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

Twenty-second Meeting
Nairobi, 28-30 May 1997

PROJECT PROPOSALS: CHINA

This document includes the comments and recommendations from the Fund Secretariat on the following projects:

Foam

- Elimination of CFC-12 in the manufacture of EPS foam sheet at Zhoushan Fuchuan Plastic Products Factory — UNDP
- Elimination of CFC-12 in the manufacture of EPS foam sheet at Zhejiang Wanpeng Clique Co., Ltd. — UNDP

Refrigeration

- Elimination of CFCs 11 and 12 in the manufacture of domestic freezers at Jilin Jinuoer Electric Appliances Group Co. — UNDP
- Elimination of CFCs 11 and 12 in the manufacture of domestic freezers at Hongxiang Group - Laizhou Freezer Plant — UNDP
- Phasing out ODS at the refrigerator plant of Hefei Meiling Co. Ltd. — UNIDO
- Phasing out ODS at the Hualing refrigerator plant — UNIDO
- Phasing out ODS at the refrigerator plant of Zerowatt Electric Appliances Group — UNIDO
- Conversion of manufacturing facilities from CFC-11 foaming agent to cyclopentane and CFC-12 refrigerant to HFC-134a at Gansu Changfeng Baoan Industry Co. Ltd. — World Bank

• Phasing out ODS at the Zel Tianjin Compressor Co., Ltd.	UNIDO
• Conversion of CFC-12 medium open type refrigerating compressor at Chongqing Bingyang Refrigerating Machine Co.	World Bank
• Conversion of CFC-12 medium open-type refrigerating compressor to HCFC-22 compressor at Guangzhou Refrigerating Machinery Factory	World Bank
• Conversion of CFC-12 small open type refrigerating compressor production at Ningbo Refrigerating Machinery Factory	World Bank
• Conversion of CFC-12 small open-type refrigerating compressor to HCFC-22 refrigerating compressor at Subei Refrigeration Machinery Factory	World Bank
• Conversion of CFC-12 medium open type refrigerating compressor at Wuhan New World Refrigeration Industrial Co. Ltd.	World Bank
• Conversion of CFC-12 small and medium open type refrigerating compressor production at Zhejiang Chunhui Company (Group) (ZCC)	World Bank
• Conversion of CFC-12 small open-type and semi-hermetic refrigerating compressor to HCFC-22 refrigerating compressor at Zhenjiang Refrigerating Equipment Factory (ZREF)	World Bank

Solvent

• Elimination of ODS (CFC-113) used in the production line at Shanghai Railway Communication Equipment Factory	UNDP
• Elimination of ODS (CFC-113) used in the production line at Shanghai Computer Factory	UNDP
• Conversion of ODS precision cleaning processes from CFC-113 to aqueous cleaning at Huangshi Dongbei Refrigeration Co.	UNIDO
• Conversion of ODS cleaning processes from CFC-113 to trichloroethylene at Hangli Refrigeration Ltd.	UNIDO
• Conversion of ODS precision cleaning processes from CFC-113 to aqueous cleaning at Jiaxipera Compressor Factory	UNIDO

PROJECT EVALUATION SHEET
CHINA

SECTOR: Foams ODS use in sector (1991): 17,773 ODP tonnes

Sub-sector cost-effectiveness thresholds: Extruded Polystyrene Foam 8.22 US $/kg

Project Titles:

(a) Elimination of CFC-12 in the from flexible slabstock foam manufacture of EPS at Zhoushan Fuchuan Plastic Products Factory in Beijing.

(b) Elimination of CFC-12 in the from flexible slabstock foam manufacture of EPS sheet at Zhejiang Wanpeng Clique Co., Ltd, Wu Yi City, Zhejiang Region.

Project Data	**EPS**	**EPS**
	Zhoushan Fuchuan	**Zhejiang Wanpeng**
ODS phase-out (ODP tonnes)	61	121
Proposed project duration (Yrs)	2	2
Incremental capital cost (US $)	452,650	479,930
Contingency (%)	10	10
Incremental operational cost (US $)	37,900	24,620
Total project cost (US $)	490,550	504,550
Local ownership (%)	100	100
Export component (%)	0	0
Amount requested (US $) {Original}	490,550	504,550
{Revised}		
Cost effectiveness (US $/kg)	8.04	4.17
National Coordinating Agency	National Environmental Protection Agency (NEPA)	
Implementing Agency	UNDP	
Technical review completed?	Yes	Yes

Secretariat's Recommendations:		
Amount recommended (US $)	380,360	366,730
Project impact (ODP tonnes)	61	120
Cost effectiveness (US $/kg)	6.23	3.05
Implementing Agency support cost (US $)	49,447	46,675
Total cost to Multilateral Fund (US $)	429,807	413,405

PROJECT DESCRIPTION

(a) Elimination of CFC-12 in the from flexible slabstock foam manufacture of EPS at Zhoushan Fuchuan Plastic Products Factory in Beijing.
(b) Elimination of CFC-12 in the from flexible slabstock foam manufacture of EPS sheet at Zhejiang Wanpeng Clique Co., Ltd, Wu Yi City, Zhejiang Region.

1. Both companies manufacture polystyrene foam sheets using CFC-12 as blowing agent. They will phase out the use of CFC-12 through substitution with butane as blowing agent.

