project. The full project when completed would provide a major indigenous source of non-ODS domestic refrigerators for the Philippine market. Technology for the non-ODS refrigerators would be transferred by the Philacor's parent company, General Electric. The OORG review for a preliminary version of this project is attached.

Philippines Republic
REVIEW OF FOUR PROJECT SUMMARIES
Conversion of Domestic Manufacturing to HFC-134a

Project Proposals by The World Bank, December 1992

1. **Introduction of recovery/ recycle equipment and the conversion process to HFC-134a at CONCEPCION Industries;**
2. **Idem, at FEDERAL ELECTRIC Industries;**
3. **Idem, at PHILACOR Industries;**
4. **Idem, at SANYO Industries.**

Kuijpers, LJM (OORG)
Eindhoven, 1993 01 04
RWR-570-LK-93005 -lk

REVIEW OF THE FOUR PROPOSALS

1. Recommendations

All project descriptions propose a phased approach, however, it is not clear what the differences between the two phases is, since all decisions are taken in the first phase. Furthermore, the component that describes training and technology transfer in the first phase does not guarantee a low risk conversion; it should deal with this aspect more elaborately Moreover, in contrast to to the OORG recommendation that technology transfer is of utmost importance and should be within the framework of existing relationships, this condition is not satisfied in an appropriate way.
It is not at all certain whether the way of investigating "pilot-scale" production on one production line (as proposed several times) will be the adequate one.
There are (too) large differences between the separate proposals concerning investment and operating costs (investments varying from US $22,- to US $112,- per kg ODS/phased out).
It is recommended to consider financing of a first phases, however, not until more clarity, in particular on (better) technology transfer and costs, has been given in revised proposals.

2. Relevance and adequacy of information provided

All four project proposals contain the same general description why and how the conversion should be made. It may be so that -as stated- the firms may test and optimize HFC-134a's behaviour, but one **will be completely dependent on the compressor manufacturer that will deliver.**
It is stated that the desiccant is a major problem; this will not be the case, taking into account experiences in the majority of the developed countries. **Compressor compatibility testing** is stated to be required; in principle this **should be done at the compressor manufacturer's site.** It will certainly not result in the "use of the proper displacement, motor output and construction materials of the compressor". Heat exchangers, oils, piping and control systems are stated to require testing. If adequate oil is provided together with the compressor it is the manufacturing process that needs to be screened. It is questionable whether appropriate testing of HFC-134a can be done in a surrounding where there is still substantial CFC-12 production.
Summarizing, too many questions are left open.

The projects describe a two phase approach, however, phase one comprises training, decisions on investments, investments, actually everything, phase two is (only) the full conversion to HFC-134a along paths which have been set out in the first phase, and cannot be seen as a separate "phase two".

Furthermore, all project descriptions lack the "certainty" in the conversion that can be found in the OORG "definitive recommendations":

- conversions should be phased, with the **first phase encompassing pilot production, with emphasis on reliability;**
- effective HFC-134a technology transfer is of utmost importance and should be within the framework of existing working relationships or agreements with technology suppliers established for this purpose.

The effective transfer is not guaranteed in most of the proposals, since only the delivery of (reliable) HFC-134a compressors is no guarantee for transfer. Moreover, on the compressor suppliers one finds statements like "is currently designing and testing an HFC-134a compressor", "begin negotiations with another compressor supplier, it expects that this one will be able". This is at least no firm working relationship.
The above maybe does not hold for the Sanyo company where the parent company is currently bringing HFC-134a technology to the desired level of reliability, and could transfer this to daughters in developing countries. However, it is not dealt with in the proposal.
Apart from the fact that **the relation with the compressor manufacturers should be much more clearly outlined,** the same holds for the licensing operation from the Admiral company which has not yet started (how can this ever be an existing working relationship). What would be interesting as well is to get more information , in the case of one company (Philacor), on whether the (partial) US ownership implies participation of an appliance company or just capital.

The investments in recover and recycle equipment may be useful and cost effective (see under 4). However, data on how many repairs are being done in the manufacturing process at the different manufacturers are lacking, and would be useful (it cannot be so that it is 10% for all of the manufacturers considered). Furthermore it is so that one should bear in mind that this equipment will only be useful as long as there is CFC-12 production (for costs and the differences in costs see further below).

3. Technical soundness

In the Philippines, 15% of the CFC consumption is used in refrigeration (and a high percentage of 20% in MAC, where recover and recycle makes sense at short notice), of which 5.5% in domestic appliance manufacturing and servicing. One should realize that the four projects proposed aim at a reduction of -in total- 3% of today's consumption of CFCs in the Philippines. Although export figures given for the companies concerned are low (for which an early conversion would be less needed), conversion will be useful for public awareness, but most of all for the fact that shortages in supplies can be expected in the course of this decade (although the proposals do not mention the chemical suppliers to the appliance manufacturers concerned).

