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EXECUTIVE COMMITTEE OF
THE MULTILATERAL FUND FOR THE
IMPLEMENTATION OF THE MONTREAL PROTOCOL
Twenty-third Meeting
Montreal, 12-14 November 1997

PROJECT PROPOSALS: INDIA

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

Foam

- | | |
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| • Phase-out of CFCs in the manufacture of cold cured molded, integral skin and rigid PUF products at Joti FoamProducts P. Ltd. | UNDP |
| • Elimination of CFCs in the manufacture of flexible cold-cured molded PU foam at K.J. Polymers P. Ltd. | UNDP |
| • Phase-out of CFCs in the manufacture of integral skin PUF products at Legend Interiors | UNDP |
| • Phase-out of CFCs in the manufacture of cold cured molded and integral skin at Shri Krishna Polyurethane Industries P. Ltd. | UNDP |
| • Elimination of CFCs in the manufacture of flexible cold-cured molded PU foam at Siddhi Polymer (India) P. Ltd. | UNDP |
| • Elimination of CFCs in the manufacture of flexible molded cold-cured and integral skin PU foam at Venus Auto P. Ltd. | UNDP |
| • Elimination of CFCs in the manufacture of rigid PUF insulated thermoware at Alaska Industries | UNDP |
| • Elimination of CFCs in the manufacture of rigid PUF insulated thermoware at Bluplast Corporation | UNDP |
| • Elimination of CFCs in the manufacture of rigid polyurethane foam insulation products at Malanpur Entech P. Ltd. | UNDP |

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| • Elimination of CFCs in the manufacture of rigid PUF insulated thermoware at Nissan Thermoware P. Ltd. | UNDP |
| • Elimination of CFCs in the manufacture of rigid polyurethane foam insulation products at Panna International | UNDP |
| • Elimination of CFCs in the manufacture of rigid polyurethane foam at Ras Polybuild Products P. Ltd. | UNDP |
| • Elimination of CFCs in the manufacture of rigid polyurethane foam insulation products at Reliable Rotomoulders P. Ltd. | UNDP |
| • Elimination of CFCs in the manufacture of rigid polyurethane foam insulation products at Viral Corportion | UNDP |

Refrigeration

- | | |
|---|------------|
| • Elimination of CFCs in the manufacture of commercial refrigeration equipment at Aarkay Industries | World Bank |
| • Elimination of CFCs in the manufacture of commercial refrigeration equipment at Saikrupa Industries | World Bank |
| • Elimination of CFCs in the manufacture of commercial refrigeration equipment at Sarkar Refrigeration Industries | World Bank |
| • Elimination of CFCs in The manufacture of commercial refrigeration equipment at Sidwal Refrigeration Industries P. Ltd. | World Bank |
| • Elimination of CFCs in the manufacture of domestic refrigerators at Whirlpool of India Ltd. | World Bank |

**PROJECT EVALUATION SHEET
INDIA**

SECTOR: FOAMS ODS use in sector (1991): 1,577 ODP tonnes

Sub-sector cost-effectiveness thresholds: Integral Skin US \$16.86/kg

Project Titles:

- (a) Phase-out of CFCs in the manufacture of cold cured molded, integral skin and rigid PUF products at Joti Foam Products P. Ltd.
- (b) Elimination of CFCs in the manufacture of flexible cold-cured molded PU foam at K.J. Polymers P. Ltd.
- (c) Phase-out of CFCs in the manufacture of integral skin PUF products at Legend Interiors
- (d) Phase-out of CFCs in the manufacture of cold cured molded and integral skin at Shri Krishna Polyurethane Industries P. Ltd.
- (e) Elimination of CFCs in the manufacture of flexible cold-cured molded PU foam at Siddhi Polymer P. Ltd.
- (f) Elimination of CFCs in the manufacture of flexible molded cold-cured and integral skin PU foam at Venus Auto P. Ltd.

Project Data	Integral Skin					
	Joti	K.J.	Legend	Shri Krishna	Siddhi	Venus
ODS phase-out (ODP tonnes)	39.2	30	9.8	19.7	7.5	21
Proposed project duration (months)	24	24	24	24	24	24
Incremental capital cost (US \$)	308,000	206,000	115,000	242,000	121,000	205,000
- including contingency (%)	10	10	10	10	10	10
Incremental operational cost (US \$)	38,000	39,000	9,000	21,000	6,500	30,000
Total project cost (US \$)	346,000	245,000	124,000	263,000	127,500	235,000
Local ownership (%)	100	100	100	100	100	100
Export component (%)						
Amount requested (US \$) {Original}	346,000	245,000	124,000	263,000	126,450	235,000
{Revised}						
Cost effectiveness (US \$/kg)	9.21	8.17	13.73	13.73	16.86	11.49
National Coordinating Agency	Ministry of Environment and Forests (MOEF)					
Implementing Agency	UNDP					
Technical review completed?	Yes	Yes	Yes	Yes	Yes	Yes

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

PROJECT DESCRIPTION

Foam Sector Profile

Sector ODS consumption (1991) reported in country programme	1577 tonnes ODP
Most recent consumption data	Not available
ODS to be phased out in approved projects (as at July 1997)	1754 tonnes ODP
ODS phased out (as at July 1997)	215 tonnes ODP
ODS to be phased out in current proposed projects	246 tonnes ODP
Latest (1995) CFC-11 consumption reported according to Art.7	2522 tonnes ODP

(a) Phase-out of CFCs in the manufacture of cold cured molded, integral skin and rigid PUF products at Joti Foam Products P. Ltd.

