



**United Nations
Environment
Programme**



Distr.
LIMITED

UNEP/OzL.Pro/ExCom/28/26
16 June 1999

ORIGINAL: ENGLISH

EXECUTIVE COMMITTEE
OF THE MULTILATERAL FUND FOR THE
IMPLEMENTATION OF THE MONTREAL PROTOCOL
Twenty-eighth Meeting
Montreal, 14-16 July 1999

PROJECT PROPOSALS: CHINA

This document includes the comments and recommendations of the Fund Secretariat on the following project proposals:

Foam

- Conversion of PU slabstock manufacture from CFC-11 to liquid carbon dioxide technology in Longkou Shunfa Foam Plant IBRD
- Conversion of PU slabstock manufacture from CFC-11 to liquid carbon dioxide technology in Shandong Tianhua (Group) Plastic Plant IBRD
- Elimination of CFC-12 in manufacturing of EPE foam packaging nets at 27 enterprises (Umbrella Project) UNIDO
- Phaseout of CFC-11 by conversion to n-pentane technology in the manufacture of rigid polyurethane foam sandwich panels at Chengde Commercial Machinery Group Co. Ltd. IBRD
- Phaseout of CFC-11 by conversion to HCFC-141b technology in the manufacture of rigid polyurethane insulation foam at Heilongjiang Commercial Installation Corporation IBRD
- Phaseout of CFC-11 by conversion to HCFC-141b technology in the manufacture of rigid polyurethane insulation foam at Jiangsu Taizhou Commercial Machiner General Factory IBRD
- Phaseout of CFC-11 by conversion to HCFC-141b technology in the manufacture of rigid polyurethane insulation foam at Wuhan Commercial Machinery Factory IBRD

- Phaseout of CFC-11 by conversion to HCFC-141b technology in the manufacture of rigid polyurethane foam at Guangdong Zhujiang Refrigeration and Air Conditioning Co. IBRD
- Phase-out of CFC-11 by conversion to HCFC-141b technology in the manufacture of rigid polyurethane insulation foam at Hengfeng Polyurethane Spray Co. Ltd. UNDP
- Phase-out of CFC-11 in the manufacture of rigid polyurethane foam through the use of water blown technology at Jiangsu Chemical Research Institute UNDP
- Phase-out of CFC-11 by conversion to HCFC-141b technology in the manufacture of rigid polyurethane insulation foam at Jiaxing Anti-Corrosion Factory. UNDP
- Phase-out of CFC-11 by conversion to HCFC-141b technology in the manufacture of rigid polyurethane insulation foam at Penglai Polyurethane Industry Co. UNDP
- Phase-out of CFC-11 by conversion to n-pentane technology in the manufacture of rigid polyurethane insulation foam at Suzhou Purification Equipment Factory UNDP

Refrigeration

- Replacement of CFC-12 refrigerant with HCFC-22 in the manufacture of small open type compressors at Wuhan Commercial Machinery Factory IBRD
- Replacement of CFC-12 refrigerant with HCFC-22 in the manufacture of semi-hermetic compressors at Yueyang Hengli Air-Cool Equipment Co. Ltd. IBRD
- Replacement of CFC-12 refrigerant with HCFC-22 in the manufacture of small and medium sized open type compressors at Zhejiang Commercial Machinery Factory IBRD

Solvent

- Elimination of ODS used in the production lines at Irico (Caihong) Color Picture Tube Factory UNDP

**PROJECT EVALUATION SHEET
CHINA**

SECTOR: Foam ODS use in sector (1997): 23,900 ODP tonnes

Sub-sector cost-effectiveness thresholds: Flexible Slabstock US \$6.23/kg
Polystyrene/polyethylene US \$8.22/kg

Project Titles:

- (a) Conversion of PU slabstock manufacture from CFC-11 to liquid carbon dioxide technology in Longkou Shunfa Foam Plant
- (b) Conversion of PU slabstock manufacture from CFC-11 to liquid carbon dioxide technology in Shandong Tianhua (Group) Plastic Plant
- (c) Elimination of CFC-12 in manufacturing of EPE foam packaging nets at 27 enterprises (Umbrella Project)

| Project Data | Flexible slabstock | Flexible slabstock | Polystyrene/polyethylene |
|-------------------------------------|---------------------------------------|--------------------|--------------------------|
| | Longkou | Shandong | Umbrella |
| Enterprise consumption (ODP tonnes) | 70.70 | 85.80 | 825.70 |
| Project impact (ODP tonnes) | 70.70 | 85.80 | 825.70 |
| Project duration (months) | 36 | 36 | 24 |
| Initial amount requested (US \$) | 440,461 | 534,534 | 5,979,626 |
| Final project cost (US \$): | | | |
| Incremental capital cost (a) | 565,000 | 565,000 | 6,410,110 |
| Contingency cost (b) | 51,500 | 51,500 | 464,210 |
| Incremental operating cost (c) | 11,883 | -16,235 | -1,327,269 |
| Total project cost (a+b+c) | 628,383 | 600,265 | 5,547,051 |
| Local ownership (%) | 100% | 100% | 100% |
| Export component (%) | 0% | 0% | 0% |
| Amount requested (US \$) | 440,461 | 534,534 | 5,289,441 |
| Cost effectiveness (US \$/kg.) | 6.23 | 6.23 | 6.43 |
| Counterpart funding confirmed? | Yes | Yes | |
| National coordinating agency | State Environmental Protection Agency | | |
| Implementing agency | IBRD | IBRD | UNIDO |

| Secretariat's Recommendations | | | |
|--|---------|---------|--|
| Amount recommended (US \$) | 440,461 | 534,534 | |
| Project impact (ODP tonnes) | 70.70 | 85.80 | |
| Cost effectiveness (US \$/kg) | 6.23 | 6.23 | |
| Implementing agency support cost (US \$) | 57,260 | 68,799 | |
| Total cost to Multilateral Fund (US \$) | 497,721 | 603,333 | |

**PROJECT EVALUATION SHEET
CHINA**

SECTOR: Foam ODS use in sector (1997): 23,900 ODP tonnes

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

Project Titles:

- (a) Phaseout of CFC-11 by conversion to n-pentane technology in the manufacture of rigid polyurethane foam sandwich panels at Chengde Commercial Machinery Group Co. Ltd.
- (b) Phaseout of CFC-11 by conversion to HCFC-141b technology in the manufacture of rigid polyurethane insulation foam at Heilongjiang Commercial Installation Corporation
- (c) Phaseout of CFC-11 by conversion to HCFC-141b technology in the manufacture of rigid polyurethane insulation foam at Jiangsu Taizhou Commercial Machinery General Factory
- (d) Phaseout of CFC-11 by conversion to HCFC-141b technology in the manufacture of rigid polyurethane insulation foam at Wuhan Commercial Machinery Factory
- (e) Phaseout of CFC-11 by conversion to HCFC-141b technology in the manufacture of rigid polyurethane foam at Guangdong Zhujiang Refrigeration and Air Conditioning Co.

