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EXECUTIVE COMMITTEE OF
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PROJECT PROPOSALS: CHINA

Aerosol

- Umbrella project to complete CFC phaseout in general purpose aerosols at NCLI plus Fujiang Light Industry Co. IBRD

Foam

- Conversion to cyclopentane in the manufacture of heating pipes at Jixi City Thermal Power Company UNDP

Refrigeration

- Conversion to cyclopentane and R-134a in the manufacture of domestic freezers at Wanbao Freezer Industrial Corporation UNDP

PROJECT EVALUATION SHEET **CHINA**

SECTOR: Aerosol ODS use in sector (1996): 5,000 ODP tonnes

Project Title:

Umbrella project to complete CFC phaseout in general purpose aerosols at NCLI and Fujian Light Industry Co.

Project Data	Aerosol
	NCLI and Fujian
ODS phase-out (ODP tonnes)	1,220
Proposed project duration (months)	24
Incremental capital cost (US \$)	835,625
- including contingency (%)	10
Incremental operational cost (US \$)	(218,800)
Total project cost (US \$)	616,825
Local ownership (%)	100
Export component (%)	-
Amount requested (US \$)	616,825
{Original}	
{Revised}	547,675
Cost effectiveness (US \$/kg)	0.51
National Coordinating Agency	National Environmental Protection Agency
Implementing Agency	World Bank
Technical review completed?	Yes

<i>Secretariat's Recommendations:</i>	
Amount recommended (US \$)	547,675
Project impact (ODP tonnes)	1,224
Cost effectiveness (US \$/kg)	0.45
Implementing Agency support cost (US \$)	71,198
Total cost to Multilateral Fund (US \$)	618,873

PROJECT DESCRIPTION

Umbrella project to complete CFC phaseout in general purpose aerosols at NCLI and Fujian Light Industry Co.

1. The Government of China is submitting a terminal umbrella project in the aerosol sector. The two main objectives of the project are: a) to support implementation of the 1997 ban on CFC use in the aerosol sector (except for medical uses) through a Technical Assistance Programme; and b) to phase out 1,220 tonnes of CFCs used as aerosol propellant in the Fujian region.

2. In 1991, total annual consumption of CFCs in the aerosol sector in China was 8,600 tonnes, equivalent to 14.2 per cent of the total ODS consumption in the country. The country programme forecasted a 30 percent growth rate per annum of aerosol products between 1991 and 1996, which would have resulted in an unconstrained consumption of 23,500 tonnes of ODSs at the end of that period.

3. The country programme indicates that the Government of China has decided to impose a ban on CFC use in the aerosol sector from end December 1997, as a key policy initiative to achieve the earliest possible CFC phaseout in the sector, with minimum negative impact on the many small fillers that comprise the sector. To achieve this target, in April 1991, an official notice issued by the Ministry of Light Industry in co-operation with NEPA, stated that any new aerosol plant or expansion of existing plants should be based on non-ODS technology.

4. So far, the Executive Committee has approved three investment projects for the establishment of aerosol filling centres located in Tianjin, North China, and Shanghai, South China, both approved at the 7th Meeting of the Executive Committee in June 1992), and Zhongshan-Guangdong, East China, approved at the 13th Meeting in July 1994. These centres will provide filling service for several small enterprises which are not able to retrofit their plants to meet safety requirements for the use of HAPs (purified LPG). The Tianjin and Shanghai Filling Centres can also provide qualified HAPs for those enterprises which are able to use this propellant safely. In addition, the Committee also approved a technical assistance programme to support appraisal and implementation of the Tianjin and Shanghai filling centres.

5. The Shanghai and Tianjin Centres were completed and passed state approval in April and July 1997, respectively, while the Guangdong Zhongshan Centre was completed at the end of 1997. In total, 16,667 ODP tonnes have been phased out, equivalent to 75 per cent of the total unconstrained ODS consumption of the aerosol sector in 1996.

6. The three centres were completed about two years beyond the originally projected start up date (due to administrative and implementation and procurement problems). Thus, new aerosol fillers (at least eight in Fujian province) were established between 1991 and 1994, some of them using LPG propellant. Also, during this period, several large established fillers suddenly faced competition from

many small enterprises with both lower administrative costs and lower material costs and thus decided to convert to LPG, not always with safe technology.

