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

Twentieth Meeting
Montreal, 16-18 October 1996

PROJECT PROPOSALS: INDIA

This document includes the Comments and Recommendations from the Fund Secretariat on the following projects:

Foam

- | | |
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| • Elimination of CFCs in the manufacture of rigid PUF products at Best Plastronics P. Ltd. | UNDP |
| • Elimination of CFCs in the manufacture of rigid PUF insulated thermoware at Bharat Plast | UNDP |
| • Elimination of CFCs in the manufacture of rigid PUF insulated thermoware at Amar Enterprises | UNDP |
| • Elimination of CFCs in the manufacture of EPE foam products at Vora Cork Industries | UNDP |
| • Elimination of CFCs in the manufacture of rigid PUF products at Deccan Engineering Enterprises | UNDP |
| • Elimination of CFCs in the manufacture of rigid PUF insulated thermoware at Bharat Cottage Industries | UNDP |
| • Phase-out of CFCs in the manufacture of cold cured molded PUF products at Krishna Fabrications Ltd. | UNDP |
| • Phase-out of CFCs in the manufacture of cold cured molded PUF products at K.B. Poly Industries P. Ltd. | UNDP |

Refrigeration

- Elimination of CFCs in the manufacture of commercial refrigeration equipment at Supercold Refrigeration Systems World Bank
- Elimination of CFCs in the manufacture of commercial refrigeration equipment at Murali Refrigeration and Engineering Co. World Bank

PROJECT EVALUATION SHEET

INDIA

SECTOR: FOAM

Sub-sector cost-effectiveness thresholds:

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

Extruded polyethylene foam US \$8.22/kg

Integral Skin PU foam US \$16.86/kg

Rigid PU foam US \$7.83/kg

- Project Titles:**
- (a) Elimination of CFCs in the manufacture of EPE foam products at Vora cork Industries
 - (b) Phase-out of CFCs in the manufacture of cold cured molded PUF products at K.B. Poly Industries
 - (c) Phase-out of CFCs in the manufacture of cold cured molded PUF products at Krishna Fabrications Ltd.
 - (d) Elimination of CFCs in the manufacture of rigid PUF insulated thermoware at Amar Enterprises
 - (e) Elimination of CFCs in the manufacture of rigid PUF products at Best Plastronics P. Ltd.
 - (f) Elimination of CFCs in the manufacture of rigid PUF insulated thermoware at Bharat Cottage Industries
 - (g) Elimination of CFCs in the manufacture of rigid PUF insulated thermoware at Bharat Plast
 - (h) Elimination of CFCs in the manufacture of rigid PUF products at Deccan engineering Enterprises

Project Data	Extruded Polyethylene	Integral Skin Molded		Rigid				
	Vora Cork	K.B. Poly	Krishna	Amar	Best Plastronics	Bharat Cottage	Bharat Plast	Deccan
ODS (CFC-11) phase out (ODP tonnes)	39.6	10	13	17.5	21	8.5	11.5	9
Proposed project duration (Yrs)	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Incremental capital cost (US\$)	303,000	140,000	151,000	110,000	121,000	55,000	63,000	60,000
Contingency (%)	10	10	10	10	10	10	10	10
Incremental operational cost (US\$)	(5,000)	9,000	13,000	10,000	8,000	6,000	8,000	4,000
Total project cost (US\$)	298,000	149,000	164,000	120,000	129,000	61,000	71,000	64,000
Local ownership (%)	100	100	100	100	100	100	100	100
Export component (%)	0	0	0	0	0	0	0	0
Amount requested (US\$) {Original	298,000	149,000	164,000	120,000	129,000	61,000	71,000	64,000
{Revised	264,500							
Cost effectiveness (US\$/kg.)	7.53	14.9	12.61	7.41	6.63	7.78	6.68	7.67
National Coordinating Agency	Ministry of Environment and Forests							
Implementing Agency	UNDP	UNDP	UNDP	UNDP	UNDP	UNDP	UNDP	UNDP
Technical review completed?	YES	YES	YES	YES	YES	YES	YES	YES
Secretariat's Recommendations								
Amount recommended (US \$)	264,500	149,000	164,000	120,000	129,000	61,000	71,000	64,000
Project Impact (ODP tonnes)	39.6	10	13	16.18	19.46	7.84	10.62	8.34
Cost effectiveness (US \$/kg)	6.68	14.9	12.61	7.41	6.63	7.78	6.68	7.67
Implementing Agency support cost (US\$)	34,385	19,370	21,320	15,600	16,770	7,930	9,230	8,320
Total cost to Multilateral Fund	298,885	168,370	185,320	135,600	145,770	68,930	80,230	72,320

PROJECT DESCRIPTION

Extruded Polyethylene Foam Project

- (a) Elimination of CFCs in the manufacture of EPE foam products at Vora Cork Industries

1. Vora Cork Industries Ltd. Manufactures both high and low density extruded polyethylene foam, used for lining of beverage cups, packaging etc. It operates two extruders - a seven-year old, 120mm diameter Samson (Korea), capacity 150 kg/hr with a low pressure piston pump and a four-year old Berstoff (German), capacity 90 kg/hr with a high pressure diaphragm pump.