| Project Data | Rigid | Rigid | Rigid | Rigid | Rigid |
|-------------------------------------|---|--------------|-----------------|---------|----------|
| | Chengde | Heilongjiang | Jiangsu Taizhou | Wuhan | Zhujiang |
| Enterprise consumption (ODP tonnes) | 106.00 | 58.00 | 31.20 | 32.30 | 96.80 |
| Project impact (ODP tonnes) | 106.00 | 52.60 | 28.30 | 29.30 | 87.70 |
| Project duration (months) | 36 | 36 | 36 | 36 | 36 |
| Initial amount requested (US \$) | 829,980 | 411,858 | 192,890 | 149,195 | 680,230 |
| Final project cost (US \$): | | | | | |
| Incremental capital cost (a) | 557,000 | 155,000 | 97,000 | 80,000 | 160,000 |
| Contingency cost (b) | 55,700 | 15,500 | 9,700 | 8,000 | 16,000 |
| Incremental operating cost (c) | 663,366 | 327,338 | 86,190 | 61,195 | 504,230 |
| Total project cost (a+b+c) | 1,276,066 | 497,838 | 192,890 | 149,195 | 680,230 |
| Local ownership (%) | 100% | 100% | 100% | 100% | 100% |
| Export component (%) | 0% | 0% | 0% | 0% | 0% |
| Amount requested (US \$) | 829,980 | 411,858 | 192,890 | 149,195 | 680,230 |
| Cost effectiveness (US \$/kg.) | 7.83 | 7.83 | 6.82 | 5.09 | 7.75 |
| Counterpart funding confirmed? | Yes | Yes | | | Yes |
| National coordinating agency | State Environmental Protection Administration | | | | |
| Implementing agency | IBRD | IBRD | IBRD | IBRD | IBRD |

| Secretariat's Recommendations | | | | | |
|--|---------|---------|---------|---------|---------|
| Amount recommended (US \$) | 829,980 | 411,858 | 192,890 | 149,195 | 581,230 |
| Project impact (ODP tonnes) | 106.00 | 52.60 | 28.30 | 29.30 | 87.70 |
| Cost effectiveness (US \$/kg) | 7.83 | 7.83 | 6.82 | 5.09 | 6.62 |
| Implementing agency support cost (US \$) | 101,298 | 53,542 | 25,076 | 19,395 | 73,935 |
| Total cost to Multilateral Fund (US \$) | 931,278 | 465,400 | 217,966 | 168,590 | 655,165 |

PROJECT EVALUATION SHEET CHINA

SECTOR: Foam ODS use in sector (1997): 23,900 ODP tonnes

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

Project Titles:

- (i) Phase-out of CFC-11 by conversion to HCFC-141b technology in the manufacture of rigid polyurethane insulation foam at Hengfeng Polyurethane Spray Co. Ltd.
- (j) Phase-out of CFC-11 in the manufacture of rigid polyurethane foam through the use of water blown technology at Jiangsu Chemical Research Institute
- (k) Phase-out of CFC-11 by conversion to HCFC-141b technology in the manufacture of rigid polyurethane insulation foam at Jiaxing Anti-Corrosion Factory.
- (l) Phase-out of CFC-11 by conversion to HCFC-141b technology in the manufacture of rigid polyurethane insulation foam at Penglai Polyurethane Industry Co.
- (m) Phase-out of CFC-11 by conversion to n-pentane technology in the manufacture of rigid polyurethane insulation foam at Suzhou Purification Equipment Factory

| Project Data | Rigid | Rigid | Rigid | Rigid | Rigid |
|-------------------------------------|---|---------|---------|---------|---------|
| | Hengfeng | Jiangsu | Jiaxing | Penglai | Suzhou |
| Enterprise consumption (ODP tonnes) | 170.00 | 32.40 | 22.33 | 73.10 | 66.00 |
| Project impact (ODP tonnes) | 154.10 | 32.40 | 19.36 | 63.50 | 66.00 |
| Project duration (months) | 30 | 30 | 30 | 30 | 30 |
| Initial amount requested (US \$) | 1,206,600 | 253,690 | 151,590 | 497,200 | 516,780 |
| Final project cost (US \$): | | | | | |
| Incremental capital cost (a) | 540,000 | 150,000 | 75,000 | 135,000 | 435,000 |
| Contingency cost (b) | 54,000 | 15,000 | 7,500 | 13,500 | 43,500 |
| Incremental operating cost (c) | 822,690 | 228,900 | 128,300 | 412,990 | 39,850 |
| Total project cost (a+b+c) | 1,416,690 | 393,900 | 210,800 | 561,490 | 518,350 |
| Local ownership (%) | 100% | 100% | 100% | 100% | 100% |
| Export component (%) | | 0% | 0% | 0% | 0% |
| Amount requested (US \$) | 1,206,600 | 253,690 | 151,590 | 497,200 | 516,780 |
| Cost effectiveness (US \$/kg.) | 7.83 | 7.83 | 7.83 | 7.83 | 7.83 |
| Counterpart funding confirmed? | Yes | Yes | Yes | Yes | Yes |
| National coordinating agency | State Environmental Protection Administration | | | | |
| Implementing agency | UNDP | UNDP | UNDP | UNDP | UNDP |

| Secretariat's Recommendations | | | | | |
|--|-----------|---------|---------|---------|---------|
| Amount recommended (US \$) | 1,206,600 | 253,690 | 151,590 | 497,200 | 516,780 |
| Project impact (ODP tonnes) | 154.10 | 32.40 | 19.36 | 63.50 | 66.00 |
| Cost effectiveness (US \$/kg) | 7.83 | 7.83 | 7.83 | 7.83 | 7.83 |
| Implementing agency support cost (US \$) | 142,726 | 32,980 | 19,707 | 64,636 | 66,846 |
| Total cost to Multilateral Fund (US \$) | 1,349,326 | 286,670 | 171,297 | 561,836 | 583,626 |

PROJECT DESCRIPTION

- (a) **Conversion of PU Slabstock Manufacture from CFC-11 to Liquid Carbon Dioxide technology in Longkou Shunfa Foam Plant**
- (b) **Conversion of PU slabstock manufacture from CFC-11 to liquid carbon dioxide technology in Shandong Tianhua (Group) Plastic Plant**
- (c) **Elimination of CFC-12 in manufacturing of EPE foam packaging nets at 27 enterprises (Umbrella Project)**
- (d) **Phaseout of CFC-11 by conversion to n-pentane technology in the manufacture of rigid polyurethane foam sandwich panels at Chengde Commercial Machinery Group Co. Ltd.**
- (e) **Phaseout of CFC-11 by conversion to HCFC-141b technology in the manufacture of rigid polyurethane insulation foam at Heilongjiang Commercial Installation Corporation**
- (f) **Phaseout of CFC-11 by conversion to HCFC-141b technology in the manufacture of rigid polyurethane insulation foam at Jiangsu Taizhou Commercial Machiner General Factory**
- (g) **Phaseout of CFC-11 by conversion to HCFC-141b technology in the manufacture of rigid polyurethane insulation foam at Wuhan Commercial Machinery Factory**
- (h) **Phaseout of CFC-11 by conversion to HCFC-141b technology in the manufacture of rigid polyurethane foam at Guangdong Zhujiang Refrigeration and Air Conditioning Co.**
- (i) **Phase-out of CFC-11 by conversion to HCFC-141b technology in the manufacture of rigid polyurethane insulation foam at Hengfeng Polyurethane Spray Co. Ltd.**
- (j) **Phase-out of CFC-11 in the manufacture of rigid polyurethane foam through the use of water blown technology at Jiangsu Chemical Research Institute**
- (k) **Phase-out of CFC-11 by conversion to HCFC-141b technology in the manufacture of rigid polyurethane insulation foam at Jiaxing Anti-Corrosion Factory.**
- (l) **Phase-out of CFC-11 by conversion to HCFC-141b technology in the manufacture of rigid polyurethane insulation foam at Penglai Polyurethane Industry Co.**
- (m) **Phase-out of CFC-11 by conversion to n-pentane technology in the manufacture of rigid polyurethane insulation foam at Suzhou Purification Equipment Factory**