7. As a result of voluntary phaseout actions promoted by NEPA and in anticipation of the 1997 ban on using ODS propellants in aerosols, especially in the regions where the filling centers are located, many aerosol companies converted to non- ODS technology.

8. However, many of the converted fillers to LPG and new enterprises established using LPG, are reported to be operating in a way which compromises safety (e.g., electrical installations not matching area classification, unsafe retrofit of equipment, lack of gas detectors and fire equipment, insufficient ventilation, and lack of training in handling flammable gases).

9. The Technical Assistance Programme included in the proposal will address this issue to assure enforcement of safety regulation policies to eliminate CFC use in the aerosol sector in a safe manner. It will include the following activities:

- (a) A safety component to develop a draft safety regulation in reference to the aerosol industry in China. Twenty five key people will be invited to discuss the proposed regulation during a one week workshop; final re-writing will take place, and a second workshop will formally adopt the fully checked regulation. Compliance will be obligatory, and sanctions will culminate with plant closures if infractions are not corrected (initial work was covered under the UNEP project).
- (b) Implementation of an inspection programme. A draft audit document will be developed and field tested. After field testing, and final revision, the Scientific Research Institute of Fragrance will train Government officials and safety officers (four teams of 25 people) in regulations and the means of conducting safety audits.
- (c) Quality component: An inspection system for aerosol finished products will be established for seeking any remnants of CFC based aerosol products. Any CFC products found will either be in the exempt category or will trigger the enforcement mechanism of the 1997 CFC ban in general purpose aerosols. The team will also insist upon and assure the veracity of environmental labeling.
- (d) Development of standard components to normalize aerosol activities. Conversion to LPG technology makes standardization an important policy element. China has some specific products standards which should be revised and corrected, and additional ones produced. The Institute will also study the essential use issue and establish a clear technical strategy supported by the appropriate standards.

10. The Technical Assistance Programme will result in aerosol companies being faced with three alternatives: 1) producing good quality products with non-ODS propellants in a safe plant that complies with international standards, 2) going out of business, or 3) using the filling centres

established in Tianjin, Shanghai, and Guangdong. The total cost of the Technical Assistance Programme is US \$183,000.

11. In Fujian province, there are currently over 26 aerosol fillers, 15 of which were still using CFCs as of the end of 1997 (the 15 enterprises were established before July 1995 in spite of the notice issued by the Government in April 1991), with a total aerosol production over 35 million cans (CFC and LPG propellants).

12. Jinjiang Jintong Fine Chemicals Co. Ltd, is the biggest aerosol filler plant in Fujian Province, with an annual CFC consumption of 200 tonnes used for the production of 5 million cans of hair spray, air freshener and disinfectants. The plant began aerosol production in 1993 and currently operates two locally manufactured semi-automatic filling machines.

13. The aggregate production by the other 14 fillers was estimated at 16.48 million cans. These enterprises are too far away from both the Shanghai and Guangdong Centres to be used efficiently. These enterprises are listed in Table 1. The remaining fillers in the province (with a total production of 9.5 million cans), have already converted to LPG technology, often with no provision at all for plant safety.

14. The conversion at Jinjiang Jintong Fine Chemicals Co. Ltd entails replacing the existing filling lines, installation of HAP storage facilities (80 tonnes of LPG to ensure supply to all fillers in the region), safety systems and related equipment. Cost of additional demand for HAP will be covered by the enterprises. The cost of a joint storage LPG facility will be lower than installing smaller size LPG tanks at each enterprise. The total capital costs for the conversion have been estimated at US \$329,750 while operating savings (NPV for four years) have been estimated at US \$124,150.

15. The costs associated with capital equipment required for the conversion to LPG propellant for the remaining 14 enterprises will be covered by the enterprises themselves. The project proposes to improve safety conditions at these plants through a safety package and a safety training programme (US \$7,000 per plant).