2. The main costs of the projects are as follows:

		Zhoushan US $	Zhejiang US $
(i)	Capital Costs		
	LPG storage and handling	173,500	173,500
	Extruder and grinder retrofits	20,500	26,600
	Fire protection and safety equipment and measures	177,500	179,200
	Other items (pallets, heating facility)	30,000	47,000
	Technology transfer	10,000	10,000
	Contingency	41,150	43,630
	Total	452,650	479,930
(ii)	Incremental operational cost	37,900	24,620

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

1. The Fund Secretariat and UNDP's foam expert discussed the projects. The discussions related mainly to the prices of chemicals used in the projects which did not appear to be consistent with prices of similar chemicals used in other China projects and the resultant high operational costs of the projects, which is unusual for projects in the EPS foam sub-sector. Consequently the prices were revised based on information supplied by UNDP. The cost of pallets (US $5,000 each) was not considered incremental, while the cost of antistatic clothing was agreed at US $3,000 and US $2,000 for Zhejiang and Zhoushan respectively.

2. After the necessary adjustments to the capital cost and recalculation of the incremental operational costs (CFC-12: US $1.7/kg; Butane: US $0.8/kg), the following project costs were agreed.

	Zhejiang	**Zhoushan**
Incremental Capital Cost	471,130	444,950
Incremental Operational Savings	104,400	64,590
Total Project cost	366,730	380,360

Impact of Projects on Meeting the 1999 Freeze

3. The project document indicates: "In order to achieve the 1999 freeze at the average ODS consumption level of 1995 to 1997 China needs to phase-out 8,000 ODP tonnes in 1997, 7,000 ODP tonnes in 1998, and 3,000 ODP tonnes in 1999. This project will phase-out 61 ODP tonnes and will make a significant contribution to China's ODP phase-out plan."

RECOMMENDATION

1. The Fund Secretariat recommends blanket approval of the projects with the funding levels and associated support costs as indicted below.

Project Title	Project Cost US $	Support Cost US $	Implementing Agency
(a) Elimination of CFC-12 in the from flexible slabstock foam manufacture of EPS at Zhoushan Fuchuan Plastic Products Factory in Beijing.	380,360	49,447	UNDP
(b) Elimination of CFC-12 in the from flexible slabstock foam manufacture of EPS sheet at Zhejiang Wanpeng Clique Co., Ltd, Wu Yi City, Zhejiang Region	366,730	46,675	UNDP

PROJECT EVALUATION SHEET
CHINA

SECTOR: Refrigeration ODS use in sector (1993): 8,490 ODP tonnes
Sub-sector cost-effectiveness thresholds: Domestic 13.76 US $/kg

Project Titles:

(a) Elimination of CFCs 11 and 12 in the manufacture of domestic freezers at Jilin Jinuoer Electric Appliances Group Co.
(b) Elimination of CFCs 11 and 12 in the manufacture of domestic freezers at Hongxiang Group - Laizhou Freezer Plant
(c) Phasing out ODS at the refrigerator plant of Hefei Meiling Co. Ltd.
(d) Phasing out ODS at the Hualing refrigerator plant
(e) Phasing out ODS at the refrigerator plant of Zerowatt Electric Appliances Group
(f) Conversion of manufacturing facilities from CFC-11 foaming agent to cyclopentane and CFC-12 refrigerant to HFC-134a at Gansu Changfeng Baoan Industry Co. Ltd. (operating cost)

Project Data	**Domestic**					**Operating Costs**
	Jilin Jinuoer	Hongxiang	Meiling	Hualing	Zerowatt	Gansu
ODS phase out (ODP tonnes)	223.94	301.53	849	280	423	N/A
Proposed project duration (Yrs)	3	3	2	2	2	2
Incremental capital cost (US$)	2,820,840	978,600	2,083,546	210,580	2,125,651	
Contingency (%)	10	10	10	10	10	
Incremental operational cost (US$)	873,279	998,002	1,574,870	772,866	486,946	260,000
Total project cost (US$)	3,694,019	1,976,602	3,658,416	983,446	2,612,597	
Local ownership (%)	100	100	100	100	100	100
Export component (%)						0
Amount requested (US$) {Original}	3,694,019	1,976,602	3,658,416	983,446	2,612,597	260,000
{Revised}						
Cost effectiveness (US$/kg.)	10.72	4.93	4.31	3.51	6.18	N/A
National Coordinating Agency	National Environmental Protection Agency (NEPA)					
Implementing Agency	UNDP	UNDP	UNIDO	UNIDO	UNIDO	World Bank
Technical review completed?	Yes	Yes	Yes	Yes	Yes	N/A
Secretariat's Recommendations						
Amount recommended (US $)			3,006,381	764,108	2,220,815	
Project Impact (ODP tonnes)			849	280	423	
Cost effectiveness (US $/kg)			3.54	2.72	5.25	
Implementing Agency support cost (US$)			390,830	99,334	288,705	
Total cost to Multilateral Fund			3,397,211	863,442	2,509,521	

(*) Capital costs (US $634,150) were approved at the 20th Executive Committee Meeting.

PROJECT DESCRIPTION

(a) Elimination of CFCs 11 and 12 in the manufacture of domestic freezers at Jilin Jinuoer Electric Appliances Group Co.

1. Jilin operates three separate and independent lines for the production of nine models of chest freezers and refrigerators. Its current CFCs consumption is reported at 223.9 ODP tonnes for the production of 221,988 units in 1996.

2. The existing CFC technology was obtained from Fujitsu General Co. from Japan which included refrigerator design and the supply of equipment. The company does not have marketing or product licensing agreements with Fujitsu..

3. The baseline equipment for refrigeration and foam parts consists of locally made and imported equipment.

4. Jilin plans to convert the refrigerant system from CFC-12 to HFC-134a. With assistance from Matsushita and Zanussi, the enterprise has already built and tested prototypes using HCF-134a refrigerant. The conversion requires replacement of all charging boards with automatic equipment suitable for HFC-134a refrigerant. Existing leak detectors will be replaced with new equipment. Vacuum pumps will be retrofitted to be compatible with the new refrigerant.

