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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: PAKISTAN

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

Foam

- | | |
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| • Conversion to CFC-free technology in the manufacture of integral skin polyurethane foam at Synthetic Products Enterprises (Pvt) Ltd. | World Bank |
| • Conversion to CFC-free technology in the manufacture of polyurethane foam (flexible slabstock, flexible molded, rigid foam) at Diamond Group of Industries | World Bank |
| • Conversion to CFC-free technology in the manufacture of rigid polyurethane foam (thermoware) (Umbrella) | World Bank |

Refrigeration

- | | |
|---|------------|
| • Phasing out ODS at the freezer factory of Hirra Farooq's (Pvt) Ltd., Pakistan | UNIDO |
| • Conversion to CFC-free technology in the manufacture of polyurethane foam (domestic refrigeration) at Cool Industries Limited (Waves) | World Bank |
| • Conversion to CFC-free technology in the manufacture of polyurethane foam at Singer Pakistan Limited | World Bank |
| • Conversion to CFC-free technology in the manufacture of polyurethane foam at Kold Kraft Limited | World Bank |

PROJECT EVALUATION SHEET **PAKISTAN**

SECTOR: FOAMS ODS use in sector (1995): 270 ODP tonnes

Sub-sector cost-effectiveness thresholds: Integral Skin US \$16.86/kg
 General US \$9.53/kg
 Rigid US \$7.83/kg

Project Title:

- (a) SPEL - Conversion to CFC-free technology in the manufacture of integral skin polyurethane foam
- (b) Diamond Group - Conversion to CFC-free technology in the manufacture of polyurethane foam (Flexible Slabstock, Flexible Molded, Rigid Foam)
- (c) UMBRELLA - Conversion to CFC-free technology in the manufacture of rigid polyurethane foam (thermoware)

Project Data	Integral Skin	General	Rigid
	SPEL	Diamond	Umbrella
ODS phase-out (ODP tonnes)	13.6	64.1	239.6
Proposed project duration (months)	24	36	24
Incremental capital cost (US \$)	145,500	1,061,500	2,073,500
- including contingency (%)	10	10	10
Incremental operational cost (US \$)	24,500	193,350	437,800
Total project cost (US \$)	173,000	1,254,850	2,511,300
Local ownership (%)	100	100	
Export component (%)			
Amount requested (US \$) {Original}	173,000	839,100	1,637,400
{Revised}			
Cost effectiveness (US \$/kg)	12.72	13.09	6.83
National Coordinating Agency	Ministry of Environment, Local Government & Rural Development		
Implementing Agency	World Bank		
Technical review completed?	Yes	Yes	Yes

Secretariat's Recommendations:			
Amount recommended (US \$)	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 (1995) reported in country programme	270 tonnes ODP
Most recent consumption data (1995)	610 tonnes ODP
ODS to be phased out in approved projects (as at July 1997)	265 tonnes ODP
ODS reported to have been phased out (as at July 1997)	0 tonnes ODP
ODS to be phased-out in current proposed projects	318 tonnes ODP
Latest (1995) CFC-11 consumption reported according to Art. 7	226 tonnes ODP

(a) SPEL - Conversion to CFC-free technology in the manufacture of integral skin polyurethane foam

1. Spel will phaseout the use of CFC-11 in the manufacture of integral skin molded polyurethane foam for bicycle seat markets by converting to water blown formulations with interim use of HCFC-141b. The company currently has one ThermoMechs low pressure dispenser (1992) with maximum output 30 kg/min, and also uses epoxy molds.
2. The capital costs include replacement of the low pressure machine by high pressure dispenser (US \$90,000), the introduction of 20 replacement molds (US \$15,000), trials, technology transfer and training (US \$30,000). Contingency costs of US \$13,500 are also included. Incremental operating costs of US \$24,500 are expected based on the use of the following chemicals: 15 tonnes CFC-11; 13 tonnes HCFC-141b.