16. Under the proposed safety package component, each filler would be required to install proper safety systems to comply fully with the safety requirements for aerosol operations at their own costs. The enterprises in the Fujian Province will benefit from the provisions under the Technical Assistance Programme regarding design information; however, the major part of the investment costs will be borne by the enterprises themselves.

17. Since this project can be implemented within the next year and considering that the ban on the use of CFC in the aerosol sector has been enforced, the project will have an impact in CFC consumption in 1999 (i.e., phase out of 1,224 tonnes) and thereby help China achieve the 1999 freeze requirement.

Table 1

List of enterprises in Fujian Province still filling with CFC propellant

Enterprise	Consumption (1996)	Status of enterprise
Jinjiang Jintong Fine Chemicals	200	Awaiting safe conversion
Zhangzhou Chemical Factory	100	Awaiting safe conversion
Zhangzhou Shuangfei Cosmetics	30	Awaiting safe conversion
Zao'an Yungeng Daily Use Chemicals	35	Awaiting safe conversion
Fuqing Yuanxin Daily Use Chemicals	55	Awaiting safe conversion
Fuqing Liqi Cosmetic Factory	130	Awaiting safe conversion
Fuqing Jiawang Jinghong Chemicals	100	Awaiting safe conversion
Fuzhou Xierong Daily Use Chemicals	55	Awaiting safe conversion
Shishi Tailun Fine Chemicals	55	Awaiting safe conversion
Jinjiang Mendejiao Daily Use Chemicals	120	Awaiting safe conversion
Zhangpu Laili Daily Use Chemicals	88	Awaiting safe conversion
Xiamen Daily Use Chemicals	66	Awaiting safe conversion
Jinjiang Anhui Lingshui Daily Use Chemicals	60	Awaiting safe conversion
Yunxiao Yunhai Daily Use Chemicals	130	Awaiting safe conversion
Total	1,224	

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS**COMMENTS**

1. The Fund Secretariat reviewed the project proposal in light of the China Country Programme and the three investment projects for the establishment of aerosol filling centres in the country, approved by the Executive Committee.
2. The project submitted by the Government of China is a terminal umbrella project in the aerosol sector, excluding the medical aerosol products.
3. During the project review process, the World Bank affirmed that as of December 1997, total consumption of CFCs in the aerosol sector in the country, excluding medical products, was 1,220 tonnes. The Bank also indicated that the enterprises covered by the project were established before July 1995.
4. The World Bank and the Fund Secretariat discussed issues related to the Technical Assistance Programme and the equipment requested for the conversion of the Jinjiang Jintong Fine Chemicals plant, including the installation of a HAP storage facility to service the entire Fujian region. Operating

savings associated with the conversion of the Jinjiang Jintong Fine Chemicals plant were adjusted after re-analyzing the cost of some of the chemicals used in the formulations.

5. The US \$7,00 requested in the project covers only costs to enhance safety at the plant level (enhanced ventilation, modification to electrical installation, and secure small storage are for HAP cylinder). In total US \$98,000 is requested to cover the 14 enterprises with a total consumption of 1,024 tonnes of CFCs.

RECOMMENDATION

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

Project Title	Project Cost US \$	Support Cost US \$	Implementing Agency
Umbrella project to complete CFC phaseout in general purpose aerosols at NCLI and Fujian Light Industry Co	547,675	71,198	World Bank

PROJECT EVALUATION SHEET CHINA

SECTOR: Rigid Foams ODS use in sector (1991): 7,400 ODP tonnes

Sub-sector cost-effectiveness thresholds: Rigid US \$7.83/kg

Project Title:

Jixi City Thermal Power Company - Conversion to Cyclopentane in the manufacture of heating pipes

Project Data	Rigid Foam
ODS phase-out (ODP tonnes)	86
Proposed project duration (Yrs)	2
Incremental capital cost (US\$)	720,500
Contingency (%)	10
Incremental operational cost (US\$)	637,792
Total project cost (US\$)	1,358,292
Local ownership (%)	100
Export component (%)	0
Amount requested (US\$) { Original	673,380
{ Revised	
Cost effectiveness (US\$/kg)	7.83
National Coordinating Agency	NEPA
Implementing Agency	UNDP
Technical review completed?	yes

<i>Secretariat's Recommendations</i>	
Amount recommended (US \$)	673,380
Project impact (ODP tonnes)	86
Cost effectiveness (US \$/kg)	7.83
Implementing Agency support cost (US\$)	87,539
Total cost to Multilateral Fund	760,919

PROJECT DESCRIPTION

Jixi City Thermal Power Company - Conversion to Cyclopentane in the manufacture of heating pipes.