5. The foam system will be converted from CFC-11 to cyclopentane. Replacement of all foaming machines with new equipment is requested in the project proposal.

6. The conversion requires also installation of new cyclopentane storage facilities, new pre-mixing stations, modification of foaming jigs, installation of safety equipment, technical assistance and training.

7. Operating costs are requested for a 6 month duration. Incremental cost of new HFC-134a compressors at US $5.00 per unit is included in the calculation of operating costs.

(b) Elimination of CFCs 11 and 12 in the manufacture of domestic freezers at Hongxiang Group - Laizhou Freezer Plant

8. Laizhou Freezer Plant operates one single line for the production of six models of a range of domestic freezers. Its current CFCs consumption is reported at 301.5 ODP tonnes for the production of 226,284 units in 1996.

9. The existing CFC technology originates from Zanussi, Italy, although it was acquired “second-hand” from a Chinese partner. The replacement refrigeration technology will be obtained from Tsinghua University Refrigeration Research Standards Department and from the Beijing Household Electrical Appliances Research Institute.

10. Laizhou plans to convert the refrigerant system from CFC-12 to HFC-134a and the foaming system from CFC-11 to cyclopentane.

11. The conversion requires installation of a high-pressure foaming machine, polyol/pentane premixing stations, pentane storage systems, replacement of the refrigerant charging boards; retrofit of the evacuation system, and vacuum pumps and leak detection systems; providing equipment and training needed for the safe handling and operation of the hydrocarbon based systems.

12. The proposal requests the replacement of two high pressure machines of low capacity (one imported and one locally manufactured) with a new high pressure machine of higher capacity with two mixing heads.

13. Operating costs were requested for a six month duration. Incremental cost of new HFC-134a imported compressors at US $5.00 per unit is included in the calculation of operating cost.

(c) Phasing out ODS at the refrigerator plant of Hefei Meiling Co. Ltd.

14. The company operates 4 lines for the production of domestic refrigerators and freezers with a total CFC consumption of 849 tonnes. The production history of these lines is as follows:

(i) Line 1 was established in 1984 with a modest production of 3,000 units per year which was upscaled to about 240,000 units in 1996.

(ii) Line 2 started its commercial production of about 285,000 units in 1993 and was subsequently converted to HFC-134a and HCFC-141b in 1995, and started its commercial production of CFC-free appliances (about 350,000 units) in April 1996.

(iii) Line 3 began its commercial production (193,000 units) in 1995. The line was established in 1993 for CFC-based appliances.

(iv) Line 4 was established in 1995 with CFC technology and produced about 18,000 units in 1996.

15. Hefei is requesting the incremental capital and operating costs for the conversion of lines 1 and 3, and the retroactive funding for the conversion of line 2. The company recognizes that the conversion of line 4 is not eligible for MLF financing and, therefore, this line is not included in the project proposal.

16. Conversion of line 2 to HFC-134a and HCFC-141b was done by the company itself without any technology transfer agreement. The justification provided in the project document for the use of HCFC-141b technology relates to information available to the company at the time it took its decision, and to difficulties in procurement of isobutane

compressors and cyclopentane in China. However, the company is researching converting this line to hydrocarbon technology.

17. Lines 1 and 2 will convert to isobutane (refrigerant) and cyclopentane (foaming agent). The equipment requested is to enable this conversion. The existing foaming equipment will be retrofitted for the safe use of hydrocarbons. In addition, hydrocarbon storage and safety related equipment and measures are requested.

(d) Phasing out ODS at the Hualing refrigerator plant

18. Hualing produces about 330,000 units of refrigerators and small chest freezers in five models using two production lines. The reported CFC consumption in 1996 is 280 ODP tonnes.

19. The refrigerant line consists of 2 sets of refrigerant boards and the associated evacuation system and leak detectors.

20. The foaming line consists of two high pressure machines; polyol/CFC-11 storage tanks and mixing stations; heating oven; cabinet carousel with up to 22 moulds; and 2 automatic thermoforming lines for the production of the inner liner.

21. Hualing will convert the refrigerant system from CFC-11 to HFC-134a and the foaming system from CFC-11 to HCFC-141b. Conversion to HCFC-141b was dictated by safety reasons due to the reluctance of the competent authorities to license the storage and application of hydrocarbons. The company will nonetheless undertake on its own the future conversion to zero ODP technology.

22. The enterprise is requesting modest changes in the capital equipment relating to replacement of refrigerant charging boards, leak detectors, testing laboratory and technology transfer.

23. The enterprise is requesting incremental operating costs arising from higher cost of substitutes, foam formulation and inner liner.

(e) Phasing out ODS at the refrigerator plant of Zerowatt Electric Appliances Group

24. Zerowatt operates two lines for the production of seven models of chest freezers and refrigerators. Its current CFCs consumption is reported at 355 ODP tonnes for the production of 311,800 units in 1996.

25. The refrigerant line consists of 2 imported and 3 locally made charging boards and the associated evacuation system and leak detectors. The refrigeration system is supported with climatic testing chamber.

26. The foaming line consists of: 4 Cannon and OMS high pressure machines, one of which was purchased after 1994; 3 premixing stations of local manufacture; 4 heating tunnels (3 imported and one local); 135 pieces of locally made aluminum jigs, plugs and moulds which are electrically heated; 3 sets of carousels.

27. Zerowatt plans to convert the refrigerant system from CFC-12 to isobutane (R-600a), and the foaming system from CFC-11 to cyclopentane.

28. The conversion requires: replacement of the refrigerant charging boards and mixing stations; retrofit of the evacuation system, foaming machines and the entire array of jigs, plugs and moulds; providing equipment and training needed for the safe handling and operation of the hydrocarbon based systems.

