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Implementation of the Montreal Protocol

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PROJECT PROPOSALS: MALAYSIA

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

- Elimination of CFCs in the Manufacture of Molded/Integral Skin at Bristol Sdn. Bhd. UNDP
- Elimination of CFCs in the Manufacture of Rigid Polyurethane Foam Decorative Products at Florafoam Marketing Sdn. Bhd. UNDP

PROJECT EVALUATION SHEET

COUNTRY OR REGION: Malaysia

PROJECT TITLE: (a) Elimination of CFCs in the Manufacture of Molded/Integral Skin Polyurethane Foam at Bristol Sdn.Bhd.
(b) Elimination of CFCs in the Manufacture of Rigid Polyurethane Foam Decorative Products at Florafoam Marketing Sdn.Bhd.

BUDGET: (a) Capital costs: US \$121,000
Operating costs: US \$2,400
(b) Capital costs: US \$132,000
Operating costs: US \$20,000

INCREMENTAL COSTS: (a) US \$123,400
(b) US \$152,000

ODS PHASE-OUT: (a) 8 MT
(b) 23 MT

COST EFFECTIVENESS¹: (a) US \$15.43/kg/yr.
(b) US \$7.83/kg./yr.

PROJECT DURATION: (a) One year
(b) One year

IMPLEMENTING AGENCY: UNDP

NATIONAL COORDINATING AGENCY: Department of Environment

TECHNICAL REVIEW COMPLETED: YES X NO

SECRETARIAT'S COMMENTS

1. This evaluation sheet covers two project proposals for the elimination of CFC in the manufacture of molded/integral skin polyurethane foam (Bristol Sdn.Bhd) and the manufacture of rigid polyurethane foam (Florafoam Marketing Sdn.Bhd) in Malaysia.

¹ Determined as the ratio of incremental costs to the estimated annual saving of ODP (\$/ODPkg).
For CFC-11, ODS=ODP.

(a) Bristol

2. The project proposal for Bristol Sdn. Bhd. was one project within a package of three projects submitted for three small scale ODS-consuming enterprises in the subsector in Malaysia. Of the three sub-projects, only Bristol met the cost-effectiveness criteria. UNDP therefore requested that only Bristol's project be submitted. However, due to an oversight, the project was not submitted earlier.

3. Bristol produces cold cured molded and integral skin foam using CFC-11 on existing two low-pressure and one high-pressure foam dispensers. The company will switch to all water blown system. Thus the capital cost of conversion involves the cost of one high pressure foam dispenser, trials and start up, technology transfer and training. The project will also incur incremental operating costs.

4. The project costs are as follows:

Total incremental capital costs: US \$121,000

Total operating costs: US \$ 2,400

Total project cost: US \$123,400

Cost effectiveness: US \$15.43/kg./yr.

The cost-effectiveness is within the cost-effectiveness threshold for integral skin foam (US \$16.86/kg./yr.)

5. (b) Florafoam

6. Florafoam will convert its polyurethane rigid foam manufacturing operations from the use of CFC-11 to the use of HCFC-141b as blowing agent. The capital cost of conversion relates to provision of one high pressure foam dispenser, trials, technology transfer and training. The project will incur incremental operating costs.

7. The project costs are as follows:

Total capital costs: US \$132,000

Total operating costs: US \$20,000

Total project cost: US \$152,000

Cost-effectiveness (based on net CFC-11 elimination) is US \$7.33/kg./yr. This is within the threshold for rigid polyurethane foam.

SECRETARIAT'S RECOMMENDATIONS

8. The Fund Secretariat recommends as follows:
- (a) To approve the project for Bristol Sdn.Bhd. in the sum of US \$123,400 (cost effectiveness US \$15.43) and US \$16,040 as support costs.
 - (b) To approve the project for Florafoam in the amount of US \$152,000 (cost-effectiveness US \$7.3/kg./yr.) and US \$19,760 as support costs.

PROJECT COVER SHEET

COUNTRY : MALAYSIA

PROJECT TITLE : Elimination of CFCs in the
manufacture of Molded/Integral Skin
PUF at Bristol Sdn. Bhd.