2. The company will substitute iso-pentane for CFC-12 as the blowing agent. The capital cost includes the cost of providing ventilation, fire alarm and fire protection systems (US \$90,000), two bulk storage tanks (US \$50,000), modification to the two extruders (US \$30,000), high pressure iso-pentane metering pump (US \$75,000), start-up and trials, training and technology transfer (US \$25,000). The project will have incremental savings.

Integral Skin Projects

- (b) Phase-out of CFCs in the manufacture of cold cured molded PUF products at K.B. Poly Industries.

- (c) Phase-out of CFCs in the manufacture of cold cured molded PUF products at Krishna Fabrications Ltd.

3. Two enterprises (K.B. Poly Industries and Krishna Fabrications Ltd.) manufacture cold cured molded polyurethane seat cushions and complete seat assemblies for the automotive industry. Each enterprise has a low pressure foam dispenser (a four-year old and a ten-year old) and use fiberglass molds.

4. Both enterprises will convert from the use of CFC-11 to all-water blown high resilience foam. The capital cost of conversion includes the replacement of the low pressure machines with high pressure ones (US \$90,000 each), replacement of the fiberglass molds with metallic molds (US \$1,500 each), water heating system (US \$10,000), technology transfer, trials and training (US \$15,000). There will be incremental operating costs arising from increased use of MDI.

Rigid Polyurethane Foam Projects

- (d) Elimination of CFCs in the manufacture of rigid PUF insulated thermoware at Amar Enterprises

- (e) Elimination of CFCs in the manufacture of rigid PUF products at Best Plastronics P. Ltd.

- (f) Elimination of CFCs in the manufacture of rigid PUF insulated thermoware at Bharat Cottage Industries
- (g) Elimination of CFCs in the manufacture of rigid PUF insulated thermoware at Bharat Plast
- (h) Elimination of CFCs in the manufacture of rigid PUF products at Deccan engineering Enterprises

5. Three of the five enterprises (Amar Enterprises, Bharat Cottage Industries and Bharat Plast.) involved in the production of rigid polyurethane foam products manufacture thermoware products. Of the remaining two companies, Best Plastronics manufactures rigid polyurethane foam slabs, boards and pipe sections, while Deccan Engineering Enterprises manufactures rigid polyurethane foam for a variety of insulation applications. Amar Enterprises, Bharat Cottage Industries and Deccan Engineering each operates low pressure foam dispensers, Bharat Plast operates one high pressure and one low pressure, while Best Plastronics operates one low pressure and two high pressure dispensers.

6. All the enterprises will convert to all-water blown systems. Initially HCFC-141b in combination with water will be used as a transition process (for 2-3 years) pending availability of the fully matured water blown technology. The low pressure dispensers will be replaced with high pressure ones at a cost of US \$40,000-US \$80,000. Other items of capital cost are technology transfer, start up, trials and training (US \$15,000-US \$20,000). There will be incremental capital costs due to increased use of MDI.

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

1. All the projects were reviewed jointly between the Staff of the Secretariat and UNDP's foam expert and costs were agreed.

Reasons for Using HCFCs

2. The implementing agency listed the range of available technologies and advised that fully water-based systems are proposed as the permanent technology. However, until the commercial introduction of mature water-based systems, (which is expected in up to 2-3 years) a combination of water and HCFC-141b based systems will need to be used to maintain product standards and acceptability. No additional investments are foreseen to be needed to convert to fully water-blown technology after this interim period. In regards to the interim use of HCFC-141b, the implementing agencies advised that it met the following requirements:

- Proven and reasonably mature technology.
- Cost effective conversion.
- Easy availability of pre-blended systems at favorable pricing.
- Enables critical properties to be obtained in the end product (thermal conductivity, dimensional stability, closed cell content, surface properties and strength).
- Facilitates compliance with (local and international) standards on safety and environment.
- Provide 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, such as mold redesign are needed

The agency noted that pentane based systems require extensive safety related provisions/investments that may only be justified for large scale users.

3. UNDP was reminded of the Executive Committee Decision requiring a declaration from the companies using transition phase-out technologies. It is understood that the enterprises will indeed not request funding for the second stage conversion.

Extruded Polyethylene Foam: Vora Cork

4. It was agreed that the cost of hand-held fire extinguishers would not be eligible unless it met the cost of additional extinguishers required specifically for the conversion. The capital cost was reduced by US \$5,000 by the removal of the cost of hand-held fire extinguishers. Incremental operational cost calculation was revised from a savings of US \$5,000 to US \$33,500 due to adjustments in operating time, net equipment cost and incremental maintenance cost.