29. Zerowatt is claiming incremental operating costs due to the new refrigerant and new foaming formulation.

(f) Conversion of manufacturing facilities from CFC-11 foaming agent to cyclopentane and CFC-12 refrigerant to HFC-134a at Gansu Changfeng Baoan Industry Co. Ltd. (operating cost)

30. The Executive Committee has approved capital cost for conversion of Gansu Changfeng at US $637,156 at its 20th Meeting pending determination by the World Bank, in consultation with the Secretariat, of accurate figures for the operating costs and of whether there was any element of double counting (Decision 20/22) (UNEP/OzL.Pro/ExCom/20/72).

31. Incremental operating costs calculated at US $260,000 for a six month duration were requested in the original proposal, including US $190,190 for imported compressors.

32. The World Bank has resubmitted the request for US $260,000 for incremental operating costs for consideration by the 22nd Meeting of the Executive Committee.

33. Costs of US $69,810 are not related to compressors and are recommended for approval. Any additional costs for compressors should be calculated in the light of the decision taken on the compressor policy paper.

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

(a) Elimination of CFCs 11 and 12 in the manufacture of domestic freezers at Jilin Jinuoer Electric Appliances Group Co.

1. UNDP stated that "Approval of this project will eliminate 223.94 ODP tonnes based on 1996 consumption of CFCs and make a significant contribution to China's ODS elimination programme".

2. UNDP and the Secretariat discussed issues regarding replacement costs at international prices for baseline equipment of Chinese origin and for locally procured materials and skills (e.g., cost of piping, construction, etc.); and costs regarding other pieces of equipment and chemicals.

3. Four of the existing six foaming machines were locally made as poor imitations of international brands. In spite of their relatively recent date of manufacture they experience frequent breakdown, and thus declining efficiency.

4. Incremental cost for replacing the machine was estimated by the Secretariat on the basis of the cost of retrofit with due consideration to the fact that the machines were locally made and are reported to have poor performance.

5. The Secretariat and UNDP are still discussing the level of incremental costs for these machines. The result of the discussion will be reported to the Executive Committee in due course.

6. The incremental operating cost includes the cost associated with the new compressor. UNDP was informed that this cost could constitute double counting since the Fund has already funded the production of 5,900,000 compressor units in China. The Executive Committee will decide this issue in light of its consideration of the paper on compressor conversion being submitted to this meeting.

(b) Elimination of CFCs 11 and 12 in the manufacture of domestic freezers at Hongxiang Group - Laizhou Freezer Plant

7. UNDP stated that "Approval of this project will eliminate 301.53 ODP tonnes based on 1996 consumption of CFCs and make a significant contribution to China's ODS elimination programme".

8. UNDP and the Secretariat discussed issues regarding replacement costs at international prices for baseline equipment of Chinese origin and for locally procured materials and skills (e.g., cost of piping, construction, etc.); and costs regarding other pieces of equipment and chemicals.

9. Incremental compressor cost requested in the proposal was determined to be ineligible since the Multilateral Fund is funding the conversion of compressors manufacture in China.

10. Compressor conversion has already been funded in China for production of 5,900.000 units per year. The policy paper on incremental cost of compressors will be considered by the 22nd Meeting of the Executive Committee .

11. The Secretariat is still discussing with UNDP the level of funding for the foam machines. The result of the discussion will be communicated to the Sub-Committee on Project Review.

(c) Phasing out ODS at the refrigerator plant of Hefei Meiling Co. Ltd.

12. UNIDO stated that "The project will be finalized by end 1999 and thus will contribute to the freeze target of the country by phasing out 849 ODP tonnes in line with NEPA's ODS phase-out programme".

13. On the request of the Secretariat, UNIDO submitted written information, with confirmation from the enterprise, regarding the chronology of establishing line 3 and of the conversion of line 2. The Secretariat sought assurance that the conversion of line 2 was not offset by establishing a new CFC line.

14. The eligibility of all budget items and the level of their costs were discussed with UNIDO. The costs were adjusted accordingly.

15. Meiling will provide the full costs of some of the eligible equipment and will finance the non-incremental portions in the costs of some other equipment.

16. The Secretariat applied the prices of chemicals provided by NEPA in the calculation of the incremental operating costs. This was done because of the wide range of prices applied by UNIDO in the three projects being presented here.

(d) Phasing out ODS at the Hualing refrigerator plant

17. UNIDO stated that "The project will be finalized by end 1999 and thus will contribute to the freeze target of the country by phasing out 280 ODP tonnes in line with NEPA's ODS phase out programme".

18. The technological choice of HCFC-141b was based on safety reasons due to the physical location of the plant.

19. The Secretariat applied the prices of chemicals submitted by NEPA to UNIDO in the calculation of the incremental operating costs. The cost of the project was adjusted accordingly.

(e) Phasing out ODS at the refrigerator plant of Zerowatt Electric Appliances Group

20. UNIDO stated that "The project will be finalized by end 1999 and thus will contribute to the freeze target of the country by phasing out 355 ODP tonnes in line with NEPA's ODS phase out programme".

21. Zerowatt produced 311,800 units in 1996.

22. The Secretariat discussed with UNIDO all the requested equipment and safety measures and the level of their costs. UNIDO obtained assurance from the enterprise to some of the requested fund equipment (e.g.,. halon leak detector, welding machines) and also to fund the incremental portion in the cost of certain items.

23. The Secretariat applied the production figures for 1996 provided by the enterprise, and used list of prices provided by NEPA for chemicals in the calculation of the incremental operating costs.