1. Joti Foam Products P. Ltd will phaseout the use of CFC-11 in the production of cold-cured molded, integral skin and rigid PUF products for the furniture and automotive sectors. The company currently has: two Hennecke dispensers (1983, model HK-270 and HK-1250) with maximum outputs 35 kg/min at 150 bar and 135 kg/min at 80 bar, respectively, one block-making plant for rigid PUF, and sixty fiberglass molds for molded PUF seats.

2. The manufacturing operations are to be converted to water blown systems for cold cured molded PUF and HCFC-141b based systems for integral skin and rigid PUF. The capital costs include: the replacement of one Hennecke foam dispenser (HK-1250) by a 135 kg/min high pressure foam dispenser (US \$125,000); the retrofitting of the low pressure dispenser HK-270 (US \$20,000) and the rigid block plant (US \$15,000); the replacement of the fiberglass molds to metallic molds (US \$75,000), and the introduction of a mold heating system (US \$10,000). Trials, technology transfer and training amount to US \$35,000. Contingency costs of US \$28,000 are also included. Incremental operating costs of US \$38,000 are expected based on the use of the following chemicals:

for cold-cured molded PUF: 19,000 kg CFC-11, 66,500 kg MDI; 90,000 kg MDI;
for integral skin PUF: 7,000 kg CFC-11, 24,500 kg MDI; 5,000 kg HCFC-141b, 26,000 kg MDI;
for rigid PUF: 13,200 kg CFC-11; 10,000 kg HCFC-141b, 2,000 kg MDI.

3. Calculation of incremental operational costs of the projects was based on the following prices CFC-11; US \$2.50/kg, HCFC-141 US \$3.50/kg; Methylene and Chloride US \$2.50/kg.

(b) Elimination of CFCs in the manufacture of flexible cold-cured molded PU foam at K.J. Polymers P. Ltd.

1. The company K. J. Polymers P. Ltd. will convert from the use of CFC-11 in the manufacture of flexible cold-cured molded polyurethane foam products for the automotive and furniture market. K. J. Polymers operates three high pressure machines: two Elastogran Puomat

(1993 and 1995) and one in-house fabricated (1995), each with maximum outputs of 60 lit/kg. The company also uses one low pressure machine Klockner Windsor (1994) with output 36 lit/min, 47 molds (42 fiberglass and 5 metallic), and two continuous conveyor systems.

2. K.J. Polymers is substituting water blown formulations for CFC-11 as an auxiliary blowing agent. The capital cost of conversion involves: the replacement of the Klockner low pressure dispenser by a high pressure dispenser (US \$90,000), the replacement of forty-two fiberglass molds (US \$42,000), and the installation of two mold heating ovens (US \$20,000). The capital cost associated with trials, technology transfer and training is US \$35,000, while the cost of contingency is US \$19,000. Incremental operating costs of US \$39,000 are expected on the basis of the use of the following chemicals: 30,000 kg CFC-11 and 105,000 kg Methylene Chloride 144,000 MDI.

(c) Phase-out of CFCs in the manufacture of integral skin PUF products at Legend Interiors

1. Legend Interiors will phaseout the use of CFC-11 in the production of integral skin polyurethane products for furniture applications. The company currently has one SAIP low pressure machine (1995) with a capacity of 30 lit/min.

2. The manufacturing operations are to be converted to water blown systems with water and HCFC-141b based system as an interim step. The capital costs include the replacement of the low pressure dispenser by one high pressure foam dispenser (US \$80,000). Trials, technology transfer and training amount to US \$25,000. Capital costs also include contingency (US \$10,000). Incremental operating costs of US \$9,000 are expected based on the use of the following chemicals: 9,800 kg CFC-11, 34,000 kg MDI; 7,000 kg HCFC-141b and 36,000 kg MDI.

(d) Phase-out of CFCs in the manufacture of cold cured molded and integral skin at Shri Krishna Polyurethane Industries P. Ltd.

1. Shri Krishna Polyurethane Industries P. Ltd. will phaseout the use of CFC-11 in the production of cold-cured molded and integral skin polyurethane foam for furniture applications. The company currently has two low pressure machines: Impianti OMS (1986) and SAIP SP 12 (1995), with maximum outputs of 35 lit/min and 15 lit/min, respectively. It also uses twenty fiberglass molds for cold cured molded polyurethane foam.