(b) Diamond Group - Conversion to CFC-free technology in the manufacture of polyurethane foam (Flexible Slabstock, Flexible Molded, Rigid Foam)

1. The Diamond Group of industries consists of four different foam manufacturing companies: Diamond Industries Enterprises, located in Karachi, produces flexible slabstock and molded foams and rigid panels; Citafoam Industries, in Lahore, produces flexible slabstock foams; Diamond Industries, in Gadoon, produces flexible slabstock and molded foams; and Crescent, produces XPE using butane as a blowing agent.
2. The project is to phase out the use of CFC-11 in production of: (i) flexible slabstock by conversion to methylene chloride and additives in Gadoon and Lahore plants, and to LCD technology for one production unit in Karachi with a CFC consumption of 5 tonnes; (ii) molded foam by conversion to water blown in Karachi and Gadoon plants; and (iii) rigid foam panels by conversion to a CFC-free system through interim use of HCFC-141b; conversion to a zero-ODP solution will be undertaken later at Diamond's own expense.
3. Conversion to methylene chloride for flexible slabstock production in Gadoon and Lahore will require upgrade of the exhaust system, trials and technology transfer (US \$90,000). In Karachi, conversion to LCD technology will require procurement of an LCD metering

system for Maxfoam, LCD transfer and a control unit, a high pressure metering unit, and a license fee (US \$535,000).

4. Conversion to water blown technology for flexible molded production will require replacing the two low pressure dispensers by a high pressure dispenser, two new mold ovens for pre-heating of molds and replacement of existing 30 molds by aluminum molds (US \$320,000).
5. Conversion to HCFC-141b technology for rigid foam production will only require retrofitting the existing high pressure dispenser.
6. The project also includes technology transfer from external process experts assigned by the implementing agency, to ensure smooth transition to the new technology; training of production personnel for working with the new formulations, particularly the safe handling of the HCFC-141b based systems and safety and health issues associated with use of methylene chloride.
7. The Diamond Group intends to expand its present operations in Karachi, due to space constraints in the current location. As part of this expansion project, Diamond will install a new LCD unit, two new high pressure dispensers for flexible molded operations, and one new high pressure dispenser and press for rigid panels. Estimated costs for the expansion project are US \$2 million to US \$2.5 million.
8. Total incremental operating costs amount to US \$193,350. The following prices were used to calculate the incremental operating costs of the projects: CFC-11 US \$2.70; HCFC-141b US \$4.20; pre-blending charges US \$0.20/kg.

(c) UMBRELLA - Conversion to CFC-free technology in the manufacture of rigid polyurethane foam (thermoware)

1. This umbrella project is to replace CFC used in the manufacture of rigid polyurethane foam in the following nineteen foam enterprises with HCFC-141b as foam blowing agent as an interim solution and water blown as a final solution:

<u>Plant</u>	<u>Qty</u>	<u>Baseline equipment</u>
Unique Plastics	1	Cannon C7RF2
Efasco Industries	1	Cannon C7RF2
Plasticrafter Ltd.	2	Cannon C7RF2
ASLF Zubair&Co	1	Cannon C7RF2
	1	Max (1982)

3Z Industrial and Trading	1	Cannon C7RF2
Shoalbee Industries		
/Full Bright Plastic	1	Cannon C7
	1	Cannon Twin Cam
Modern Plastic Works	1	Cannon C7RF2
Arm Brothers	1	Cannon C7RF2
Pakistan Plastics Industries	1	Cannon C2 (1989)
Khursheed Industries	1	Cannon C7RF2 (1984)
Queen Plastic Industries	1	Cannon C7 (1990)
Baber Plastic Industries	1	C7FK2 (1994)
Polycon Pakistan		
MH Plastic	1	Max-96 (locally made)
National Plastics		
Tropical Industries	1	Cannon C7RF2
Tariq Industries	1	Gusmer FF Proportioner
Flying Plastic Industries	1	Cannon C7RF2 (1990)
Raj Industries	1	Cannon C7RF2 (1994)

2. The capital costs include one high pressure foaming machine 40/20 kg/min per enterprise (14) at US \$90,000 each and one at US \$60,000 at Polycon; two high pressure foaming machines 40/20 kg/min for Shoalbee (US \$180,000); retrofit of the Gusmer dispenser at Tariq Industries (US \$5,000). Trials, technology transfer and training amounts to US \$15,000 per company (16) and to US \$20,000 for Shoalbee. The contingency costs amount to US \$10,500 per company, except Shoalbee (US \$20,000); Polycon (US \$7,500); MH Plastics (US \$1,500), and Tariq Industries (US \$2,000). Technology transfer will be provided by the chemical suppliers: BASF, ICI and Simpson.
3. Total incremental operating costs amount to US \$437,800, based on the use of the following chemicals: CFC-11 and preblending charges. Note that HCFC-141b replacement is calculated based on a ratio of 0.85:1, reduced further by 10% to account for fewer evaporation losses by using a premixer or premixer blend.