1. Jixi City Thermal Power Company (Jixi) currently manufactures polyurethane heating pipes at three factories located in three different towns. It operates with one low pressure machine at each factory working on a continuous line foaming steel pipes on which polyethylene is continuously extruded.
2. Under this project, Jixi will eliminate the use of CFCs in the manufacture of the polyurethane insulated heating pipes through the introduction of formulations and procedures for foam injection based on the use of cyclopentane as blowing agent. In order to achieve this Jixi will change from continuous to discontinuous process when it converts to the use of cyclopentane.
3. The project includes provision of a new 320 l/min high pressure foaming equipment with two heads to replace the existing three low pressure machines, installation of premixer, pentane storage, safety and ventilation systems, technology transfer, production trials and commissioning and training.
4. The high pressure machine is estimated to cost US\$ 320,000, underground pentane storage tank with double wall US\$ 35,000, pentane premixer and intermediate tank US\$ 85,000 and auxiliary equipment, including fire protection and safety systems US\$ 111,500, while technology transfer, trials and testing and safety training, were estimated to be US\$ 75,000. The total capital cost including contingency is US\$ 720,500. The incremental operational cost is US\$ 637,792. The total project cost is US\$ 1,358,292. However, the eligible grant is US\$ 673,380, i.e. the threshold grant amount for the consumption of 86 tonnes.

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

1. The Secretariat was advised that if the insulation is going to be thicker to compensate for lower insulation value of the pentane-blown foam, n-pentane would be a better alternative than cyclopentane, since it is readily available and generally much cheaper than cyclopentane. However, for specific process conditions such as in the case of Jixi where the PE extrusion head could be a factor in the ability to increase the thickness of the foam layer, cyclopentane could be a suitable alternative.
2. The price of the high pressure machine estimated at US\$ 320,000 was considered to be high as this could be within the range of US\$ 220,000 - US\$ 250,000. Other costs that were considered to be high were safety training, estimated to be US\$ 25,000 but which based on other approved projects could be estimated at US\$ 10,000, the cost of the premixer.

3. However, the expected reductions in the capital costs and potentially in the incremental operational cost would not affect the project cost since the total project cost would still exceed the maximum funding allowed under the threshold cost-effectiveness.

RECOMMENDATIONS

1. The Fund Secretariat recommends blanket approval of the Jixi City project with the funding level and associated support cost as indicated below.

	Project Cost US \$	Support Cost US \$	Implementing Agency
Jixi City Thermal Power Company - conversion to cyclopentane in the manufacture of heating pipes	673,380	87,539	UNDP

PROJECT EVALUATION SHEET **CHINA**

SECTOR: REFRIGERATION ODS use in sector (1993): 8,490 ODP tonnes

Sub-sector cost-effectiveness thresholds: DOMESTIC US \$13.76/kg

Project Titles: Conversion to Cyclopentane and R-134a in the Manufacture of Domestic Freezers at Wanbao Freezer Industrial Corporation

Project Data	Wanbao
ODS phase-out (ODP tonnes)	138.2
Proposed project duration (months)	24
Incremental capital cost (US \$)	1,195,150
- including contingency (%)	10
Incremental operational cost (US \$)	207,220*
Total project cost (US \$)	1,437,400*
Local ownership (%)	N/A
Export component (%)	N/A
Amount requested (US \$)	1,437,400
{Original}	
{Revised}	1,402,370
Cost effectiveness (US \$/kg)	6.8
National Coordinating Agency	NEPA
Implementing Agency	UNDP
Technical review completed?	yes

Secretariat's Recommendations:	
Amount recommended (US \$)	1,402,370
Project impact (ODP tonnes)	138.2
Cost effectiveness (US \$/kg)	6.6
Implementing Agency support cost (US \$)	182,308
Total cost to Multilateral Fund (US \$)	1,584,678

* This amount does not include incremental cost for compressor cost in the calculation of IOC.