2. The production is to be converted to water blown systems for cold cured molded polyurethane foams and HCFC-141b based systems for integral skin polyurethane foams. The capital costs include: the replacement of the two low pressure machines by two high pressure dispensers (US \$160,000); the replacement of the twenty fiberglass molds by metallic molds (US \$25,000), and finally the introduction of a mold heating system (US \$10,000). Trials, technology transfer and training amount to US \$35,000. Capital costs also include contingency (US \$22,000). Incremental operating costs of US \$21,000 are expected based on the use of the following chemicals:

for cold-cured molded PUF: 12,700 kg CFC-11, 44,000 kg MDI; 60,000 kg MDI;
for integral skin PUF: 7,000 kg CFC-11; 24,500 kg MDI; 5,000 kg HCFC-141b and
26,000 MDI.

(e) Elimination of CFCs in the manufacture of flexible cold-cured molded PU foam at Siddhi Polymer P. Ltd.

1. Siddhi Polymer P. Ltd. will phaseout the use of CFC-11 in the manufacture of flexible cold-cured molded polyurethane foam products for the automotive and furniture markets. The company currently has: one in-house built low pressure machine (1993), with a maximum output of 30 lit/min; one batch blender, and ten fiberglass molds.

2. The production is to be converted to water blown formulations. The capital costs include the replacement of the low pressure by one high pressure foam dispenser (US \$80,000), and the replacement of the ten fiberglass molds by metallic molds (US \$10,000). Also, the introduction of a mold heating system (US \$5,000) will be necessary. Trials, technology transfer and training amount to US \$15,000. Capital costs also include contingency (US \$11,000). Incremental operating costs of US \$6,500 are expected based on the use of the following chemicals: 7,500 kg CFC-11, 27,000 kg MDI; 36,000 kg MDI.

(f) Elimination of CFCs in the manufacture of flexible molded cold-cured and integral skin PU foam at Venus Auto P. Ltd.

1. Venus Auto P. Ltd. will phaseout the use of CFC-11 in the manufacture of flexible cold-cured molded polyurethane foam and integral skin polyurethane foam product for the automotive and furniture markets. The company currently has the following equipment: one high pressure Elastogran dispenser (1985) and one low pressure Nova Pumech dispenser (1994) both with maximum output 30 lit/min. The company also utilizes forty-eight molds, ten of which are aluminium molds the rest consisting of fiberglass molds.

2. The manufacturing operations are to be converted to water blown formulations. For integral skin foam, the water blown technology will be implemented after an interim step to HCFC-141b based systems. The capital costs include: the replacement of the low pressure machine by a high pressure dispenser of equivalent effective output (US \$90,000); retrofitting of the existing high pressure dispenser (US \$36,000), corresponding to 50% of the cost not covered by enterprise; the replacement of thirty-eight fiberglass molds to aluminium molds, and finally the introduction of a mold heating oven.. Trials, technology transfer and training amount to US \$30,000. Contingency costs of US \$19,000 are also included. Incremental operating costs of US \$30,000 are expected based on the use of the following chemical:

for cold-cured molded PUF: 14,000 kg CFC-11, 49,000 kg MDI; 68,000 kg MDI;
for integral skin PUF: 7,000 kg CFC-11; 25,000 kg MDI; 5,000 kg HCFC-141b and
27,000 MDI.

Justification for the Use of HCFCs

3. If applicable, the enterprises have opted for converting to such CFC-free systems, with HCFC-141b based systems as an interim step, until technologies for safe CFC-free alternatives become mature and commercially viable.

Equipment or Components to be Destroyed or Rendered Unusable

4. The fate of the replaced equipment in all the above projects is not indicated.

Impact of Project on 1999 Freeze

5. The Ozone Cell, Ministry of Environment and Forest (MOEF) is leading the efforts in the phaseout of CFC's in close cooperation with the consuming and supplying industry. Complete phaseout for foams other than rigid polyurethane is targeted for the year 2000. Rigid PUFs are expected to be CFC-free from the year 2006. The implementation of these projects will help India to meet the 1999 freeze.

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

Integral Skin/Flexible Molded Foams

1. Based on expert advice to the Secretariat the following cost items are still being discussed with the Implementing Agencies.

- change of molds following conversion
- provision of heating ovens
- replacement of low pressure with high pressure machines.