SECTOR COVERED : Foamed Plastics

ODS USED IN SECTOR : 600 t CFCs (=ODP) in 1991

PROJECT IMPACT : 8 t of CFC-11 (1994 consumption)

PROJECT DURATION : One year

PROJECT ECONOMIC LIFE : 10 years

TOTAL PROJECT COST : US\$ 123,400

PROPOSED MLF GRANT : US\$ 123,400

COST EFFECTIVENESS : Grant Effectiveness - USD 15.43/kg/y
Unit Abatement Cost - USD 2.64/kg/y

NATIONAL COORDINATING BODY : Government of Malaysia
Department of Environment (DOE)

IMPLEMENTING AGENCY : UNDP

APPRAISAL DATE : February 1995

PROJECT SUMMARY

Under this project, Bristol will phase out CFCs in the manufacture of molded/integral skin polyurethane foam products, by converting foam operations to water based systems (for cold cured moldings) and HCFC-141b based formulations (for integral skin products). The project includes replacing the existing low pressure machine with high pressure machine of equivalent capacity, trials, technology transfer and training. Increased operating costs are expected due to the higher costs of the new formulations.

PREPARED BY: Bert Veenendaal
REVIEWED BY: Dr. Hubert Creyf

PROJECT OF THE GOVERNMENT OF MALAYSIA
ELIMINATION OF CFCs IN THE MANUFACTURE OF
COLD CURED MOLDED AND INTEGRAL SKIN PUF
AT BRISTOL INDUSTRIES SDN. BHD.

1. PROJECT OBJECTIVE

The objective of this project is to phase out the use of about 8 tons of CFC-11 annually in the manufacture of cold-cured molded polyurethane foam (PUF) and integral skin PUF at Bristol Industries Sdn. Bhd.

2. ENTERPRISE BACKGROUND

Bristol Industries Sdn.Bhd., was established in 1988, and is a 100% Malaysian owned enterprise. It employs 17 persons. The enterprise manufactures cold cured PUF molded products such as furniture seat cushions, and integral skin PUF products such as head rests, arm rests, chairs, panels, computer furniture etc. The products are sold in the domestic as well as export market.

The enterprise consumed about 8 t of CFC-11, in its production in 1994, of which about 3 t was for cold cured products and 5 t for the integral skin products.

3. PROJECT DESCRIPTION

Bristol Industries Sdn.Bhd., has three foam dispensers as under :

- | | | |
|---|---|---------------------|
| . Cannon Low Pressure Dispenser Model C30 FL2 | : | Cold cured Products |
| . OMS Low Pressure Dispenser Model C15 | : | Integral Skin |
| . OMS High Pressure Dispenser Model H40 | : | Integral Skin |

In this project, Bristol Industries Sdn.Bhd. will switch to all-water blown system, in place of CFC-11 formulation for the cold cured moldings and HCFC-141b based formulations for integral skin moldings. To cater to the increased viscosity of the new formulation, a high pressure foam dispenser will be required to replace the existing two low pressure units (Cannon C30 and OMS C15). In addition, provision for trials, training and technology transfer by external process expert will be made. Increased operating costs are expected, due to the higher costs of the new formulations.

4. TECHNOLOGY

ODS phase-out technologies for Molded flexible PUF are, for all practical purposes restricted to water based systems, sometimes complemented with (premixed) additives. The enterprise is therefore implementing water based systems as its replacement technology for its molded PUF products.

ODS phaseout technologies for integral skin PUF are as under :

Low ODS technologies (Interim)>HCFC-22>HCFC-141b
ODS free technologies(Long term)>Pentanes>HFC-134a>
Chemically generated CO₂ (water)

Bristol has selected water-based systems for replacement, but would need interim use of HCFC-141b during the adjustment process of its integral skin formulations.