PROJECT DESCRIPTION

Conversion to Cyclopentane and R-134a in the Manufacture of Domestic Freezers at Wanbao Freezer Industrial Corporation (WBF)

1. ODS consumption in the affected sector is estimated at 8,490 tons (1993) and was quoted to grow 16%. Annual production of domestic refrigerators reached 8.1 million units in 1993. The Executive Committee approved twenty-six domestic refrigeration projects, phasing out 6,879 ODP tonnes.
2. According to UNDP calculation, in order to achieve the 1999 freeze at the average ODS consumption level of the three years 1995, 1996, 1997, China needs to phase out 8,000 ODP tons in 1997, 7,000 tons in 1998 and 3,000 in 1999.
3. 138.2 ODP tonnes will be phased out as a result of implementation of the above mentioned domestic refrigeration project. The project document contains a statement that "Approval of this project by the MLF in 1997 should result in the elimination of the CFCs used in the manufacture of domestic freezers at WBF by end 1999 and will make a significant contribution to China's elimination programme."
4. WBF belongs to the Industrial Section of Wanbao Group comprising several companies which specialize in manufacturing domestic refrigerators, freezers and compressors. The Executive Committee approved two projects for Wanbao on conversion of production of domestic refrigerators and one project for conversion of a compressor manufacturing facility.
5. WBF is a 100% China-owned enterprise manufacturing domestic refrigerators and freezers mainly for sale in the local market. About 5 per cent of its production is exported to Article 5 countries. The company uses CFC-11 as the blowing agent in the production of rigid polyurethane insulation foam for the refrigerator/freezer cabinets, lids and doors. CFC-12 is used as a refrigerant.
6. Based on 1996 production figures, total CFC consumption of WBF was 138.2 ODP tons. Under this project, WBF will eliminate CFC-11 consumption by switching to the use of cyclopentane as a blowing agent. The existing foaming equipment will need to be replaced or retrofitted. The project covers all the necessary safety measures needed for safe operation with the flammable blowing agent.
7. The enterprise selected HFC-134a refrigerant to replace the use of CFC-12. Re-design and testing of the refrigeration system as well as changes to manufacturing procedures are required. Accordingly, new system evacuation, refrigerant charging, vacuum pumps, retrofitting of vacuum pumps, and leak detection equipment are required.
8. Funds requested will cover costs of capital equipment and costs associated with technology transfer, re-design, prototyping, testing, pilot scale production and reliability trials, and training.

9. Incremental operating costs resulting from the conversion to the new technology are requested for a period of six months. Operating costs associated with HFC-134a based compressors are not requested for funding in this proposal pending operationalization of decision 22/26 for China by the Executive Committee.

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

1. According to the project document approval of this project will make a significant contribution to China's ODS elimination program.
2. UNDP confirmed to the Secretariat that the company does not export any of its products to non-Article 5 countries.
3. The Secretariat discussed with UNDP the requested incremental capital and operating costs. The Secretariat questioned the eligibility of part of requested costs for conversion of existing heating ovens, cost of a pre-mixing station and cost of piping related to transportation of cyclopentane from the storage facility to a premixer. UNDP provided additional information regarding the design of the preheating oven. The cost for conversion of this equipment is retained as requested. The capital costs of the two other components have been reduced.
4. On the incremental operating cost, it was agreed to use price of cyclopentane applied to the projects submitted by China to the 23rd Meeting and to use the weighted average of incremental cost of several components resulting in some reduction of the total incremental operating cost.
5. ODS based production equipment which will be replaced with non-ODS equipment funded by the project will be destroyed or rendered unusable. The list of existing equipment is attached to the project document.

RECOMMENDATIONS

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

	Project Cost US \$	Support Cost US \$	Implementing Agency
Wanbao Freezer Industrial Corporation	1,402,370	182,308	UNDP