2. Agreed costs of the affected projects will be communicated to the Sub-Committee on Project Review.

3. The affected projects are:

- Joti Foam Products
- K.J. Polymers
- Legend Interiors
- Shri Krishna
- Siddhi Polymer
- Venus Auto

PROJECT EVALUATION SHEET **INDIA**

SECTOR: FOAM ODS use in sector (1991): 1,577 ODP tonnes

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

Project Titles: Elimination of CFCs in the manufacture of rigid PUF insulation products at:

(a) Alaska Industries (b) Bluplast Corporation (c) Malanpur Entech (d) Nissan Thermoware
(e) Panna International (f) Ras Polybuild Products (g) Reliable Rotomoulders (h) Viral Corporation

Project Data	Rigid							
	Alaska	Bluplast	Malanpur	Nissan	Panna	Ras	Reliable	Viral
ODS (CFC-11) phase out (ODP tonnes)	19	11	20.5	15.4	10.5	19.2	8.7	12.8
Proposed project duration (months)	24	24	24	24	24	24	24	24
Incremental capital cost (US\$)	110,000	66,000	127,000	105,000	37,000	110,000	55,000	72,000
- including contingency (%)	10	10	10	10	23	10	10	10
Incremental operational cost (US\$)	18,000	10,000	21,000	15,000	11,000	18,000	8,000	12,000
Total project cost (US\$)	128,000	76,000	148,000	120,000	48,000	128,000	63,000	84,000
Local ownership (%)	100	100	100	100	100	100	100	100
Export component (%)								
Amount requested (US\$) {Original}	128,000	76,000	148,000	111,000	48,000	128,000	63,000	84,000
{Revised}								
Cost effectiveness (US\$/kg.)	7.29	7.51	7.83	7.83	4.96	7.22	7.83	7.13
National Coordinating Agency	Ministry of Environment and Forests (MOEF)							
Implementing Agency	UNDP							
Technical review completed?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Secretariat's Recommendations								
Amount recommended (US \$)	128,000	76,000	148,000	111,000	48,000	128,000	63,000	84,000
Project Impact (ODP tonnes)	17.56	10.12	18.91	15.4	9.68	17.73	8.7	11.78
Cost effectiveness (US \$/kg)	7.29	7.51	7.83	7.83	4.96	7.22	7.83	7.13
Implementing Agency support cost (US\$)	16,640	9,880	19,240	14,430	6,240	16,640	8,190	10,920
Total cost to Multilateral Fund	144,640	85,880	167,240	125,430	54,250	144,640	71,190	94,920

PROJECT DESCRIPTION

Foam Sector Profile

Sector ODS consumption (1991) reported in country programme	1577 tonnes ODP
Most recent consumption data	not available
ODS to be phased out in approved projects (as at July 1997)	1754 tonnes ODP
ODS phased out (as at July 1997)	215 tonnes ODP
ODS to be phased out in current proposed projects	246 tonnes ODP
Latest (1995) CFC-11 consumption reported according to Art.7	2534 tonnes ODP

(a) Elimination of CFCs in the manufacture of rigid PUF insulated thermoware at Alaska Industries

1. Alaska Industries will phaseout the use of CFC-11 in the manufacture of rigid polyurethane foam insulated thermoware. The enterprise has one indigenous low pressure foam dispenser (1993) of a capacity of 15 lit/min, as well as six injection molding machines and a large number of molds and fixtures.
2. The manufacturing operations are to be converted to water blown systems, with a combination of water and HCFC-141b based systems as an interim step. The capital costs include: the replacement of the low pressure dispenser by a high pressure machine (US \$80,000). Trials, technology transfer and training amount to US \$20,000. Contingency costs of US \$10,000 are also included. Incremental operating costs of US \$10,500 are expected based on the use of the following chemicals: 19,000 kg CFC-11; 13,000 kg HCFC-141b and 5,000 kg MDI.
3. Incremental operational costs of all the projects were calculated using the following prices: CFC-11 US\$ 2.50; HCFC-141b US\$ 3.50; MDI US\$ 2.50.

(b) Elimination of CFCs in the manufacture of rigid PUF insulated thermoware at Bluplast Corporation

1. Blupast Corporation will phaseout the use of CFC-11 in the manufacture of rigid polyurethane foam insulated thermoware. The enterprise has one indigenous low pressure foam dispenser (1993) of a capacity of 9 lit/min, as well as six injection molding machines and a large number of molds and fixtures.
2. The manufacturing operations are to be converted to water blown systems, with a combination of water and HCFC-141b based systems as an interim step. The capital costs include: the replacement of the low pressure dispenser by a high pressure machine (US \$45,000). Trials, technology transfer and training amount to US \$15,000. Contingency costs of US \$6,000 are also included. Incremental operating costs of US \$10,000 are expected based on the use of the following chemicals: 11,000 kg CFC-11; 8,000 kg HCFC-141b and 2,000 kg MDI.