Sector Background

| | | |
|---|------------------|------------|
| - Latest available total ODS consumption (1997) | 90,511.1 | ODP tonnes |
| - Baseline consumption* of Annex A Group I substances (CFCs) | 57,818.7 | ODP tonnes |
| - 1998 consumption of Annex A Group I substances | Not reported | |
| - Baseline consumption of CFCs in foam sector | Not reported | |
| - 1998 consumption of CFCs in foam sector | Not reported | |
| - Funds approved for investment projects in foam sector as of March 1999 (27 th Meeting) | US \$ 47,479,916 | |
| - Quantity of CFC to be phased out in foam sector as of March 1999 (27 th Meeting) | 10,483.9 | ODP tonnes |
| - Quantity of CFC phased out in foam sector as of March 1999 (27 th Meeting) | 2,442 | ODP tonnes |

*Baseline consumption of Annex A controlled substances refers to average of the consumption for the years 1995-1997 inclusive.

Other relevant information:

1. China has prepared an update of its country programme. UNDP and the World Bank indicated that according to this update country programme the CFC consumption in the foam sector in 1997 was 23,900 ODP tonnes made up of 17,300 ODP tonnes CFC-11 and 6,600 ODP tonnes of CFC-12. There was no information on consumption attributed to newly established foam production capacity (i.e. those established after 25 July 1995). They state that the planned phase out target dates of CFC used in polyethylene and polystyrene foams is 2005, while in the polyurethane foam sub-sector it will be 2010.

2. Thirteen projects are being submitted to the 28th Executive Committee Meeting in the foam sector. When approved and implemented 1,621.36 ODP tonnes of CFC-11 (795.66 ODP tonnes) and CFC-12 (825.7 ODP tonnes) will be phased out.

Impact of the Projects

3. The 1,621.36 ODP tonnes to be phased out constitutes 2.8 per cent of China's baseline consumption of Annex A Group I substances. There will be a residual ODP of 167.94 ODP tonnes due to the use of HCFC-141b as substitute blowing agent. China's foam sector baseline consumption data is not yet available.

Justification for the Use of HCFC-141b

4. The following enterprises – Heilongjiang Commercial Installation Corporation, Jiangsu Taizhou Commercial Machinery, Wuhan Commercial Machinery, Guangdong Zhujiang Refrigeration and Air Conditioning, Hengfeng Polyurethane Spray, Jiaying Anti-Corrosion and Penglai Polyurethane – will convert their operations to interim use of HCFC-141b. Justification for the use of HCFC-141b has been provided in each project based on technical and economic analysis of the available technological options, and in some cases also based on the companies' own in-house development and assessment of the technological options. In accordance with Executive Committee Decision 27/13 the Government of China has sent a letter endorsing the use of HCFC-141b by the enterprises. This is attached as an annex to this evaluation.

(a) Conversion of PU Slabstock Manufacture from CFC-11 to Liquid Carbon Dioxide technology in Longkou Shunfa Foam Plant

(b) Conversion of PU slabstock manufacture from CFC-11 to liquid carbon dioxide technology in Shandong Tianhua (Group) Plastic Plant

5. Longkou Shunfa Foam Plant ("Longkou") and Shandong Tianhua (Group) Plastic Plant (Tianhua) produce PU flexible slabstock foam used for furniture and garments. Longkou operates two foam units, a vertifoam and a boxfoam and consumes 70.7 tonnes CFC-11, while Shandong operates a maxfoam and consumes 85.5 tonnes CFC-11. Both enterprises will convert their production to use liquid carbon dioxide (LCD) technology. Longkou will rationalize the vertifoam and boxfoam so as to apply for one LCD unit and will cover the costs of new conveyor, tunnel and cutting machines. The LCD unit costs US \$420,000 in each project. Other costs in each project include LCD storage and refrigeration US \$50,000, building modification US \$10,000, technology acquisition US \$50,000, trial materials US \$15,000, technical assistance US \$20,000. Contingency costs for Longkou and Shandong are US \$51,500 and US \$56,500

respectively. The projects also include incremental operating costs of US \$11,883 and US \$16,235 respectively.

(c) Elimination of CFC-12 in manufacturing of EPE foam packaging nets at 27 enterprises (Umbrella Project)

6. This is the second umbrella project in the sub-sector (extruded polyethylene foam nets for packaging) submitted by UNIDO. The sub-sector is reported to consist of 70 enterprises with 150 production lines consuming 2,000 tonnes CFC-12 (based on 1996 data). The first umbrella project which was approved at the 22nd Meeting for 25 enterprises with 45 production lines cost US \$4,488,516 to phase out 1,146 tonnes CFC-12.

7. This second umbrella project covers 27 enterprises with 47 production lines for the phase out of 825.7 tonnes CFC-12. The total project cost is US \$5,976,626 made up of US \$7,326,620 in capital cost and US \$1,137,548 in incremental operational savings.

8. All the enterprises operate Chinese made extruders purchased between January 1993 and March 1995. Fifteen of the enterprises operate one extruder each with average CFC-12 consumption of about 18.8 tonnes, seven enterprises operate two extruders each with average consumption of 35.8 tonnes, four enterprises operate three lines each with average consumption of 48.3 tonnes, while one enterprise operates 6 extruders with CFC-12 consumption of about 97 tonnes.

9. The CFC-12 will be phased out through replacement with butane. The costs of each project includes the cost of retrofit of the existing extruders, the cost of butane tank and supply system and safety related modifications. The costs of the equipment are estimated on the basis of international prices. The capital costs have been calculated for one extruder line and pro-rated for the enterprises with more than one extruder. Technology transfer, training and consultancy amount to US \$250,000 (which is 25% more than was approved for the first umbrella project). Each project includes incremental operational savings.

10. The list of enterprises involved and summary of the project costs are shown in Table 1 attached to this evaluation.

(d) Phaseout of CFC-11 by conversion to n-pentane technology in the manufacture of rigid polyurethane foam sandwich panels at Chengde Commercial Machinery Group Co. Ltd.

11. Chengde Commercial Machinery Group Co. Ltd. ("Chengde") produces PU sandwich panels that are used for cold storage and construction. This project will phase out 106 tonnes CFC-11 by converting to n-pentane technology. Chengde has one Hennecke HK2500 installed in 1986 and a AS-60 spray foam machine purchased in 1986. Both machines will be replaced at the same capacities at US \$152,000 and US \$25,000 respectively. Other costs include premix station (US \$80,000), safety modification (US \$160,000), n-pentane storage and distribution (US \$55,000), technology transfer, trial and training (US \$85,000). Incremental operating costs amount to US \$663,366. The cost of all equipment installed before 1989 have been discounted for old age.