5. PROJECT COSTS

5.1. CAPITAL COSTS

The following are the incremental capital costs expected :

1. One High Pressure foam dispenser	: US\$100,000
2. Trials and Start-up	: US\$ 5,000
3. Technology transfer/training	: US\$ 5,000
4. Contingencies	: US\$ 11,000

Total	: US\$121,000
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5.2. OPERATING COSTS

The use of alternative blowing agents would lead to the following incremental operating costs :

Before

8,000 kg CFC-11 at US\$ 2.30/kg	: US\$ 18,400
11,000 kg MDI at US\$ 2.50/kg	: US\$ 27,500

Total	: US\$ 45,900
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After

3,500 kg HCFC-141b at US\$ 2.80/kg	: US\$ 9,800
15,000 kg MDI at US\$ 2.50/kg	: US\$ 37,500

Total	: US\$ 47,300
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Incremental Operating Costs	: US\$ 1,400
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NPV at 10% discount (2 yrs/10%)	: US\$ 2,400
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5.3. COST EFFECTIVENESS

5.3.1 Grant Effectiveness

a.	MLF Grant	:	US\$	123,400
b.	ODS phased out	:	kg	8,000
Grant Effectiveness [a/b]				: US\$ 15.43/kg/y

5.3.2 Unit Abatement Costs

a.	ODS Reduction Capital Costs	:	US\$	121,000
b.	Annual incremental costs	:	US\$	1,400
c.	Capital Recovery Factor(10y/10%)	:		0.16275
d.	ODS Reduction/year	:	kg	8,000
Unit Abatement Costs[(a x c + b)/d]				: US\$ 2.64/kg/y

6. FINANCIAL PLAN

The enterprise requests a grant covering the total incremental cost as calculated under 6.1 and 6.2 :

US\$123,400
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7. PROJECT IMPACT

This project will eliminate the use of about 8 t of CFC-11 in the first year after implementation. The project employs commercially viable and environmentally acceptable technology.

8. PROJECT IMPLEMENTATION

8.1 Management

It is envisaged that the United Nations Office of Project Services (UNOPS), would oversee the completion of the project. Technical assistance would be provided by UNDP-SEED/MPU.

8.2 Schedule

TASK	Q1	Q2	Q3	Q4	Q5	Q6
1.a) MLF Approval b) Procurement Preparation c) Vendor Selection	X	X X				
2.a) Transportation, arrival and customs clearance b) Installation and plant modification.			X	X		
3.a) Machine Start-up b) Trials/Training c) Certification				X X X		

9. ANNEX

Annex-A: Technical Review

PROJECT COVER SHEET

COUNTRY : MALAYSIA

PROJECT TITLE : Elimination of CFCs in the manufacture of rigid polyurethane foam decorative products at Florafoam Marketing Sdn.Bhd.

SECTOR COVERED : Foamed Plastics

ODS USED IN SECTOR : 600 t CFCs (=ODP) in 1991

PROJECT IMPACT : 23 t of CFC-11 (1994 consumption)

PROJECT DURATION : One year

PROJECT ECONOMIC LIFE : 10 years

TOTAL PROJECT COST : US\$ 152,000

PROPOSED MLF GRANT : US\$ 152,000

COST EFFECTIVENESS : Grant Effectiveness : USD 6.61/kg/y
Unit Abatement Cost : USD 1.42/kg/y

NATIONAL COORDINATING BODY : Government of Malaysia
Department of Environment (DOE)

IMPLEMENTING AGENCY : UNDP

APPRAISAL DATE : February 1995

PROJECT SUMMARY

In this project, Florafoam Marketing Sdn.Bhd will phase out CFCs in the in the manufacture of rigid polyurethane foam decorative products such as floral foam, by converting to HCFC-141b based formulations. The project includes replacing the existing low pressure machine with a high pressure machine of equivalent capacity, trials, technology transfer and training. Increased operating costs are expected due to the higher costs of the HCFC-141b based formulation.