(c) Elimination of CFCs in the manufacture of rigid polyurethane foam insulation products at Malanpur Entech

1. Malanpur Entech will phaseout the use of CFC-11 in the manufacture of rigid polyurethane foam insulated thermoware. The enterprise has one Cannon C-60 and one mobile Gusmer FF-1600 low pressure foam dispensers of capacities of 60 lit/min and 9 lit/min, respectively, as well as associated tooling and fixtures.
2. The manufacturing operations are to be converted to water blown systems, with a combination of water and HCFC-141b based systems as an interim step. The capital costs include: the replacement of the Cannon low pressure dispenser by a high pressure machine (US \$90,000), and the retrofitting of the mobile dispenser (US \$5,000). Trials, technology transfer and training amount to US \$20,000. Contingency costs of US \$12,000 are also included. Incremental operating costs of US \$21,000 are expected based on the use of the following chemicals: 20,500 kg CFC-11; 14,500 kg HCFC-141b and 5,000 kg MDI.

(d) Elimination of CFCs in the manufacture of rigid PUF insulated thermoware at Nissan Thermoware

1. Nissan Thermoware will phaseout the use of CFC-11 in the manufacture of rigid polyurethane foam insulated thermoware. The enterprise has two Gusmer FF-1600 low pressure dispensers, both 1992 models, as well as ten injection molding machines and a large number of molds and fixtures.
2. The manufacturing operations are to be converted to water blown systems, with a combination of water and HCFC-141b based systems as an interim step. The capital costs include: the replacement of both low pressure dispensers by two high pressure machines (US \$80,000). Trials, technology transfer and training amount to US \$15,000. Contingency costs of US \$10,000 are also included. Incremental operating costs of US \$15,000 are expected based on the use of the following chemicals: 15,400 kg CFC-11; 11,000 kg HCFC-141b and 3,500 kg MDI.

(e) Elimination of CFCs in the manufacture of rigid polyurethane foam insulation products at Panna International

1. Panna International will phaseout the use of CFC-11 in the manufacture of rigid polyurethane foam insulation products. The enterprise has one Gusmer H-2000 high pressure machine, as well as twenty-four foaming jigs.
2. The manufacturing operations are to be converted to water blown systems, with a combination of water and HCFC-141b based systems as an interim step. The capital costs include: the retrofit of the high pressure dispenser (US \$10,000). Trials, technology transfer and training amount to US \$20,000. Contingency costs of US \$7,000 are also

included. Incremental operating costs of US \$11,000 are expected based on the use of the following chemicals: 10,500 kg CFC-11; 7,500 kg HCFC-141b and 2,500 kg MDI.

(f) Elimination of CFCs in the manufacture of rigid polyurethane foam insulation products at Ras Polybuild Products

1. Ras Polybuild Products will phaseout the use of CFC-11 in the manufacture of rigid polyurethane foam insulation and imitation wood products. The enterprise has one Stepan model 800-640 low pressure machine (1994) with a capacity of 30 kg/min, and associated molds and fixtures.
2. The manufacturing operations are to be converted to water blown systems, with a combination of water and HCFC-141b based systems as an interim step. The capital costs include: the replacement of the low pressure dispenser by a high pressure unit (US \$80,000). Trials, technology transfer and training amount to US \$20,000. Contingency costs of US \$10,000 are also included. Incremental operating costs of US \$18,000 are expected based on the use of the following chemicals: 19,200 kg CFC-11; 13,000 kg HCFC-141b and 4,600 kg MDI.

(g) Elimination of CFCs in the manufacture of rigid polyurethane foam insulation products at Reliable Rotomoulders

1. Reliable Rotomoulders will phaseout the use of CFC-11 in the manufacture of rigid polyurethane foam insulation products. The enterprise has one Gusmer FF-1600 low pressure machine with a capacity of 9 lit/min, and associated molds and fixtures.
2. The manufacturing operations are to be converted to water blown systems, with a combination of water and HCFC-141b based systems as an interim step. The capital costs include: the replacement of the low pressure dispenser by a high pressure unit (US \$35,000). Trials, technology transfer and training amount to US \$15,000. Contingency costs of US \$5,000 are also included. Incremental operating costs of US \$8,000 are expected based on the use of the following chemicals: 8,700 kg CFC-11; 6,000 kg HCFC-141b and 2,000 kg MDI.

(h) Elimination of CFCs in the manufacture of rigid polyurethane foam insulation products at Viral Corporation

1. Viral Corporation will phaseout the use of CFC-11 in the manufacture of rigid polyurethane foam insulation products. The enterprise has one fabricated low pressure machine with a capacity of 10 lit/min, and associated molds and fixtures.
2. The manufacturing operations are to be converted to water blown systems, with a combination of water and HCFC-141b based systems as an interim step. The capital costs include: the replacement of the low pressure dispenser by a high pressure unit (US \$45,000). Trials, technology transfer and training amount to US \$20,000.

Contingency costs of US \$7,000 are also included. Incremental operating costs of US \$12,000 are expected based on the use of the following chemicals: 12,800 kg CFC-11; 9,000 kg HCFC-141b and 3,000 kg MDI.

Justification for the Use of HCFCs

3. The above companies have chosen interim use of water and HCFC-141b based systems to maintain product standards and acceptability.