(e) Phaseout of CFC-11 by conversion to HCFC-141b technology in the manufacture of rigid polyurethane insulation foam at Heilongjiang Commercial Installation Corporation

12. Heilongjiang Commercial Installation Corporation (“Heilongjiang”) produces PU insulation foam for food processing, petroleum, district heating and power plants. This project will phase out 58 tonnes CFC-11 by converting to HCFC-141b technology. Heilongjiang has five local-made spray machines purchased between 1990 and 1995, replacement cost will be US \$125,000. Other costs include technology transfer, trial and training (US \$30,000). Incremental operating costs amount to US \$327,338.

(f) Phaseout of CFC-11 by conversion to HCFC-141b technology in the manufacture of rigid polyurethane insulation foam at Jiangsu Taizhou Commercial Machinery General Factory

13. Jiangsu Taizhou Commercial Machinery General Factory (“Taizhou”) produces PU insulation foam for cold storage, commercial freezers, demonstration freezers and ice cream machines. This project will phase out 28.3 tonnes out of 31.2 tonnes CFC-11 used annually by converting to HCFC-141b technology. Taizhou has two local-made foam machines purchased in 1986. These two machines will be replaced by one high-pressure foaming machine at cost of US \$62,000. Other costs include technology transfer, trial and training (US \$30,000) and mold modification (US \$5,000). Incremental operating costs amount to US \$86,190. The costs of all equipment installed in 1986 have been discounted for old age.

(g) Phaseout of CFC-11 by conversion to HCFC-141b technology in the manufacture of rigid polyurethane insulation foam at Wuhan Commercial Machinery Factory

14. Wuhan Commercial Machinery Corporation (“Wuhan”) produces PU insulation foam for ice-cream machines, food vending machines and refrigeration trucks. The project will phase out 29.3 tonnes out of 32.3 tonnes CFC-11 used by Wuhan by converting to HCFC-141b technology. Wuhan has two local-made spray machines purchased in 1992. These two machines will be replaced by one high-pressure spray foam machines at US \$45,000. Other costs include retrofit of press (US \$5,000), technology transfer, trial and training (US \$30,000). Incremental operating costs amount to US \$61,195.

(h) Phaseout of CFC-11 by conversion to HCFC-141b technology in the manufacture of rigid polyurethane foam at Guangdong Zhujiang Refrigeration and Air Conditioning Co.

15. This project will phase out 87.7 ODP tonnes out of 96.8 ODP tonnes CFC-11 consumed by Guangdong Zhujiang Refrigeration and Air Conditioning Co. (“Zhujiang”), a 100% state owned Chinese enterprise, producing rigid PU foam for cold storage. Zhujiang will eliminate the use of CFC-11 in the production of foam for cold storage by switching to the use of HCFC-141b. The enterprise has two Graco, two Glas-Craft spray foam machines purchased before July 1995. These machines will be replaced at the same capacities at US \$25,000 each. Other costs include premix station (US \$30,000), technology transfer, trial and training (US \$30,000). Incremental costs amount to US \$504,230. Zhujiang also has a low pressure locally made spray foam

machine purchased in 1996. This machine will also be scrapped by Zhujiang and the plant will not use any ODS after the completion of the project.

(i) Phase-out of CFC-11 by conversion to HCFC-141b technology in the manufacture of rigid polyurethane insulation foam at Hengfeng Polyurethane Spray Co. Ltd.

16. Hengfeng Polyurethane Spray Co. Ltd. (“Hengfeng”) produces PU insulation foam panels and spray for cold storage, petroleum distribution pipes and brewers. The panels are produced by hand mixing technique. The project will phase out 154.1 tonnes out of 170 tonnes CFC-11 used in the spray and panel foam by converting to HCFC-141b technology. Hengfeng has 61 locally made low pressure spray foam machines operated by its headquarters and affiliated offices. Out of the 61 machines, 36 were purchased and put into production before July 25, 1995, while the rest were purchased later. Hengfeng would rationalize its production and replace the 36 low pressure machines with 15 new high pressure spray foam machines at US \$25,000 each. Other costs include high pressure foam dispenser for panel production at US \$160,000 and retrofitting of the press at US \$5,000 for the panel production, technology transfer, trial and training (US \$60,000). Incremental operating costs amount to US \$1,048,590. Hengfeng will co-finance the high pressure dispenser for panel production according to ExCom Decision 26/37.

(j) Phase-out of CFC-11 in the manufacture of rigid polyurethane foam through the use of water blown technology at Jiangsu Chemical Research Institute

17. Jiangsu uses 30 tonnes CFC-11 annually. Jiangsu Chemical Research Institute (“Jiangsu”), a 100% state own Chinese institute produces PU foam internal insulation for Iveco vans using spray technique. Jiangsu operates four locally made low pressure spray foam dispensers and two Glas-Craft Mini II. Under the project, Jiangsu will eliminate the use of CFC-11 by switching to water blown technology. The cost of the project includes the cost of replacement of the six spray foam machines at US \$150,000, training and technology transfer, testing and pilot scale production (US \$30,000), and incremental operating cost for two years (US \$228,900).

(k) Phase-out of CFC-11 by conversion to HCFC-141b technology in the manufacture of rigid polyurethane insulation foam at Jiaxing Anti-Corrosion Factory.

18. Jiaxing Anti-Corrosion Factory (“Jiaxing”) produces PU insulation pipes for petroleum, petrochemical, and pharmaceutical plants. The project will phase out 19.36 tonnes out of 22.33 tonnes CFC-11 used by Jiaxing by converting to HCFC-141b technology. Jiaxing uses hand mixing for the production of the pipes. The conversion to HCFC-141b requires a low output high pressure foaming machine at the cost of US \$40,000. Other costs include mold modification US \$5,000, batch premixer US \$15,000 and technology transfer, trial and training (US \$25,000). Incremental operating costs amount to US \$159,940. Jiaxing will co-finance the high pressure machine according to ExCom Decision 26/37.

(l) Phase-out of CFC-11 by conversion to HCFC-141b technology in the manufacture of rigid polyurethane insulation foam at Penglai Polyurethane Industry Co.

19. Penglai Polyurethane Industry Co. (“Penglai”) produces PU sandwich panels and pipes. This project will phase out 63.5 tonnes out of the 70 tonnes CFC-11 used annually by Penglai by converting to HCFC-141b technology. Penglai has a Cannon H40 and a Cannon HC40 both installed in 1986 and two Glas-Craft MINI spray foam machines purchased in 1992. Penglai agreed to rationalize its panel production and only apply for one high pressure machine at US \$80,000. Other costs include replacement of two spray foam machines at US \$25,000 each, retrofitting of press at US \$5,000 and technology transfer, trial and training (US \$30,000). Incremental operating costs amount to US \$430,890.