(f) Conversion of manufacturing facilities from CFC-11 foaming agent to cyclopentane and CFC-12 refrigerant to HFC-134a at Gansu Changfeng Baoan Industry Co. Ltd. (operating cost)

24. The Secretariat is submitting the paper included in document UNEP/OzL.Pro/ExCom/22/73 where the issue of incremental operating costs for compressor conversion in relation to this project is discussed.

RECOMMENDATION(S)

1. The Fund Secretariat recommends blanket approval of the projects with associated support costs at the funding level shown in the table below:

	Project Cost US $	Support Cost US $	Implementing Agency
c) Phasing out ODS at the refrigerator plant of Hefei Meiling Co. Ltd.	3,006,381	390,830	UNIDO
d) Phasing out ODS at the Hualing refrigerator plant	764,108	99,334	UNIDO
(e) Phasing out ODS at the refrigerator plant of Zerowatt Electric Appliances Group	2,220,815	288,705	UNIDO

PROJECT EVALUATION SHEET
CHINA

SECTOR: MAC & COMPRESSOR ODS use in sector : N/A ODP tonnes

Sub-sector cost-effectiveness thresholds: N/A

Project Title:
Phasing out ODS at the ZEL Compressor Co. Ltd. In Tianjin

Project Data	Zel
ODS phase-out (ODP tonnes)	430
Proposed project duration (Yrs)	2
Incremental capital cost (US$)	1,668,600
Contingency (%)	10
Incremental operational cost (US$)	Not requested
Total project cost (US$)	1,668,600
Local ownership (%)	50
Export component (%)	0
Amount requested (US$) {Original	1,215,500
{Revised	834,300
Cost effectiveness (US$/kg)	N/A
National Coordinating Agency	National Environmental Protection Agency (NEPA)
Implementing Agency	UNIDO
Technical review completed?	Yes

Secretariat's Recommendations	
Amount recommended (US $)	834,300
Project impact (ODP tonnes)	N/A
Cost effectiveness (US $/kg)	N/A
Implementing Agency support cost (US$)	108,459
Total cost to Multilateral Fund	942,759

PROJECT DESCRIPTION

Phasing out ODS at the ZEL compressor Co. Ltd. in Tianjin

1. There are 18 local compressor producers in China which satisfy the demand of the domestic refrigeration sector. Total annual output is about 6 million units. Two projects have been approved by the Executive Committee to convert two compressor manufacturing companies to HFC-134a technology with total production capacity of 1,850,000 units per year.

2. The current annual production at Zel Tianjin factory is 1,200,000 units. An extension of capacity has commenced in 1996, targeting a production level of 2 million units a year by 1999. However, this additional capacity is not covered by the project. The project covers the conversion of production of CFC-12 based compressors to HFC-134a based technology. Implementation of the project will result in increasing the production of HFC-134a compressors in China to 5,900,000 units per year.

3. HFC-134a compressor from ZEL Tianjin factory will be used by four refrigerator and freezer companies which are being presently converted to HFC-134a technology with assistance from the Multilateral Fund.

4. The ZEL Tianjin proposal includes: redesign, prototyping and testing, modification of existing equipment where applicable, procurement and installation of new equipment, retooling and modification of assembly lines.

5. The proposal is included in the strategy of the Government of China for the phase out of CFCs in the domestic refrigeration sector.

6. Technical assistance of the conversion will be provided by the original technology supplier.

7. ZEL Tianjin company will provide its own inputs and cost-sharing for equipment that are not eligible for incremental funding during the implementation of the project.

8. No incremental operating costs are requested in the project proposal.

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

1. The proposal does not contain statements on how the project will contribute to helping China to achieve the 1999 freeze.

2. The chosen technology is proven.

3. The Secretariat discussed with UNIDO the eligibility and incrementality of all cost items. The costs of washing machines, bending machines and testing equipment were brought in line with similar costs approved for other compressor manufacturing companies in Article 5 countries. The drilling, facing and seaming machine was recognized as ineligible.

RECOMMENDATIONS

1. The Fund Secretariat recommends blanket approval of the project with associated support costs at the funding level shown in the table below:

	Project Cost US $	Support Cost US $	Implementing Agency
Phasing out ODS at ZEL Compressor Co. Ltd. in Tianjin	834,300	108,459	UNIDO

PROJECT EVALUATION SHEET
CHINA

SECTOR: Refrigeration ODS use in sector (1995): 12,200 ODP tonnes
Sub-sector cost-effectiveness thresholds: N/A
Project Titles:
(a) Conversion of CFC-12 medium open type refrigerating compressor at Chongqing Bingeing Refrigerating Machine Co.
(b) Conversion of CFC-12 medium open-type refrigerating compressor to HCFC-22 compressor at Guangzhou Refrigerating Machinery Factory
(c) Conversion of CFC-12 small open-type refrigerating compressor production at Ningbo Refrigerating Machinery Factory
(d) Conversion of CFC-12 small open-type refrigerating compressor to HCFC-22 refrigerating compressor at Subei Refrigeration Machinery Factory
(e) Conversion of CFC-12 medium open-type refrigerating compressor at Wuhan New World Refrigeration Industrial Co., Ltd.
(f) Conversion of CFC-12 small and medium open-type refrigerating compressor production at Zhejiang Chunhui Company (Group) (ZCC)
(g) Conversion of CFC-12 small open-type and semi-hermetic refrigerating compressor to HCFC-22 refrigerating compressor at Zhenjiang Refrigerating Equipment Factory (ZREF)