As stated under 2, **whether all compressor manufacturers are ready to support a so far not commercial operation is questionable. For this reason a more clear description of what a first phase should contain is required.** And, as far as technology transfer is concerned, this more elaborate description applies in paticular to training.

In the proposals, introduction of HFC-134a is stated to be guaranteed by training a number of engineers during a couple of days (30 days in total for a firm producing 8,000 units and 32 days for a firm producing 70,000 units). This training should be done by technicians "familiar with HFC-134a systems". However, where can these be found ? Should this not be the basic element in the description how technology transfer is being done ? Maybe for this reason, one proposal (Philacor) introduces an "assessment team", a so called "refrigerant transition team", during the first phase; nevertheless, apart from obtaining exeperience in the field, where do these persons gather the necessary knowledge ?

4. Cost effectiveness

A number of questions apply to the costs presented:

1. Training should be an essential component in building up the necessary experience; in the proposals it is generally estimated at less than 5% of the total investment, which can be considered much too low. However, when specific higher costs are mentioned, it requires a definition of the working relationship with other institutes or firms.
2. It is not clear why the costs per kg of CFCs phased out should vary so widely from USD 112.50 (Concepcion) down to 30, 28.50 and 22.00 (Philacor).
   Careful consideration of the costs for evacuation equipment (only assumed to be needed in one case), oil and refrigerant charging equipment (varying from 20 to 360,000 and calorimeter tests does not yield further insights.
3. Incremental operating costs are stated to be caused by more expensive refrigerants and components. Next to giving a comparison of refrigerant prices, more information on the costs of the components assumed for the 15 year period is absolutely necessary. It is not at all clear why e.g. a capillary tube should be more expensive for HFC-134a than for CFC-12.
4. Furthermore, the variation in incremental operating costs is enormous, and varies from around USD 12.00 (Fied Electric) via USD 35.00 (Concepcion/Philacor) to the order of USD 120.00 (Sanyo). This needs more information and/or a more precise definition.
5. All investment costs occur in the first phase; which is questionable taking into account the phased approach proposed.
   Next, in several proposals it is mentioned that one production line (out of two or three) will be used for testing HFC-134a appliances. Can the respective manufacturers maintain their production level in this way. And if not, what would be the cost involved in buying appliances outside (or from imports).
6. The investment in recover and recycle equipment varies widely, from USD 2-3,000 to USD 65,000 for recycle and reclamation (Concepcion). On which considerations these figures are based on and how can a value of USD 52.00 per kg of CFCs phased out (as in the case of Concepcion) be cost-effective (for only three to four years at maximum) ?

As far as the total investment in all proposals is concerned, the order of magnitude may be all right. However, at least the training component needs to be increased substantially, maybe other components reduced (as e.g. in the case of Concepcion), and recover and recycle should be considered as to cost effectiveness (maybe separated from the conversion proposals).

A critical question should be asked here. What is the critical production level of a firm in order to accelerate as much as possible the conversion to HFC-134a ? In particular when working relationships with others in the developed countries exist, and imports -during a certain period of time- could make the conversion to HFC-134a (at a later stage) to a lower risk.

Eindhoven, 4 January 1993

L.J.M. Kuijpers

The Montreal Protocol on Substances that Deplete the Ozone Layer

Philippines ODS Phase Out Investment Program

Project Cover Sheet

COUNTRY:	Philippines
PROJECT TITLE:	Conversion from CFC-12 to HFC-134a Refrigerant in Household Refrigerators at Concepcion Industries (Phase I)
SECTORS COVERED:	Refrigeration
PROJECT DURATION:	Two years
PROJECT IMPACT:	17 MT CFC-12 (upon full conversion to HFC-134a)
TOTAL PROJECT COST:	Phase I US$ 900,000 Investment
PROPOSED OTF FINANCING:	This request is for **permission to proceed**; no funding is requested at this time. Phase I of this project to the EC at its next meeting for funding approval of about US$ 1.06 million.
NATIONAL COORDINATING AGENCY:	Department of Environment and Natural Resources (DENR)
IMPLEMENTING AGENCY:	The World Bank

PROJECT SUMMARY

This OTF request is for permission to proceed on final preparation of a project proposal to develop HFC-134a refrigerator production capability at Concepcion. The technical program for the project, especially the technology transfer arrangements, are being completed by the enterprise in accordance with the OORG reviewer's comments. Phase I of the project will be ready for submission to the next EC meeting at which time funding will be requested. Phase I of the project would lead to the conversion of an existing CFC based refrigerator manufacturing facility at Concepcion to production of refrigerators using HFC-134a as the working fluid. In Phase I, about 20 prototype and test refrigerators would be produced and recovery/reclamation procedures would be adopted for servicing in-plant defective CFC-12 refrigerators. Phase I would provide equipment needed to convert one of Concepcion's two production lines to the manufacturer of HFC-134a units. Equipment for the remaining line and the incremental operating costs for production of HFC-134a refrigerators would be included in a Phase II project. The full project when completed would provide a major indigenous source of non-ODS domestic refrigerators for the Philippine market. Technology for the non-ODS refrigerators would be transferred by Concepcion's compressor supplier, Matsushita. The OORG review for a preliminary version of this project is attached.