(m) Phase-out of CFC-11 by conversion to n-pentane technology in the manufacture of rigid polyurethane insulation foam at Suzhou Purification Equipment Factory

20. Suzhou Purification Equipment Factory (“Suzhou”) produces PU sandwich panels for super-clean workshops of high-tech companies. This project will phase out 66 tonnes CFC-11 by converting to n-pentane technology. Suzhou has one Cannon H200 purchased in 1987. This machine will be replaced by a high pressure foaming machines at US \$140,000. Other costs include premix station US \$80,000, pentane storage and distribution US \$40,000, safety modification US \$127,000, safety certification, technology transfer, trial and training (US \$88,000). Incremental operating costs amount to US \$152,650. The cost of replacement of equipment installed before 1989 has been discounted for old age.

SECRETARIAT’S COMMENTS AND RECOMMENDATIONS

COMMENTS

Flexible Slabstock Foam

Longkou and Shandong

1. The projects’ costs have been agreed between the Fund Secretariat and the World Bank.

Rigid Foam

Heilongjiang, Jiangsu Taizhou, Wuhan

2. The projects’ costs were agreed between the Fund Secretariat and the World Bank.

Chengde (World Bank), Hengfeng, Jiangsu, Jiaxing, Penglai and Souzhou (UNDP)

3. The Fund Secretariat and the two implementing agencies (UNDP and World Bank) discussed the respective projects applying similar principles regarding the calculation of incremental operational cost and the application of guidelines relating to replacement and/or retrofit of baseline equipment, in particular baseline high pressure spray and pouring foam machines. This resulted in changes in the incremental capital costs of Chengde, Zhujiang,

Jiangsu, Penglai and changes in the incremental operating costs of Hengfeng and Penglai. However the changes did not affect the eligible project costs (except in the case of Zhujiang), since the costs of each project exceeded the threshold funding limit even with the reductions. For instance, in the case of Chengde the calculation of the capital cost based on retrofit of the existing high pressure machine resulted in the total incremental capital cost of US \$577,500 instead of US \$612,700 but with incremental operational cost of about US \$480,000, the project cost would exceed the funding limit of US \$829,980.

4. The agreed costs of the flexible slabstock and rigid foam projects listed above are as indicated in the Secretariat's recommendations on the Project Evaluation Sheet.

Guandong Zhujiang

5. The company's four eligible baseline spray foam dispensers are high pressure dispensers. The incremental capital cost of conversion was therefore based on retrofit of the sprayers to use HCFC-141b at US \$10,000 each. There was no evidence that the company had a premixing unit in the baseline, therefore the cost of the premixer at US \$30,000 could not be considered as eligible incremental cost. Hence, the eligible incremental capital cost (ICC) was calculated to be US \$77,000, as indicated below.

| | |
|--------------------------------------|--------------------|
| Retrofit of 4 spray foam dispensers | US \$40,000 |
| Trial, technology transfer, training | <u>US \$30,000</u> |
| Sub-total | US \$70,000 |
| 10% contingency | <u>US \$7,000</u> |
| Total ICC | US \$77,000 |

6. With incremental operational cost of US \$504,230, the total project cost would be US \$581,230 (i.e. US \$77,000 and US \$504,230).

7. Consequently the eligible grant was determined to be US \$581,230.

Extruded Polyethylene Foam

Umbrella Project for 27 Enterprises.

8. Information provided by UNIDO indicates that there are 70 factories producing extruded polyethylene foam net bags with 150 production lines consuming 2000 tonnes CFC-12. The submission of this second project for 27 factories with 47 lines consuming 825 tonnes CFC-12 brings the number of factories and production lines covered to 52 and 144 respectively with total CFC-12 consumption of 1972 tonnes. This means that, if the second umbrella project is approved, 18 enterprises with 57 lines will remain in the sub-sector, but with a total CFC-12 consumption of only 28 tonnes. This is not consistent with characteristics of the sub-sector as indicated in the first two projects. For instance, there is an average of 1.8 production lines per enterprise in the two projects whereas the remaining third umbrella project which UNIDO expects to submit in 2000 would have average of 3.3 lines per enterprise but with much less CFC-12 consumption. Since the information provided by UNIDO is based on 1996 data, it is essential that clear delineation of capacities established after the July 25, 1995 be made for the group of enterprises to be covered under the next umbrella project.

9. The Fund Secretariat and UNIDO discussed the project's costs and related issues against the background of the first umbrella project and the sector background information provided by UNIDO. These discussions had not been concluded at the time of dispatch of documentation. The outcome of the discussions will be communicated to the Sub-Committee on Project Review.

10. In view of the decision of the Executive Committee requesting submission of a sector strategy document for the polyethylene/polystyrene foam sub-sector, the extruded polyethylene foam (umbrella) project is submitted for individual consideration, in light of the strategy document.

RECOMMENDATIONS

1. The Fund Secretariat recommends blanket approval of the projects for Chengde, Heilongjiang, Hengfeng, Longkou, Jiangsu, Jiangsu Taizhou, Jiaxing, Penglai, Shandong, Suzhou, Wuhan and Zhujiang, with the funding levels and associated support costs indicated in the table below.

| | Project Title | Project Cost (US\$) | Support Cost (US\$) | Implementing Agency |
|-----|---|---------------------|---------------------|---------------------|
| (a) | Conversion of PU slabstock manufacture from CFC-11 to liquid carbon dioxide technology in Longkou Shunfa Foam Plant | 440,461 | 57,260 | IBRD |
| (b) | Conversion of PU slabstock manufacture from CFC-11 to liquid carbon dioxide technology in Shandong Tianhua (Group) Plastic Plant | 534,534 | 68,798 | IBRD |
| (d) | Phaseout of CFC-11 by conversion to n-pentane technology in the manufacture of rigid polyurethane foam sandwich panels at Chengde Commercial Machinery Group Co. Ltd. | 829,980 | 101,298 | IBRD |
| (e) | Phaseout of CFC-11 by conversion to HCFC-141b technology in the manufacture of rigid polyurethane insulation foam at Heilongjiang Commercial Installation Corporation | 411,858 | 53,542 | IBRD |
| (f) | Phaseout of CFC-11 by conversion to HCFC-141b technology in the manufacture of rigid polyurethane insulation foam at Jiangsu Taizhou Commercial Machinery General Factory | 192,890 | 25,076 | IBRD |
| (g) | Phaseout of CFC-11 by conversion to HCFC-141b technology in the manufacture of rigid polyurethane insulation foam at Wuhan Commercial Machinery Factory | 149,195 | 19,395 | IBRD |
| (h) | Phaseout of CFC-11 by conversion to HCFC-141b technology in the manufacture of rigid polyurethane foam at Guangdong Zhujiang Refrigeration and Air Conditioning Co. | 581,230 | 73,935 | IBRD |
| (i) | Phase-out of CFC-11 by conversion to HCFC-141b technology in the manufacture of rigid polyurethane insulation foam at Hengfeng Polyurethane Spray Co. Ltd. | 1,206,600 | 142,726 | UNDP |
| (j) | Phase-out of CFC-11 in the manufacture of rigid polyurethane foam through the use of water blown technology at Jiangsu Chemical Research Institute | 253,690 | 32,980 | UNDP |

| | | | | |
|-----|---|---------|--------|------|
| (k) | Phase-out of CFC-11 by conversion to HCFC-141b technology in the manufacture of rigid polyurethane insulation foam at Jiaying Anti-Corrosion Factory. | 151,590 | 19,707 | UNDP |
| (l) | Phase-out of CFC-11 by conversion to HCFC-141b technology in the manufacture of rigid polyurethane insulation foam at Penglai Polyurethane Industry Co. | 497,200 | 64,636 | UNDP |
| (m) | Phase-out of CFC-11 by conversion to n-pentane technology in the manufacture of rigid polyurethane insulation foam at Suzhou Purification Equipment Factory | 516,780 | 66,846 | UNDP |