Justification for the Use of HCFCs

4. The enterprises that have chosen HCFC-141b technology are aware that it will be on an interim basis until a suitable final solution is available, since HCFC-141b offers the lowest investment costs.

Equipment or Components to be Destroyed or Rendered Unusable

5. The existing low pressure machine in Spel will be destroyed, however the method of destruction of this machine as well as the replaced epoxy molds is not mentioned. The fate of the replaced equipment is not indicated for the other projects.

Impact of Project on 1999 Freeze

6. The projects under preparation will phase out 318 tonnes of CFC and will effectively contribute to a reversal of the growth trend in CFC consumption in the sector and positively contribute to Pakistan's efforts to meet the 1999 consumption freeze.

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

1. The three projects SPEL, Diamond and the umbrella project are still under discussion between the Secretariat and the World Bank and the outcome will be communicated to the Sub-Committee on Project Review.
2. With regard to the flexible molded foams production at SPEL and Diamond, based on expert advice to the Secretariat the following cost items are being discussed with the World Bank:
 - change of molds following conversion
 - provision of heating ovens
 - replacement of low pressure with high pressure machines.
 - the eligibility of low CFC-11 consumption for conversion to LCD technology.
3. The Diamond Group project proposes to convert the current flexible slabstock production in Karachi to LCD technology at a capital cost of US \$535,000. The total CFC consumption at the plant is only 5 tonnes (cost effectiveness of US \$107/kg). The decision to implement LCD technology was taken to meet the requirements of a very fine cell structure required for textile industry customers. While the final project cost of the LCD component will be influenced by the results of on-going review of LCD project guidelines, the Secretariat questioned the eligibility of the request based on the cost effectiveness value.

PROJECT EVALUATION SHEET **PAKISTAN**

SECTOR: REFRIGERATION ODS use in sector (1993): 673 ODP tonnes

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

Project Titles:

- (a) Phasing out ODS at the freezer factory of Hirra Farooq's (Pvt) Ltd.
- (b) Conversion to CFC-free technology in the manufacture of polyurethane foam at Cool industries
- (c) Conversion to CFC-free technology in the manufacture of polyurethane foam at Singer
- (d) Conversion to CFC-free technology in the manufacture of polyurethane foam at Kold Kraft

Project Data	Domestic Refrigeration			Commercial
	Hirra Farooq's	Cool industries	Singer	Kold Kraft
ODS phase-out (ODP tonnes)	31.2	117.6	17.8	11.5
Proposed project duration (months)	18	36	24	24
Incremental capital cost (US \$)	464,700	860,200	776,000	206,250
- including contingency (%)	10	10	10	10
Incremental operational cost (US \$)	79,650	387,750	43,209	24,000
Total project cost (US \$)	544,350	1,247,950	819,209	230,250
Local ownership (%)				
Export component (%)				
Amount requested (US \$) {Original}	544,350	1,295,375	245,763	175,000
{Revised}		1,247,950		
Cost effectiveness (US \$/kg)	17.45	10.61	9.68	15.21
National Coordinating Agency	Ministry of Environment, Local Government & Rural Development			
Implementing Agency	UNIDO	World Bank		
Technical review completed?	Yes	Yes		

Secretariat's Recommendations:				
Amount recommended (US \$)	521,580	Pending	Pending	175,000
Project impact (ODP tonnes)	31.2			11.5
Cost effectiveness (US \$/kg)	11.34			15.21
Implementing Agency support cost (US \$)	67,805			22,750
Total cost to Multilateral Fund (US \$)	589,385			197,750

PROJECT DESCRIPTION

Background for all projects.