Equipment or Components to be Destroyed or Rendered Unusable

4. The fate of the replaced equipment in all the above projects is unknown.

Impact of Project on 1999 Freeze

5. Implementation of these projects will help India to meet the 1999 freeze.

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

1. The costs of all the projects except Nissan Thermoware and Reliable Rotomolders were discussed against the background of previously approved projects in India and agreed.

RECOMMENDATION(S)

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

Project Title	Project Cost US \$	Support Cost US \$	Implementing Agency
(a) Elimination of CFCs in the manufacture of rigid PUF insulated thermoware at Alaska Industries	128,000	16,640	UNDP
(b) Elimination of CFCs in the manufacture of rigid PUF insulated thermoware at Bluplast Corporation	76,000	9,880	UNDP
(c) Elimination of CFCs in the manufacture of rigid polyurethane foam insulation products at Malaupur Entech	148,000	19,240	UNDP
(d) Elimination of CFCs in the manufacture of rigid PUF insulated thermoware at Nissan Thermoware	111,000	14,430	UNDP

Project Title	Project Cost US \$	Support Cost US \$	Implementing Agency
(e) Elimination of CFCs in the manufacture of rigid polyurethane foam insulation products at Panna International	48,000	6,240	UNDP
(f) Elimination of CFCs in the manufacture of rigid polyurethane foam insulation products at Ras Polybuild Products	128,000	16,640	UNDP
(g) Elimination of CFCs in the manufacture of rigid polyurethane foam insulation products at Reliable Rotomoulders	63,000	8,190	UNDP
(h) Elimination of CFCs in the manufacture of rigid polyurethane foam insulation products at Viral Corporation	84,000	10,920	UNDP

PROJECT EVALUATION SHEET INDIA

SECTOR: REFRIGERATION ODS use in sector (1991): 1990 ODP tonnes

Sub-sector cost-effectiveness thresholds: Commercial 15.21 US \$/kg
Domestic 13.76 US \$/kg

Project Titles:

- (a) Elimination of CFCs in the manufacture of commercial refrigeration equipment at Aarkay Industries
- (b) Elimination of CFCs in the manufacture of commercial refrigeration equipment at Saikrupa Industries
- (c) Elimination of CFCs in the manufacture of commercial refrigeration equipment at Sarkar Refrigeration Industries
- (d) Elimination of CFCs in the manufacture of commercial refrigeration equipment at Sidwal Refrigeration Industries
- (e) Elimination of CFCs in the manufacture of domestic refrigeration equipment at Whirlpool of India

Project Data	Commercial Refrigeration/Rigid PU Foam				
	Aarkay	Saikrupa	Sarkar	Sidwal	Whirlpool
ODS phase-out (ODP tonnes)	19.8	14.8	12	11.7	339.2
Proposed project duration (months)	18	18	18	18	36
Incremental capital cost (US \$)	75,000	75,000	75,500	95,770	1,837,000
- including contingency (%)	10	10	10	10	10
Incremental operational cost (US \$)	53,298	43,118	34,050	64,397	5,258,348
Total project cost (US \$)	135,798	125,618	117,100	169,744	7,095,348
Local ownership (%)	100	100	100	100	43.7
Export component (%)	-	-	-	-	-
Amount requested (US \$) {Original}	173,010	162,830	143,865	208,185	3,100,667
{Revised}	135,798	125,618	117,100	169,744	-
Cost effectiveness (US \$/kg)	6.86	8.49	10.01	14.51	9.141
National Coordinating Agency	Ministry of Environment & Forests				
Implementing Agency	World Bank				
Technical review completed?	Yes				

Secretariat's Recommendations:					
Amount recommended (US \$)	135,798	125,618	117,100	169,744	-
Project impact (ODP tonnes)	19.8	14.8	12	11.7	-
Cost effectiveness (US \$/kg)	8.59	8.49	10.01	14.04	-
Implementing Agency support cost (US \$)	17,654	16,330	15,223	22,067	-
Total cost to Multilateral Fund (US \$)	153,452	141,948	132,323	191,811	-