RECOMMENDATION

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

	Project Cost US \$	Support Cost US \$	Implementing Agency
(a) Elimination of CFCs in the manufacture of EPE foam products at Vora cork Industries	264,500	34,385	UNDP
(b) Phase-out of CFCs in the manufacture of cold cured molded PUF products at K.B. Poly Industries	149,000	19,370	UNDP
(c) Phase-out of CFCs in the manufacture of cold cured molded PUF products at Krishna Fabrications Ltd.	164,000	21,320	UNDP
(d) Elimination of CFCs in the manufacture of rigid PUF insulated thermoware at Amar Enterprises	120,000	15,600	UNDP
(e) Elimination of CFCs in the manufacture of rigid PUF products at Best Plastronics P. Ltd.	129,000	16,670	UNDP
(f) Elimination of CFCs in the manufacture of rigid PUF insulated thermoware at Bharat Cottage Industries	61,000	7,930	UNDP
(g) Elimination of CFCs in the manufacture of rigid PUF insulated thermoware at Bharat Plast	71,000	9,230	UNDP
(h) Elimination of CFCs in the manufacture of rigid PUF products at Deccan engineering Enterprises	64,000	8,320	UNDP

**PROJECT EVALUATION SHEET
INDIA**

SECTOR: REFRIGERATION

ODS use in sector (1994): 3,437 ODP tonnes

Sub-sector cost-effectiveness thresholds:

Commercial Refrigeration US \$15.2/kg

Project Titles:

- (a) Elimination of CFCs in the manufacture of commercial refrigeration equipment at Supercold Refrigeration Systems.
- (b) Elimination of CFCs in the manufacture of commercial refrigeration equipment at Murali Refrigeration and Engineering Co.

Project Data	Commercial	
	Supercold	Murali
ODS phase-out (ODP tonnes)	11	9
Proposed project duration (Yrs)	1.5	1.5
Incremental capital cost (US\$)	81,400	79,200
Contingency (%)	10	10
Incremental operational cost (US\$)	52,370	47,285
Total project cost (US\$)	133,770	126,485
Local ownership (%)	100	100
Export component (%)	0	0
Amount requested (US\$) { Original	133,770	126,485
{ Revised	133,770	126,485
Cost effectiveness (US\$/kg)	12.16	14.05
National Coordinating Agency	MOEF	MOEF
Implementing Agency	World Bank	World Bank
Technical review completed?	Yes	Yes

Secretariat's Recommendations		
Amount recommended (US \$)	133,770	126,485
Project impact (ODP tonnes)	11	9
Cost effectiveness (US \$/kg)	12.16	14.05
Implementing Agency support cost (US\$)	17,390	16,443
Total cost to Multilateral Fund	151,160	142,928

PROJECT DESCRIPTION

- (a) Elimination of CFCs in the manufacture of commercial refrigeration equipment at Supercold Refrigeration Systems.
 - (b) Elimination of CFCs in the manufacture of commercial refrigeration equipment at Murali Refrigeration and Engineering Co.
1. ODS consumption in the commercial refrigeration sub-sector is estimated at 1,710 MT. The sector comprises a large number of small/medium enterprises and even tiny/unorganized enterprises. The Executive Committee approved 10 projects in the commercial refrigeration sector phasing out 143.1 tonnes of ODP.
 2. The two projects submitted cover another group of two medium sized enterprises which manufacture a wide range of commercial refrigeration equipment such as chest freezers/coolers, horizontal display cabinets, bottle coolers and commercial ice-cube machines. The implementation of these projects will result in phasing out of 20 ODP tonnes.
 3. Conversion to HFC-134a refrigerant entails replacement of existing leak detectors and evacuation/charging systems with new equipment, suitable for HFC-134a refrigerant as well as redesign and modification of refrigeration systems.
 4. The conversion to water/HCFC-141b based foam formulation involves the replacement of low pressure foaming machines, which cannot be retrofitted, with high pressure dispensers. New foam equipment will enable implementation of emerging ODS-free technologies.
 5. The companies recognize the transitional nature of HCFC foam technologies. They prefer to switch to a combination of water/HCFC-141b based technology at this stage, and to eventually implement ODS-free (water-blown) conversion when the fully water-blown technology becomes technologically mature and commercially viable. This can be done with little/no additional investments. Cyclopentane based systems require extensive safety related investments, that may be justified only in case of large scale users. Due to safety considerations, the use of pre-blended systems is not viable. The HFC-based systems are not yet reported to be commercially available or technically mature.
 6. The companies request incremental operational cost associated with higher cost of components and chemicals for 2 years' duration.

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS**COMMENTS**

1. The chosen technologies are proven. The choice of interim HCFC technologies has been fully explained.

RECOMMENDATIONS

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

	Project Cost US \$	Support Cost US \$	Implementing Agency
(a) Elimination of CFCs in the manufacture of commercial refrigeration equipment at Supercold Refrigeration Systems.	133,770	17,390	World Bank
(b) Elimination of CFCs in the manufacture of commercial refrigeration equipment at Murali Refrigeration and Engineering Co.	126,485	16,443	World Bank