1. The sector description in the project document contains the following information: ODS consumption in the domestic refrigeration sub-sector is estimated to be 500 ODP tons (1995). The commercial refrigeration sub-sector is estimated to consume 610 t ODP (1995). An annual growth rate of 12% is assumed. The Executive Committee approved three domestic refrigeration projects, phasing out 133.3 ODP tonnes.
2. The following four projects are medium/large sized enterprises that manufacture a wide range of refrigeration equipment. The implementation of these projects will result in the phasing out of 146.9 t ODP.
3. The projects under consideration will effectively contribute to a reversal of the growth trend in CFC consumption in the sector and positively contribute to Pakistan's efforts to meet the 1999 consumption freeze.

(a) Phasing out ODS at the freezer factory of Hirra Farooq's (Pvt) Ltd.

1. Hirra Farooq's, which is the fourth largest chest and standing freezer producer in Pakistan, consumes 31.2 mt of CFCs annually.
2. The company acquired an older plant from a previous owner in 1994 and moved to a new premises in Lahore from Islamabad. Hirra Farooq's started trial production in Lahore between December 1994 and December 1995 and started commercial production of 15,000 units in 1996.
3. UNIDO provided a letter from the company to inform of the dates of purchase and installation of the manufacturing equipment.
4. The enterprise is planning to convert its CFC-11 foam formulation to a cyclopentane formulation and is seeking 60% of the cost of replacement of its low pressure foam machine (1994) with a high pressure foam machine and 60% of the cost of a premixer suitable for cyclopentane. The enterprise is also requesting the costs of cyclopentane storage and safety equipment, and the costs of additional measures to ensure the safe handling of cyclopentane. The enterprise is not seeking the cost of modification of its jigs and fixtures.
5. The refrigeration system will be converted to HFC-134a from CFC-12. The enterprise is requesting 60% of the cost of a new refrigerant board, the cost of one new vacuum pump and the costs of retrofit of two pumps, a leak detector and redesign of eight models.

6. The enterprise is seeking 6 months incremental operating costs.
7. UNIDO stated that "The project will be finalized before end 1999 and thus will contribute to the freeze target of Pakistan".

(b) Conversion to CFC-free technology in the manufacture of polyurethane foam at Cool industries

1. Cool Industries is the largest manufacturer of freezers in Pakistan.
2. The implementation of this project will result in the phasing out of 117.6 t ODP.
3. This project proposes the conversion from CFC-11 use in foaming to HCFC-141b/HCFC-22 blend as an interim step. A letter of commitment states that it will use HCFCs only as stipulated in the project and will convert to a fully non-ODS substance at its own costs if and when local regulations require so.
4. A high pressure dispenser will be retrofitted for HCFC-141b/22 use; new premixers will be required.
5. Pentane was not chosen as a foaming technology due to safety concerns. No additional investments are expected to convert to a non-ODP technology after the interim period. It was noted that HFC 245fa may be a logical permanent solution, since it has similar insulating performance, does not attack liners, and could be implemented with no additional capital costs.
6. Incremental operating costs are requested to compensate for higher cost of components and material including compressors and plastic material for inner liner. Incremental operating costs are requested for a 6-month duration.
7. This project will convert to HFC-134a from CFC-12 use for refrigeration. New filling stations and leak detection equipment is required. The existing evacuation and charging system/vacuum pumps will be replaced or retrofitted. New compressors are required and must be imported.
8. The incremental operating costs include compressor, drier, capillary tube, liner, system use, and blowing agent costs for six months.
9. Six charging panels are listed for destruction.

(c) Conversion to CFC-free technology in the manufacture of polyurethane foam at Singer

1. Singer Pakistan is a relatively small manufacturer of domestic refrigerators and freezers.

2. The implementation of this project will result in the phasing out of 17.8 t ODP.
3. The company is 30% locally owned, and 70% owned by Singer VIII B.V. Netherlands.
4. The incremental operating costs include compressor, drier, capillary tube, chemical costs for six months..
5. This project selected cyclopentane technology to replace CFC-11 use. A high-pressure dispenser is required to replace a low-pressure dispenser. A new premixer, safety equipment and other modifications and additions are also required.
6. This project has converted to HFC-134a from CFC-12 use for refrigeration with a new filling station, two new vacuum pumps, and two new leak detectors. One vacuum pump will be retrofitted.
7. The disposal plan for the low-pressure dispenser is destruction.