PROJECT DESCRIPTION

- (a) **Elimination of CFCs in the manufacture of commercial refrigeration equipment at Aarkay Industries**
 - (b) **Elimination of CFCs in the manufacture of commercial refrigeration equipment at Saikrupa Industries**
 - (c) **Elimination of CFCs in the manufacture of commercial refrigeration equipment at Sarkar Refrigeration Industries**
 - (d) **Elimination of CFCs in the manufacture of commercial refrigeration equipment at Sidwal Refrigeration Industries**
1. It is indicated in the project documents that ODS consumption in the commercial refrigeration sub-sector is estimated at 1990 MT (1991) and is projected to reach 3437 MT in 1994 based on 20% growth p.a.. The sector comprises a large number of small/medium enterprises and unorganized enterprises. The Executive Committee has approved eight projects in the commercial refrigeration sector, phasing out 122 ODP tonnes.
 2. The four projects submitted represent another group of small and medium sized enterprises that manufacture a range of commercial refrigeration units: chest freezers, bottle/water coolers, display cabinets, and air conditioners. One enterprise, Sidwal, also manufactures air conditioners for trucks and buses. The implementation of these projects will result in the phasing out of 58.3 ODP tonnes.
 3. Conversion to HFC-134a refrigerant in the 5 enterprises involves the replacement of leak detectors, evacuation/charging units, compressors, as well as redesign and modification of the refrigeration systems.
 4. Conversion to water/HCFC-141b based foam formulation entails the replacement of low pressure foam dispensers with high pressure foam dispensers. It is stated that the low-pressure dispensers can not be retrofitted, and that new foam equipment will enable implementation of emerging fully-water- based, ODS-free systems.
 5. It is stated in the project documents that these companies recognize the transitional nature of the HCFC-141b/water foam technologies. They prefer to switch to a combination of water/HCFC-141b based technology at this stage, and to eventually implement ODS-free (fully water-blown) conversion once the commercial introduction of technologically mature water-based systems is realized. No additional investments are foreseen to convert to fully water blown technology.
 6. Replaced equipment will be scrapped or surrendered to an approved agency. A scrap value of US \$100 is listed for vacuum pumps.

7. In each project the main component of capital costs related to the foam operation is a high pressure foam dispenser at a cost of US \$40,000. In the refrigeration section, the main components are manual charging units and vacuum pumps. Each project includes US \$30,000 for trials, technology transfer and training, US \$15,000 each for the foam and refrigeration component.
8. Incremental operating costs are requested for the higher chemical and component costs for two years duration and do not reflect growth.
9. A letter from the coordinating national body (Indian Ministry of Environment and Forests-Ozone Cell) indicates that the incremental operating costs related to compressors are not being requested until the Government of India had taken a view on the issue. These costs are not included in the proposed grant.

(e) Elimination of CFCs in the manufacture of domestic refrigeration equipment at Whirlpool of India

1. ODS consumption in the domestic refrigeration sub-sector in 1991 was 700 MT. The updated 1996 figure provided by the Government of India is about 2,200 MT. The domestic refrigeration sub-sector in India is comprised of eight manufacturers with a combined total production capacity of over 5 million units annually.
2. A total amount of 1,490 ODP tonnes will be phased-out as a result of conversion of four domestic refrigerator manufacturers already approved by the Executive Committee.
3. Implementation of the domestic refrigeration project for Whirlpool of India submitted to the 23rd Executive Committee Meeting is essential for India to meet the 1999 freeze. The project proposal states that "It is imperative that new ODS phase out project proposals amounting to at least 2,800 ton per year for the next three years, be expeditiously approved to enable India to meet its obligations for complying with the 1999 freeze on CFC consumption".
4. Whirlpool of India is one of the major domestic refrigerator manufacturers in India with a production level of 705,087 refrigerators in 1996. Whirlpool of India presently operates two foaming production lines. Overall installed foaming capacity was enhanced after July 1995. Costs related to this enhancement have not been included in the calculation of incremental costs.
5. The company has selected HCFC-141b as a substitute for CFC-11 blowing agent and HFC-134a as the new refrigerant. The conversion technology and expertise will be acquired from Whirlpool USA.
6. HCFC-141b has a boiling point near ambient temperatures. HCFC-141b based systems are technically mature and commercially available. They also provide relatively the most

acceptable insulation value and energy efficiency, and the lowest investment and operating costs vis-à-vis other options. No major changes in the auxiliary equipment/tooling in the production program, such as jig/mod redesign, are needed. Based on these considerations, and in line with the overall policy of its multinational parent, Whirlpool of India has chosen HCFC-141b based systems as an interim technology, to maintain product standards and acceptability, until the commercial introduction of liquid HFCs, which is chosen as the permanent technology. No additional investments are foreseen to be needed to convert to HFC based systems.

7. Conversion to HCFC-141b involves the replacement of a pre-mixing station together with buffer tanks, piping, retrofitting of foaming machines, training and technical assistance, installation, prototype testing, trials and quality certification.
8. Conversion to HFC-134a entails changes to the existing production lines refrigerant and lubricant handling system since the compressors are supplied without lubricant, new vacuum pumps, refrigerant and lubricant charging units for production and for servicing in the 18 servicing centres, production leak detectors with spectrometer, hand leak detectors, re-design, testing and trials, technology transfer, quality certification and training.
9. Operating costs are requested for a period of 6 months. The incremental cost of compressors is included in the calculation of operating cost at US \$ 6.92/unit.

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

- (a) **Elimination of CFCs in the manufacture of commercial refrigeration equipment at Aarkay Industries**
- (b) **Elimination of CFCs in the manufacture of commercial refrigeration equipment at Saikrupa Industries**
- (c) **Elimination of CFCs in the manufacture of commercial refrigeration equipment at Sarkar Refrigeration Industries**
- (d) **Elimination of CFCs in the manufacture of commercial refrigeration equipment at Sidwal Refrigeration Industries**

1. The only issue with these projects is the cost of trials, technology transfer and training in each project (US \$30,000).