The Montreal Protocol on Substances that Deplete the Ozone Layer

Philippines ODS Phase Out Investment Program

Project Cover Sheet

COUNTRY:	Philippines
PROJECT TITLE:	Conversion from CFC-12 to HFC-134a Refrigerant in Household Refrigerators at Sanyo Philippines (Phase I)
SECTORS COVERED:	Refrigeration
PROJECT DURATION:	Two years
PROJECT IMPACT:	6 MT CFC-12 (upon full conversion to HFC-134a)
TOTAL PROJECT COST:	Phase I US$ 180,000 Investment
PROPOSED OTF FINANCING:	This request is for **permission to proceed**; no funding is requested at this time. Phase I of this project to the EC at its next meeting for funding approval of about US$ 150,000.
NATIONAL COORDINATING AGENCY:	Department of Environment and Natural Resources (DENR)
IMPLEMENTING AGENCY:	The World Bank

PROJECT SUMMARY

This OTF request is for permission to proceed on final preparation of a project proposal to develop HFC-134a refrigerator production capability at Sanyo Philippines (70% Philippine owned). The technical program for the project, especially the technology transfer arrangements, are being completed by the enterprise in accordance with the OORG reviewer's comments. Phase I of the project will be ready for submission to the next EC meeting at which time funding will be requested. Phase I of the project would lead to the conversion of an existing CFC based refrigerator manufacturing facility at Sanyo to production of refrigerators using HFC-134a as the working fluid. In Phase I, about 20 prototype and test refrigerators would be produced and recovery/reclamation procedures would be adopted for servicing in-plant defective CFC-12 refrigerators. Phase I would provide equipment needed to charge and test prototype HFC-134a refrigerators. Equipment for the production line and the incremental operating costs for production of HFC-134a refrigerators would be included in a Phase II project. The full project when completed would provide a major indigenous source of non-ODS domestic refrigerators for the Philippine market. Technology for the non-ODS refrigerators would be transferred by Sanyo Philippines's parent company, Sanyo from whom it also buys compressors. The OORG review for a preliminary version of this project is attached.

The Montreal Protocol on Substances that Deplete the Ozone Layer

Philippines ODS Phase Out Investment Program

Project Cover Sheet

COUNTRY:	Philippines
PROJECT TITLE:	Conversion from CFC-12 to HFC-134a Refrigerant in Household Refrigerators at Federal Electric (Phase I)
SECTORS COVERED:	Refrigeration
PROJECT DURATION:	Two years
PROJECT IMPACT:	5 MT CFC-12 (upon full conversion to HFC-134a)
TOTAL PROJECT COST:	Phase I US$ 120,000 Investment
PROPOSED OTF FINANCING:	This request is for **permission to proceed**; no funding is requested at this time. Phase I of this project to the EC at its next meeting for funding approval of about US$ 140,000.
NATIONAL COORDINATING AGENCY:	Department of Environment and Natural Resources (DENR)
IMPLEMENTING AGENCY:	The World Bank

PROJECT SUMMARY

This OTF request is for permission to proceed on final preparation of a project proposal to develop HFC-134a refrigerator production capability at Federal Electric. The technical program for the project, especially the technology transfer arrangements, are being completed by the enterprise in accordance with the OORG reviewer's comments. Phase I of the project will be ready for submission to the next EC meeting at which time funding will be requested. Phase I of the project would lead to the conversion of an existing CFC based refrigerator manufacturing facility at Federal Electric to production of refrigerators using HFC-134a as the working fluid. In Phase I, about 20 prototype and test refrigerators would be produced and recovery/reclamation procedures would be adopted for servicing in-plant defective CFC-12 refrigerators. Phase I would provide equipment needed to test prototype HFC-134a refrigerators Equipment for the production line and the incremental operating costs for production of HFC-134a refrigerators would be included in a Phase II project. The full project when completed would provide a major indigenous source of non-ODS domestic refrigerators for the Philippine market. Technology for the non-ODS refrigerators would be transferred by Federal Electric's licensor, Admiral and/or the compressor supplier, Tecumseh. The OORG review for a preliminary version of this project is attached.