(d) Conversion to CFC-free technology in the manufacture of polyurethane foam at Kold Kraft

1. Kold Kraft produces refrigerated insulated transports, cold storage, and refrigerated plants.
2. The implementation of this project will result in the phasing out of 11.5 t ODP.
3. This project proposes the replacement of CFC-11 technology with an interim use of HCFC-141b. Later conversion to a zero-ODP solution will be undertaken at the company's expense, if and when local regulations require. It is possible that very minor amounts of R-404 or R-409A maybe required for servicing operations. The new equipment will be filled with R-404A.
4. Foam conversion includes retrofitting of one and replacement of another dispenser with a high-pressure dispenser.
5. HCFC-141b provides the energy efficiency required, and the lowest investment costs. Its use maintains product standards and acceptability. The other permanent solutions are not yet mature enough, less energy efficient, expensive, or have high safety costs.
6. Refrigeration operation will convert to R-404A use to replace R-502. A charging unit and vacuum pump will be replaced, and other vacuum pumps will be retrofitted. A new leak detector for R-404A is required.

7. The incremental operating costs are comprised of chemical costs, for a duration of two years.
8. 10% of production is exported to Bangladesh.
9. The replaced foam dispenser and one vacuum pump will be destroyed.

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

(a) Phasing out ODS at the freezer factory of Hirra Farooq's (Pvt) Ltd.

1. The Secretariat discussed with UNIDO the background of this enterprise to ascertain the eligibility of the project.
2. The enterprise will contribute from own resources US \$98,000.
3. Minor modification to the capital and operating costs were agreed to.

(b) Conversion to CFC-free technology in the manufacture of polyurethane foam at Cool industries

1. The company has chosen HCFC-141b/HCFC-22 blend for its foaming operations in an attempt to reduce the solvent effect of HCFC-141b. This is the first time a domestic refrigeration enterprise in an Article 5 country is opting for a technology based on this blend. The blend does not provide any additional benefits. Furthermore, inspite of the incorporation of the HCFC-22 presumably to moderate the solvent effect of HCFC-141b on the inner liner, the company is requesting funding for spray applicator and additional coating materials.
2. The proposal requests the cost of five new, and more expensive, pre-mixers because the pre-blended HCFC 141b/HCFC-22 foam system is not available in Pakistan. The Secretariat cannot support costs associated with new pre-mixers. The company does not have pre-mixing equipment as part of its baseline. The Secretariat proposed to use HCFC-141b based technology. The HCFC 141b technology is very well proven and used in many Article 5 and non-Article 5 countries, including Pakistan. Pre-blended foam systems are widely available and do not require additional pre-mixing equipment. Several foam projects submitted to the 23rd Meeting are based on availability of the pre-blended HCFC 141b formulation in Pakistan.
3. The Secretariat identified also that provision of the refrigerant charging equipment as requested in the project may result in expansion of the existing capacity. Cost of leak detectors is higher than standard.

4. The Secretariat and the World Bank are still discussing the choice of technology as proposed in the project and the level of eligible capital costs. The Sub-Committee on Project Review will be informed accordingly.

(c) Conversion to CFC-free technology in the manufacture of polyurethane foam at Singer

1. The Secretariat discussed with the World Bank capital cost requested in the proposal. Several adjustments in the capital cost were proposed by the Secretariat regarding storage facility, safety cost, cost of charging board, leak detectors and vacuum pumps. The proposed adjustments reflect the existing baseline of the enterprise and the standard costs for equipment concerned.

2. The Secretariat and the World Bank are still discussing the level of eligible capital costs. The Sub-Committee on Project Review will be informed accordingly.

(d) Conversion to CFC-free technology in the manufacture of polyurethane foam at Kold Kraft

1. The technologies chosen by the company are proven. Explanations of the use of HCFC interim technology in the foam operations are provided.

2. The requested costs are justified.

RECOMMENDATION

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

Project Title	Project Cost US \$	Support Cost US \$	Implementing Agency
(a) Phasing out ODS at the freezer factory of Hirra Farooq's (Pvt) Ltd.	521,580	67,805	UNIDO
(b) Conversion to CFC-free technology in the manufacture of polyurethane foam at Cool industries	Pending		World Bank
(c) Conversion to CFC-free technology in the manufacture of polyurethane foam at Singer	Pending		World Bank
(d) Conversion to CFC-free technology in the manufacture of polyurethane foam at Kold Kraft	175,000	22,750	World Bank