2. Similar costs were approved by the Executive Committee at the 22nd meeting with the associated decision that the World Bank be requested to "develop a group approach for the transfer of technology in similar projects in India approved but not yet implemented, and in future projects in the commercial refrigeration sub-sector in India, with the objective of providing effective technology transfer and trials at 50 percent of the cost allocated in current projects".

3. The Fund Secretariat raised this issue with the World Bank, which advised that “ it had reviewed the possibility of evolving a group approach, but that there were several factors inhibiting the reduction of costs by multiple operations. Firstly, the choice of supplier can differ. Secondly, the commissioning of the machines is dependent on the progress of completion of the installation process, and these are virtually impossible to synchronize for different private enterprises. Further, the enterprises are scattered geographically all over India, and it is not easy to reduce fixed costs by covering several enterprises in one mission”.

4. To enable work on small and medium sized enterprises in the commercial refrigeration sector in India to continue, the Fund Secretariat suggests that consideration could be given to approving these projects, while at the same time confirming that no further projects will be considered for this sub-sector in India until the Executive Committee's requirements from the 22nd Meeting have been complied with.

(e) Elimination of CFCs in the manufacture of domestic refrigeration equipment at Whirlpool of India

1. The Secretariat discussed with the World Bank the following issues related to the eligibility and the costs of equipment as submitted in the project proposal.

2. All CFC-12 related equipment in the 18 servicing centers will be used to continue servicing existing CFC-12 refrigerators produced by the enterprise, providing HFC-134a equipment related to servicing will not phase out CFC-12 from those appliances and may not, therefore, be considered incremental.

3. Two new automatic continuous pre-mixers (for cabinet and door formulations) are requested in the proposal to replace the batch-type mechanical pre-mixer equipped with a temperature conditioning system. Generally, a batch-type mechanical mixer with a temperature conditioning system can be used, with minor retrofits, for pre-mixing HCFC-141b systems as was the case in several project proposals with similar baseline situation. Cost of retrofitting the existing pre-mixer has thus been proposed by the Secretariat. The second pre-mixer was not part of the baseline. Provision of the second pre-mixer for door foaming operations will enhance the versatility of production process and expand the mixing capacity which is clearly related to the expansion of production through installation of new drum unit, beside the requirement for new formulation. This represents a technological upgrade. The Secretariat proposed that the company should contribute 50% of the requested cost of the second pre-mixer.

4. The Secretariat has expressed concerns regarding the possibility of double counting due to budget items for external technical assistance for foam formulations and trials for validating formulations. The World Bank is the implementing agency for 3 system house foam formulation projects that included testing of different formulations.

5. The Secretariat raised several issues related to the eligibility of the refrigerant handling system and new vacuum pumps, as well as the level of funding of HFC-134a charging board, lubricant handling system and leak detectors.
6. Incremental operating costs requested for plastic inner liner, condenser and evaporator are higher than in similar conversion projects.
7. Incremental operating cost associated with compressor is requested in the submitted project at US \$ 6.92 per unit. The Secretariat informed the World Bank that this cost cannot be considered in the absence of the information required in Decision 22/26.
8. The estimated incremental operating costs for 6 months amount to US \$4 million for the refrigerant, and US \$1.23 million for foam, before discounting for the foreign ownership. This represents the highest ever level of incremental operating costs calculated in the history of the Multilateral Fund.
9. The Secretariat and the World Bank are still discussing the level of eligible capital and operating costs. The Sub-Committee on Project Review will be informed accordingly.

RECOMMENDATIONS

1. The Fund Secretariat recommends approval of these projects at the funding levels indicated below, together with associated support costs:

Project Title	Project Cost US \$	Support Cost US \$	Implementing Agency
(a) Elimination of CFCs in the manufacture of commercial refrigeration equipment at Aarkay Industries	135,798	17,654	World Bank
(b) Elimination of CFCs in the manufacture of commercial refrigeration equipment at Saikrupa Industries	125,618	16,330	World Bank
(c) Elimination of CFCs in the manufacture of commercial refrigeration equipment at Sarkar Refrigeration Industries	117,100	15,223	World Bank
(d) Elimination of CFCs in the manufacture of commercial refrigeration equipment at Sidwal Refrigeration Industries	169,744	22,067	World Bank
(e) Elimination of CFCs in the manufacture of domestic refrigeration equipment at Whirlpool of India	Pending		World Bank

2. The Fund Secretariat further recommends that no more projects in the commercial refrigeration sub-sector in India be considered by the Executive Committee until its requirements from the 22nd Meeting regarding development of a group approach to technology transfer, trials and training have been implemented by the World Bank.