Project Data							
	Chongqing	Guangzhou	Ningbo	Subei	Wuhan	ZCC	ZREF
ODS phase out (ODP tonnes)	190	190	171	171	209	361	186
Proposed project duration (Yrs)	3	3	3	3	3	3	3.5
Incremental capital cost (US$)	2,820,000	2,790,700	2,548,300	2,550,000	3,411,835	4,590,600	2,331,400
Contingency (%)	15	15	15	15	15	15	15
Incremental operational cost (US$)	180,300	169,000	33,900	41,500	197,400	210,900	40,000
Total project cost (US$)	3,000,300	2,959,700	2,582,200	2,591,500	3,609,235	4,801,500	2,667,300
Local ownership (%)	100	100	100	100	40	100	100
Export component (%)							
Amount requested (US$) Original	2,256,000	2,232,600	2,040,000	2,040,000	1,687,000	3,670,000	2,100,000
Revised							
Cost effectiveness (US$/kg.)	11.87	11.75	11.9	11.9	8.07	10.17	11.9
National Coordinating Agency	National Environmental Protection Agency (NEPA)						
Implementing Agency	World Bank	World Bank	World Bank	World Bank	World Bank	World Bank	World Bank
Technical review completed?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Secretariat's Recommendations							
Amount recommended (US $)							
Project Impact (ODP tonnes)							
Cost effectiveness (US $/kg)							
Implementing Agency support cost (US$)							
Total cost to Multilateral Fund							

PROJECT DESCRIPTION

(a) Conversion of CFC-12 medium open type refrigerating compressor at Chongqing Bingeing Refrigerating Machine Co.
(b) Conversion of CFC-12 medium open-type refrigerating compressor to HCFC-22 compressor at Guangzhou Refrigerating Machinery Factory
(c) Conversion of CFC-12 small open-type refrigerating compressor production at Ningbo Refrigerating Machinery Factory
(d) Conversion of CFC-12 small open-type refrigerating compressor to HCFC-22 refrigerating compressor at Subei Refrigeration Machinery Factory
(e) Conversion of CFC-12 medium open-type refrigerating compressor at Wuhan New World Refrigeration Industrial Co., Ltd.
(f) Conversion of CFC-12 small and medium open-type refrigerating compressor production at Zhejiang Chunhui Company (Group) (ZCC)
(g) Conversion of CFC-12 small open-type and semi-hermetic refrigerating compressor to HCFC-22 refrigerating compressor at Zhenjiang Refrigerating Equipment Factory (ZREF)

1. The Chinese commercial refrigeration sector consumes about 13,000 tonnes of CFC refrigerant per year, mainly CFC-12. The strategy for phasing out CFCs in this sector was presented to the Executive Committee at the 17th Meeting. The strategy was developed on the following basis: (a) that the industry should be converted to the use of HCFC-22 as a transitional measure and non-ODS refrigerants would be ultimately used; (b) that imported technology should be used as the basis for projects; and (c) to achieve phase out in the commercial refrigeration sector, China would only request financial assistance from the Multilateral Fund to meet the incremental costs of compressor conversion; the costs of converting other refrigeration system components would be met by the country.

2. At its 15th Meeting in December 1994, the Executive Committee approved US $16 million for six representative demonstration projects for conversion of all CFC-12 based compressor types used in the commercial refrigeration sector in China to HCFC and ammonia designs. These projects and negotiations with technology suppliers have served as models for the preparation of projects for conversion of the remainder of compressor factories in the sector. The World Bank stated at the time that "following successful implementation of these demonstration projects, this technology would then be replicated to a number of replication enterprises." It is understood that none of these projects has yet been implemented.

3. At its 20th Meeting, the Executive Committee approved US $8.9 million for the conversion of four additional projects for the conversion of three semi-hermetic and one centrifugal compressors to HCFC-22 and HFC-134a. This request represented the second phase of conversion of the commercial refrigeration and air-conditioning sector in China to non-CFC technology.

4. The Government of China is submitting for consideration by the 22nd Meeting of the Executive Committee, seven projects for the conversion of small and medium open type and semi-hermetic compressors to HCFC-22 refrigerant. The projects consist of technology transfer and equipment purchase necessary to convert existing CFC-12 compressor production to new

HCFC-22 designs. The seven enterprises, when converted, will have a total capacity for 67,000 HCFC-22 compressors. The total cost of the seven projects, as requested, is US $16,026,000.

5. Projects propose the installation of two to three computer controlled high precision machining centres and associated assembly equipment and testing equipment to replace, in most cases, equipment incapable of meeting the required tolerances specified by the supplier of the technology.

6. Training of related technical and maintenance staff and technology transfer fees are requested in all the proposals.

7. Indications are provided in project documents of machining equipment with a remaining lifetime of up to 8 years, which is to be scrapped. Scrap value of redundant equipment was deducted from the project costs.

8. Each project acknowledges that there is an element of "modernization" involved and a uniform level of 20 per cent reduction in capital cost has been incorporated in the proposals when calculating eligible incremental costs. The 20 per cent discounting factor was proposed on the basis of the benefit to the enterprises from postponement of expenditure to replace the existing, old equipment. Incremental operating costs have been calculated but not requested.

9. The cost-effectiveness of each project has been calculated on the basis of elimination of CFC consumption for initial refrigeration system charge and for service in the first year once the projects become operational. These compressor projects can be credited with phase-out since the Government of China has indicated that no further assistance will be sought from the Fund for the cost of converting other commercial refrigeration system components.

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

1. The Executive Committee decided at its 20th Meeting that the grant amount for approved compressor conversion project in China should be calculated using a 26 per cent discounting factor for technological upgrade and that, in future, projects in the remaining plants submitted for approval should include full baseline information, as well as detailed costs of requested capital equipment, so that an accurate determination could be made on the discounting factor for upgrading and on eligible incremental costs. (Decision 20/21).

2. Generally the project documents include sufficient baseline information, as well as detailed costs of requested capital equipment to make determination of the eligible incremental costs.