Table 1: Summary of the Second China Umbrella Extruded Polyethylene Foam Project (UNIDO)

| NO. | Name | Location | No. of lines | Average 1996-1998 | | Incremental Capital Cost, US\$ | Contingency US\$ | Incremental Operating Saving | Project Cost US\$ | Cost-effectiveness US\$/kg |
|-----|--|------------------------------|--------------|-----------------------|-------------------------------|--------------------------------|------------------|------------------------------|-------------------|----------------------------|
| | | | | Production ODP Tonnes | CFC-12 consumption ODP Tonnes | | | | | |
| 1 | Guanghua Factory | Linyi Shanxi | 6 | 384.4 | 96.9 | 655,230 | 58,930 | -147,963 | 507,267 | 5.24 |
| 2 | Chengguan Textile Factory | Lingbao Henan | 3 | 216.5 | 54.8 | 373,950 | 33,450 | -80,461 | 293,489 | 5.35 |
| 3 | Froit Factory | Pizhou Jiangsu | 3 | 170.9 | 43.0 | 373,950 | 33,450 | -61,250 | 312,700 | 7.27 |
| 4 | Feng Sunlou Factory | Feng County Jiangsu | 3 | 188.4 | 46.5 | 373,950 | 33,450 | -66,444 | 307,506 | 6.61 |
| 5 | Jinma Factory | Kuerle Xinjiang | 3 | 194.4 | 51.7 | 373,950 | 33,450 | -76,516 | 297,434 | 5.76 |
| 6 | Tianhuiyuan Factory | Lizhuang Dangshan | 2 | 135.3 | 36.6 | 282,210 | 25,110 | -52,195 | 230,015 | 6.28 |
| 7 | Tangzhai Factory | Tangzhuangweizhuang | 2 | 137.9 | 34.4 | 282,210 | 25,110 | -47,348 | 234,862 | 6.82 |
| 8 | Tianci Factory | Liquan Shanxi | 2 | 142.3 | 38.5 | 282,210 | 25,110 | -55,240 | 226,970 | 5.90 |
| 9 | No 2 Textile Factory | Pucheng Shanxi | 2 | 145.7 | 36.6 | 282,210 | 25,110 | -50,997 | 231,213 | 6.31 |
| 10 | Tongfa Factory | Lizhuangkalou Dangshan | 2 | 130.3 | 32.3 | 282,210 | 25,110 | -43,802 | 238,408 | 7.38 |
| 11 | Shayidong Factory | Shayidong Kuerle Xinjiang | 2 | 150.0 | 37.2 | 282,210 | 25,110 | -51,590 | 230,620 | 6.21 |
| 12 | Heli Factory | Kuerle Xinjiang | 2 | 137.0 | 34.7 | 282,210 | 25,110 | -48,085 | 234,125 | 6.74 |
| 13 | Wujiaqu Factory | Changji Xinjiang | 1 | 71.7 | 17.6 | 158,300 | 0 | -21,914 | 136,386 | 7.75 |
| 14 | Yongji Factory | Yongji County Shanxi | 1 | 72.1 | 17.9 | 158,300 | 0 | -22,424 | 135,876 | 7.61 |
| 15 | Caiyuan Factory | XuanmiaoCounty Dangshan | 1 | 71.5 | 17.5 | 158,300 | 0 | -21,803 | 136,497 | 7.78 |
| 16 | Hengxin Factory | Lizhuang County Dangshan | 1 | 74.3 | 18.2 | 158,300 | 0 | -22,927 | 135,373 | 7.42 |
| 17 | FengSonglou Factory | Feng County Jiangsu | 1 | 82.4 | 20.3 | 173,630 | 15,330 | -24,456 | 149,174 | 7.36 |
| 18 | Pingluchanglezhen | Pinglu Shanxi | 1 | 71.3 | 17.6 | 158,300 | 0 | -21,971 | 136,329 | 7.75 |
| 19 | Xingda Factory | Wangtubei Dangshan Anhui | 1 | 82.3 | 20.1 | 173,630 | 15,330 | -24,058 | 149,572 | 7.45 |
| 20 | Lizhuang Gongxiaoshe | Lizhuang Dangshan Anhui | 1 | 77.9 | 19.2 | 158,300 | 0 | -24,438 | 133,862 | 7.44 |
| 21 | Sanlian Factory | 310National Roud Dangshan | 1 | 72.1 | 17.5 | 158,300 | 0 | -21,657 | 136,643 | 7.81 |
| 22 | Liyuan Factory | Wangzhuanglihe Dangshan | 1 | 70.1 | 17.4 | 158,300 | 0 | -21,695 | 136,605 | 7.85 |
| 23 | Xinyu Froit Factory | Zhaotunchengzhuang Dangshan | 1 | 81.3 | 19.4 | 173,630 | 15,330 | -22,847 | 150,783 | 7.76 |
| 24 | Shijiazhuang City Food | Jinzhou City Hebei | 1 | 81.0 | 19.9 | 173,630 | 15,330 | -23,793 | 149,837 | 7.54 |
| 25 | Jinzhou Factory | Zongshizhuang County Jinzhou | 1 | 82.5 | 20.2 | 173,630 | 15,330 | -24,304 | 149,326 | 7.39 |
| 26 | Fucheng Nanxiakou | Feng County Hebei | 1 | 81.6 | 19.4 | 173,630 | 15,330 | -22,749 | 150,881 | 7.78 |
| 27 | Quyong Froit Co.Ltd | Chuijiiazhuang Quyong Hebei | 1 | 83.2 | 20.4 | 173,630 | 15,330 | -24,683 | 148,947 | 7.31 |
| | General consultancy, technology transfer, civil/electrical/mechanical engineering design and training services | | | | | | | | 250,000 | |
| | | Total | 47 | 3288.5 | 825.7 | 6,608,310 | 475,810 | -1,127,609 | 5,730,701 | 7.03 |

**PROJECT EVALUATION SHEET
CHINA**

SECTOR: Refrigeration ODS use in sector (1997): 9,500 ODP tonnes

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

Project Titles:

- (a) Replacement of CFC-12 refrigerant with HCFC-22 in the manufacture of small open type compressors at Wuhan Commercial Machinery Factory
- (b) Replacement of CFC-12 refrigerant with HCFC-22 in the manufacture of semi-hermetic compressors at Yueyang Hengli Air-Cool Equipment Co. Ltd.
- (c) Replacement of CFC-12 refrigerant with HCFC-22 in the manufacture of small and medium sized open type compressors at Zhejiang Commercial Machinery Factory

| Project Data | | Commercial | Commercial | Commercial |
|--------------------------------------|--|---|-------------------|-------------------|
| | | Wuhan | Yueyang | Zhejiang |
| Enterprise consumption (ODP tonnes) | | 107.93 | 228.23 | 160.80 |
| Project impact (ODP tonnes) | | 104.15 | 220.24 | 251.70 |
| Project duration (months) | | 36 | 36 | 36 |
| Initial amount requested (US \$) | | 1,703,560 | 1,915,584 | 1,871,387 |
| Final project cost (US \$): | | | | |
| | Incremental capital cost (a) | 1,547,716 | 1,742,725 | 1,698,947 |
| | Contingency cost (b) | 154,772 | 174,273 | 169,895 |
| | Incremental operating cost (c) | 726,815 | 535,309 | 301,305 |
| | Total project cost (a+b+c) | 2,429,303 | 2,452,307 | 2,170,147 |
| | Local ownership (%) | 100% | 100% | 100% |
| | Export component (%) | 8% | 2% | 0% |
| | Amount requested (US \$) | 1,702,488 | 1,916,998 | 1,868,842 |
| | Cost effectiveness (US \$/kg.) | 16.36 | 8.96 | 7.40 |
| | Counterpart funding confirmed? | | | |
| | National coordinating agency | State Environmental Protection Administration | | |
| | Implementing agency | IBRD | IBRD | IBRD |
| Secretariat's Recommendations | | | | |
| | Amount recommended (US \$) | | | |
| | Project impact (ODP tonnes) | | | |
| | Cost effectiveness (US \$/kg) | | | |
| | Implementing agency support cost (US \$) | | | |
| | Total cost to Multilateral Fund (US \$) | | | |

PROJECT DESCRIPTION

- (a) **Replacement of CFC-12 refrigerant with HCFC-22 in the manufacture of small open type compressors at Wuhan Commercial Machinery Factory.**
- (b) **Replacement of CFC-12 refrigerant with HCFC-22 in the manufacture of semi-hermetic compressors at Yueyang Hengli Air-Cool Equipment Co. Ltd.**
- (c) **Replacement of CFC-12 refrigerant with HCFC-22 in the manufacture of small and medium sized open type compressors at Zhejiang Commercial Machinery Factory.**

Sector Background

- | | |
|---|---------------------|
| – Latest available total ODS consumption (1997) | 90,511.1 ODP tonnes |
| – Baseline consumption* of Annex A Group I substances (CFCs) | 57,818.7 ODP tonnes |
| – 1998 consumption of Annex A Group I substances | |
| – Baseline consumption of CFCs in refrigeration sector | Not reported |
| – 1998 consumption of CFCs in refrigeration sector | |
| – Funds approved for investment projects in refrigeration sector as of March 1999 | US \$39,162,000 |
| – Quantity of CFC to be phased out in refrigeration sector as of March 1999 | |
| – Quantity of CFC phased out in refrigeration sector as of March 1999 | 3,680.0 ODP tonnes |

*Baseline consumption of Annex A controlled substances refers to average of the consumption for the years 1995-1997 inclusive.

Sector Information

1. China's baseline consumption (average of 1995-1997) of Annex A Group I substances (CFCs) reported to the Ozone Secretariat was 57,818.7 ODP tonnes.
2. The project document reports that the CFC-12 consumption of the industrial and air conditioning industries in China was about 9,500 ODP tonnes (about 16.5% of the overall consumption) in 1997; of which 46.3% (4,400 ODP tonnes) was attributed to the servicing of existing equipment.
3. The strategy for phasing out CFCs in the commercial refrigeration sector was presented to the Executive Committee at the 17th meeting indicating the consumption in the commercial refrigeration sector to be about 13,000 tonnes of CFC refrigerant per year, mainly CFC-12. 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 phasing out 13,000 tonnes of CFC refrigerant per year, mainly CFC-12; (b) non-ODS refrigerants would be ultimately used in this sector; (c) that imported technology should be used as the basis for projects; and (d) 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 systems components would be met by the country.

4. According to the “Strategy Study”, China will seek Multilateral Fund support for 24 conversion projects while the remaining 49 production lines will either be closed or converted by China. For other enterprises that are not included in the Multilateral Fund framework, they will be forced to close according to the relevant regulations. The projects will be supervised and coordinated by State Environmental Protection Administration (SEPA) to ensure their success.

5. The Executive Committee approved about US \$39.2 million for sixteen projects covering altogether 17 enterprises listed in the strategy phasing out 3,680 ODP tonnes of CFCs. From seven, remaining enterprises., three enterprises are involved in manufacturing of semi-hermetic compressors and four in production of open type compressors. Xinji Refrigerating Machinery Factory was originally included in the list of 24 enterprises. This company (Xinji) is replaced by Wuhan Commercial Machinery Factory which is also producing small open type compressors. The project for Wuhan enterprise is a part of the present submission.

6. The approval of the three proposed projects will help China to phase out a total of 576.09 ODP tonnes through conversion to HCFC-22 technology. Should each project be implemented as scheduled, the phase out of CFCs in the commercial refrigeration sector would contribute to China’s obligation to meet the requirements of the Montreal Protocol.

7. The three project proposals request incremental capital costs for acquiring imported and locally produced machining equipment, tooling, measuring and testing equipment and other accessories. Other one-time costs consist of transport/insurance/installation, trial production, training and technology transfer requested at US \$200,000 for all three enterprises.

8. Contingency costs are calculated at 14% of capital cost. The 20% discounting factor was applied in three proposals to account for the technological upgrade.

9. Incremental operating costs calculated for 2 years duration are not requested for funding.

Justification for the Use of HCFC-22

10. The three companies have selected HCFC-22 technology to replace CFC-12 in refrigeration operations. The justification for the use of HCFC is provided and attached to this evaluation and concurrence of the use of HCFC technology has also been provided in accordance with Executive Committee Decision 27/13 and is also attached.

SECRETARIAT’S COMMENTS AND RECOMMENDATIONS

COMMENTS

1. The chosen technology is proven. The use of HCFC-22 technology is explained and attached in the annex to this evaluation. The Government’s concurrence of the use of HCFC technology has been provided in accordance with Executive Committee Decision 27/13 and is also in the annex.

2. The Secretariat has discussed the three proposals with the World Bank. Several budget items related to trial production, dedicated fixtures and performance testing equipment are dependent on the type of product and the number of models produced by the individual enterprise. The Secretariat has proposed to the World Bank to adjust the requested costs accordingly.
3. The cost of molds for costing was requested for the three enterprises only one has a foundry workshop producing compressor parts from casting. The other two enterprises source cast bodies of compressors from local suppliers. In line with the Executive Committee policy not to fund producers of components, the Secretariat recognized the cost of molds as ineligible for funding in the two projects.
4. Taking into account that the World Bank gained significant experience in implementation of commercial compressor projects in China, the Secretariat has proposed to reduce contingency from 14% to 10%.
5. Since the three proposals are similar to projects discussed and approved at the 22nd Executive Committee Meeting the discounting factor due to the technological upgrade was reduced from 20% to 12% in accordance with Decision 22/42.
6. The Secretariat is still discussing with the World Bank the eligible cost for conventional measuring gauges, costs of tooling for CFC machining equipment, performance testing equipment and the salvage value of machining equipment to be replaced and used for other applications. The Sub-Committee will be informed of the results of this discussion as appropriate.

**PROJECT EVALUATION SHEET
CHINA**

SECTOR: Solvent ODS use in sector (1997): 4421 ODP tonnes

Sub-sector cost-effectiveness thresholds: CFC-113 US \$19.73/kg
TCA US \$38.50/kg

Project Titles:

(a) Elimination of ODS used in the production lines at Irico (Caihong) Color Picture Tube Factory

| Project Data | Combined CFC-113 and TCA | |
|-------------------------------------|---|------------|
| | Irico | |
| Enterprise consumption (ODP tonnes) | | 202.00 |
| Project impact (ODP tonnes) | | 202.00 |
| Project duration (months) | | 48 |
| Initial amount requested (US \$) | | 2,853,200 |
| Final project cost (US \$): | | |
| Incremental capital cost (a) | | 4,675,000 |
| Contingency cost (b) | | 467,500 |
| Incremental operating cost (c) | | -1,728,800 |
| Total project cost (a+b+c) | | 3,413,700 |
| Local ownership (%) | | 100% |
| Export component (%) | | 0% |
| Amount requested (US \$) | | 2,853,200 |
| Cost effectiveness (US \$/kg.) | | 14.10 |
| Counterpart funding confirmed? | | Yes |
| National coordinating agency | State Environmental Protection Administration | |
| Implementing agency | UNDP | |

| Secretariat's Recommendations | |
|--|--|
| Amount recommended (US \$) | |
| Project impact (ODP tonnes) | |
| Cost effectiveness (US \$/kg) | |
| Implementing agency support cost (US \$) | |
| Total cost to Multilateral Fund (US \$) | |

PROJECT DESCRIPTION

Elimination of ODS used in the production lines at Irico (Caihong) Color Picture Tube Factory

Sector background:

| | | |
|--|----------|------------|
| - Baseline consumption of Annex A Group 1 substances (CFCs)* | 57,818.7 | ODP tonnes |
| - Latest available total ODS consumption (1995) | 5,393.6 | ODP tonnes |
| - Baseline consumption in the solvent sector (1991) | 9,947 | ODP tonnes |
| - Latest available consumption in the solvent sector (1997) | 4,421 | ODP tonnes |

* Baseline consumption of Annex A controlled substances refers to average of the consumption for the years 1995-1997

1. The project was considered at the 23rd Meeting in November 1997. The Executive Committee agreed that the project was eligible for funding but that it should be considered for funding only in 1999 and no later than the second meeting of the year.

2. This is a very large project. It will phase out the use of 169 ODP tonnes of CFC-113 (211 metric tonnes) and 33 ODP tonnes of TCA (330 metric tonnes), used annually in various cleaning operations associated with the manufacture of colour picture tubes at IRICO, a 100% locally owned enterprise. IRICO currently produces some 7.5 million picture tubes per year. The enterprise has five factories in its plant which cover a total area of 300,000 square metres.

3. Replacement of the two ODS cleaning agents used in the production processes involving 16 cleaning machines will be accomplished by replacing 12 machines with an aqueous cleaning process, two machines with an air-blowing and mechanical cleaning technology developed by Toshiba, and two machines with a mineral spirits process. The phaseout will be implemented over four years in several phases related to the production processes and the factories in which they are located, in order to cause minimum disruption to the ongoing high volume production. Project inputs will include a combination of replacement of the existing 16 cleaners, improved ventilation, site preparation and plant modifications, technology transfer and trials.

4. The enterprise installed two trichloroethylene (TCE) cleaning systems in the 1980s, but converted the systems back to TCA in 1989 and January 1995 because of difficulties with stringent local regulations regarding the use of TCE. The conversion has therefore been proposed principally on the basis of aqueous cleaning technology. For two cleaning lines, aqueous technology requires a change in product design and the alternative air-blowing technology developed by Toshiba, which is compatible with current product design, will be adopted.

5. Incremental capital costs of US \$4,675,000 are made up of US \$3,350,000 for 14 new cleaning machines (the remaining two will be retrofitted), US \$575,000 for 7 de-ionised water plants and a water treatment system, US \$310,000 for building modification and site preparation, with the balance for: retrofit costs; ventilation and vapour recovery systems; shipping and insurance, and; technology transfer, training, trial runs and start-up. A 10 percent contingency has been added.

6. Incremental operating savings over four years of US \$1,728,800 will be realised from the decreased costs of solvent, partially offset by increases in energy and labour costs associated with the use of aqueous systems and the de-ionized water plants.

7. The enterprise proposes to provide counterpart funding of US \$560,500 and is seeking a grant of the balance of project costs of US \$2,853,200. The cost effectiveness of the project is US \$14.1/kg. The weighted threshold for the project is US \$22.8/kg.

Impact of project on country's Montreal Protocol obligations

8. IRICO is the largest known user of CFC-113 and TCA in China. It is stated in the project document that when implemented as scheduled, CFC consumption eliminated from the solvent sector which currently constitutes 5.2% of the country's CFC consumption, will help China to meet its obligations under the Montreal Protocol.

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

1. The project was reviewed by the Fund Secretariat before submission to the 23rd Meeting. At that time the Fund Secretariat examined, together with the implementing agency, the technology selection, retrofit options, major equipment costs, building modification and site preparation costs and chemical prices for incremental operating costs and savings.

2. Initially, the project was costed on the basis of conversion to TCE for four of the sixteen of the cleaning systems. However it was proposed in the original project document that aqueous systems would, in fact, be installed since the enterprise had not been able to implement TCE cleaning systems effectively because of stringent local regulatory provisions concerning operator safety. The project was reformulated on the basis of what was actually proposed to be implemented, and costs were maintained at the same level through counterpart funding.

3. The implementing agency advised that the high level of building modification and site preparation costs arises from the very large size of the factories and the cleaning systems themselves, some of which are up to 8 metres in length and located in the centre of the buildings. Additionally, since many of the operations take place under very clean conditions, the entire factory atmosphere has to be returned to particulate-free conditions after conversion. This presents a significant logistics problem as well as raising local works expense to a high level.

4. The above characteristics of the project have not changed, however the technology selection for the two machines for which aqueous technology is not suitable has now been established (the Toshiba air-blowing technology). The implementing agency (UNDP) advised that this choice is final.

5. Solvent consumption has increased in the intervening two years as production has increased. The cost effectiveness has improved because the requested grant has been maintained at the level submitted to the 23rd Meeting.

6. Capital costs are lower, however incremental operating costs increased because the cost of the ODS solvents has fallen. China's State Environmental Protection Agency has advised, through UNDP, that a survey of prices from January to June 1999 indicates that CFC-113 costs US \$1.96 per kg compared to US \$2.46 in 1997 and TCA costs US \$1.55 compared to US \$1.89.

RECOMMENDATION

1. There are no cost or eligibility issues, however in view of the Executive Committee's previous considerations and the current preparation of a solvent sector phase-out plan for China, the project is being submitted for individual consideration.