3. The chosen technologies are proven. Justification for selecting HCFC-22 technology has been explained.

4. The Fund Secretariat and the World Bank discussed several issues that arose during the projects review process, including the calculation of the eligible incremental cost associated with the computer controlled machining centres (CNC machines) for manufacturing of compressors crankcases, technological upgrade associated with coordination measuring systems requested; and cost issues regarding other pieces of equipment (air compressors, honing machines).

5. The principal issues are the quality of the CNC machining centres, and thus their cost, and whether one or two units are required per enterprise. The cost of the CNC machines can vary between US $380,000 and US $600,000 each. Detailed analysis has been undertaken by the Fund Secretariat in consultation with manufacturers of the required machines or equipment, manufacturers of commercial refrigeration compressors and end-users. This is the first time the Fund Secretariat has been able to undertake a detailed examination of projects in this sub-sector.

6. Similar analysis has also been undertaken by the consultants to the World Bank. At this stage, the technical issues have not yet been fully clarified and discussions between the World Bank and the Fund Secretariat are continuing.

7. The outcome of discussions will be reported to the Sub-Committee on Project Review.

8. The project proposals do not include a statement explaining how their implementation will assist China in meeting the 1999 freeze.

PROJECT EVALUATION SHEET
CHINA

SECTOR: SOLVENT ODS use in sector (1993): 4310 ODP tonnes

Sub-sector cost-effectiveness thresholds: CFC-113 19.73 US $/kg

Project Titles:
(a) Elimination of CFC-113 used in the production line at Shanghai Railway Communication Equipment
(b Elimination of CFC-113 used in the production line at Shanghai Computer
(c) Conversion of ODS precision cleaning processes from CFC-113 to aqueous cleaning at Huangshi Dongbei Refrigeration Co.
(d) Conversion of ODS precision cleaning processes from CFC-113 to trichloroethylene at Hangli Refrigeration Co.
(e) Conversion of ODS precision cleaning processes from CFC-113 to aqueous cleaning at Jiaxipera Compressor

Project Data	**CFC-113**				
	Shanghai Railway	Shanghai Computer	Huangshi Dongbei	Hangli Refrig.	Jiaxipera Compressor
ODS phase-out (ODP tonnes)	14.4	6.33	37.6	28.8	76
Proposed project duration (Yrs)	2	2	1.5	1.5	1.5
Incremental capital cost (US $)	265,000	154,000	430,100	398,200	799,700
Contingency (%)	10	10	10	10	10
Incremental operational cost (US $)	11,287	(10,662)	(193,858)	(87,112)	(491,096)
Total project cost (US $)	276,287	143,338	236,242	311,088	308,604
Local ownership (%)	100	100	100	70	100
Export component (%)	-	-	-	-	-
Amount requested (US $) {Original}	283,700	124,700	379,242	377,345	501,104
{Revised}	276,287	116,767	236,242	217,762	308.604
Cost effectiveness (US $/kg)	19.2	18.4	6.28	7.56	4.06
National Coordinating Agency	NEPA	NEPA	NEPA	NEPA	NEPA
Implementing Agency	UNDP	UNDP	UNIDO	UNIDO	UNIDO
Technical review completed?	Yes	Yes	Yes	Yes	Yes

Secretariat's Recommendations:					
Amount recommended (US $)	276,287	116,767	236,242	217,762	308,604
Project impact (ODP tonnes)	14.4	6.33	37.6	28.8	76
Cost effectiveness (US $/kg)	19.19	18.4	6.28	7.56	4.06
Implementing Agency support cost (US $)	35,917	15,180	30,711	28,309	40,119
Total cost to Multilateral Fund (US $)	312,217	131,947	266,953	246,071	348,723

PROJECT DESCRIPTION

(a) Elimination of CFC-113 used in the production line at Shanghai Railway Communication Equipment Factory.

1. This project will phase out 14.4 ODP tonnes per year of CFC-113 used for the vapour cleaning of printed circuit boards at Shanghai Railway Communication Equipment Factory. Two ODS cleaning machines currently used in the production processes are proposed to be replaced by one machine using an aqueous process and one machine using a semi-aqueous process. The enterprise is 100% locally owned.

(b) Elimination of CFC-113 used in the production line at Shanghai Computer Factory.

2. This project will phase out 6.33 ODP tonnes per year of CFC-113 used in a vapour defluxing process to clean printed wiring assemblies. Elimination of CFC-113 in this enterprise will be accomplished by replacing the existing CFC-113 cleaning machine with a batch semi-aqueous emulsion cleaner. The enterprise is 100% locally owned.

(c) Conversion of ODS precision cleaning processes from CFC-113 to aqueous cleaning at Huangshi Dongbei Refrigeration Co.

3. This project will phase-out the remaining use of 32 MT of CFC-113 and 12 MT of CFC-11 now being consumed in metal cleaning applications associated with the production of refrigeration compressors at the Huangshi Dongbei Refrigeration Co. CFC-113 is utilized as a degreasing agent in vapor for cleaning of the compressor parts. CFC-11 is used as a flushing agent in the detection and repair of faulty assembled crankcases. The enterprise had already phased out the use of CFC-113 in three other metal degreasers. Considering the cleaning requirements of the Dongbei factory, a selection has been made in favour of aqueous cleaning with spraying and utlrasonics in five stages, i.e., washing with surfactant, tap water rinsing, DI water rinsing and two-stage drying in two major manufacturing workshops. Two batch operation immersion-type closed cleaning machines with programmable transport systems are proposed to be purchased. To replace the use of CFC-11, a compressed dry air process is proposed. The project will employ commercially available technologies applicable to the refrigerator industry in China.

(d) Conversion of ODS precision cleaning processes from CFC-113 to trichloroethylene at Hangli Refrigeration Ltd.

4. This project will phase out the use of 28.8 ODP tonnes of CFC-113 now being consumed in metal cleaning applications associated with the production of refrigeration compressors at Hangli Refrigeration Ltd. The ODS solvent is utilized as a degreasing agent for vapour cleaning of electric motor components. Considering the cleaning requirements of Hangli Refrigeration Ltd., the use of trichloroethylene as a solvent had been proposed in three divisions of the company. The proposal provides for the replacement of three existing, batch operation, immersion-type closed cleaning degreasers with hermetically sealed, very-low-emission cleaning machines purposely designed for use with trichloroethylene. The project will employ

commercially available technologies applicable to the refrigerator industry in China. The enterprise is 70 percent locally owned and 30 percent owned by a Hong Kong-based company. Five percent of the output of the enterprise is exported.

(e) Conversion of ODS precision cleaning processes from CFC-113 to aqueous cleaning at Jiaxipera Compressor

5. This project will phase-out the use of 95 MT of CFC-113 now being consumed in metal cleaning applications associated with the production of refrigeration compressors at the Jiaxipera Compressor Factory. The ODS solvent is utilized as a degreasing agent for the vapor cleaning of compressor parts in three manufacturing workshops. Considering the cleaning requirements of the Jiaxipera factory, an aqueous cleaning process has been selected. The proposed cleaning machines use spray guns and ultra-sonics and have five stages, namely washing with surfactant, tap water rinsing, DI-water rinsing and two-stage drying. Five batch operation immersion-type closed cleaning machines with programmable transport systems are proposed to be purchased. The project will employ commercially available technologies applicable to the refrigerator industry in China.

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

1. Each of the five proposals contains details of how the project will assist the Government of China to meet the 1999 freeze.

Shanghai Railway Communication Equipment Factory

2. The technology selection and project formulation and costing is consistent with other similar projects approved for China. Minor cost issues were discussed and resolved with the implementing agency and the project document revised accordingly.

Shanghai Computer Factory

3. As initially presented, the proposal indicated that selection of the replacement technology had not been concluded. The implementing agency was reminded of the Executive Committee's decision on change of technology. However during the review period, the tests being conducted by the enterprise were completed and the implementing agency indicated that a firm decision on semi-aqueous technology had been reached. The proposal was already costed on that basis. Minor cost issues were discussed and resolved and the project document revised accordingly.

Huangshi Dongbei Refrigeration Co.

4. A project was approved at the 19th Meeting at a level of US $899,030 for conversion of compressor manufacture at Huangshi Dongbei. Since conversion of the cleaning process was not essential to conversion of compressor manufacture (which was to hydrocarbon technology) it was not included in the project, and has been presented separately in this proposal.

5. One of the cleaning machines will replace cleaning currently undertaken by hand. Although a process change is needed, an automatic facility represents a substantial productivity improvement. It was agreed with the implementing agency that 30 percent of the cost of the proposed automatic tunnel washer was eligible for funding. The costs of the other two machines were also discussed and minor changes were incorporated.

6. Because of the large scale of production, the cost effectiveness of the project is less than half the threshold value for CFC-113 of US $ 19.73/kg.

Hangli Refrigeration Ltd.

7. This enterprise has not received funding from the Multilateral Fund for conversion of compressor manufacture. However the proposal indicates that the enterprise is interested in the development of such a project in the future.

8. The existing CFC-based cleaning machines were purchased new in 1995 from local suppliers. Technical advice, including advice in the TEAP 'Solvents' Technical Options

Committee 1995 Assessment is that retrofitting of CFC-based machines is straightforward and may be successfully carried out so that emissions from the machines will meet the normal occupational health and safety limits applicable for trichloroethylene. Given that the machines are of recent design and manufacture, it was agreed in discussions with the implementing agency that the project should be based on full retrofitting, including provision of ventilation, for two of the machines and the complete replacement of the third as a demonstration, to enable comparison of performance. Revised project costing was agreed with the implementing agency on this basis.

Jiaxipera Compressor Factory

9. A project was approved at the 18th Meeting at a level of US $1,490,000 for conversion of compressor manufacture at Jiaxipera Compressor Factory. Since conversion of the cleaning process was not essential to conversion of compressor manufacture (which was to hydrocarbon technology) it was not included in the project, and has been presented separately in this proposal.

10. One of the cleaning machines will replace cleaning currently undertaken by hand. Although a process change is needed, an automatic facility represents a substantial productivity improvement. It was agreed with the implementing agency that 30 percent of the cost of the proposed automatic tunnel washer was eligible for funding. The costs of the other two machines were also discussed and minor changes were incorporated.

11. Because of the large scale of production, and very high ODS consumption, the cost effectiveness of the project is less than one quarter of the threshold value for CFC-113 of US $19.73/kg.

RECOMMENDATION

1. The Fund Secretariat recommends blanket approval of the five projects together with associated support costs, at the funding levels indicated in the table below.

Project Title	Project Cost US $	Support Cost US $	Implementing Agency
(a) Elimination of CFC-113 used in the production line at Shanghai Railway Communication Equipment	276,287	35,917	UNDP
(b) Elimination of CFC-113 used in the production line at Shanghai Computer	116,767	15,180	UNDP
(c) Conversion of ODS precision cleaning processes from CFC-113 to aqueous cleaning at Huangshi Dongbei Refrigeration Co.	236,242	30,711	UNIDO
(d) Conversion of ODS precision cleaning processes from CFC-113 to trichloroethylene at Hangli Refrigeration Co.	217,762	28,309	UNIDO
(e) Conversion of ODS precision cleaning processes from CFC-113 to aqueous cleaning at Jiaxipera Compressor	308,604	40,119	UNIDO