PREPARED BY: Bert Veenendaal
REVIEWED BY: Dr. Hubert Creyf

PROJECT OF THE GOVERNMENT OF MALAYSIA

FLORAFOAM - CONVERSION TO CFC-FREE TECHNOLOGY IN THE MANUFACTURE OF RIGID PUF FLORAL FOAM

1. PROJECT OBJECTIVE

The objective of this project is to phase out the use of CFC-11 in rigid polyurethane floral foam, at Florafoam Marketing Sdn.Bhd., Kuala Lumpur, Malaysia.

2. SECTOR BACKGROUND

The total CFC consumption in Malaysia in 1991, was about 600 t in the Foams Sector. The predominant consumption was of CFC-11 and to a lesser extent CFC-12, and smaller quantities of Methyl Chloroform, CFC-113 etc. The refrigeration industry consumed about 1500 t of CFCs.

3. ENTERPRISE BACKGROUND

Florafoam Marketing Sdn. Bhd. is a 100% indigenously owned enterprise established in 1987. The enterprise employs 8 persons. It manufactures rigid polyurethane decorative products such as floral foam, wreaths and bouquets, flower pots, etc., both for the domestic and export market.

The enterprise consumed about 23 t of CFC-11 as a blowing agent in the rigid foam production in 1994.

4. PROJECT DESCRIPTION

Florafoam Marketing Sdn. Bhd. has one Cannon low pressure foam dispenser, which will require replacement by one high pressure foam dispenser of equivalent capacity for converting foam operations to HCFC-141b based formulations to handle the higher viscosities. HCFC-141b based formulations are available, competitively priced in the local market. Provision for trials, technology transfer and training will be needed. Increased operating costs are expected due to the higher cost of the new formulation.

5. TECHNOLOGY

The ODS phase-out technologies for rigid polyurethane foams are as under:

- Low ODS Technologies (Interim) > Reduced CFC
 - > HCFCs (22, 141b, 22+142b)
- ODS free Technologies(Long term) > Chemically generated CO₂ (Water)
 - > Pentanes
 - > HFCs (134a, 152a, 245, 356)

The selection of the alternative technology has been made based on the following considerations :

- a) Maturity of technology.
- b) Cost effectiveness (in investment and in operation).
- c) Commercial availability.
- d) Technical Support.
- e) Product properties.
- f) Operational safety.
- g) Environmentally/legally acceptable.

The enterprise, considering these issues, has selected HCFC-141b as its interim replacement technology. The enterprise would eventually shift to water based systems, when the hydrophilic polyol blends (currently not available) become available in Malaysia.

6. PROJECT COSTS

6.1. CAPITAL COSTS

The following are the incremental capital costs expected :

1.	One High Pressure foam dispenser	:	US\$	100,000
2.	Trials and Start-up	:	US\$	5,000
3.	Technology transfer	:	US\$	10,000
4.	Training	:	US\$	5,000
5.	Contingencies	:	US\$	12,000
	Total	:	US\$	132,000

8. PROJECT IMPACT

This project will eliminate the use of 23 t of CFC-11 in the first year after implementation. The project employs commercially viable and environmentally acceptable technology.

9. PROJECT IMPLEMENTATION

9.1 Management

It is envisaged that the United Nations Office of Project Services (UNOPS), would oversee the completion of the project. Technical assistance would be provided by UNDP-SEED/MPU.

9.2 Schedule

TASK	Q1	Q2	Q3	Q4	Q5	Q6
1.a) MLF Approval	X					
b) Procurement Preparation		X				
c) Vendor Selection		X				
2.a) Transportation, arrival and customs clearance			X			
b) Installation and plant modification.				X		
3.a) Machine Start-up				X		
b) Trials/Training				X		
c) Certification				X		

10. ANNEXES

Annex-A: Technical Review

6.2. OPERATING COSTS

The use of alternative blowing agent would lead to the following incremental operating costs :

Before

23,000kg CFC-11 at US\$ 2.30/kg : US\$ 52,900

Total : US\$ 52,900

After

19,000 kg HCFC-141b at US\$ 2.80/kg : US\$ 53,200

4,000 kg MDI at US\$ 2.50/kg : US\$ 10,000

Total : US\$ 63,200

Incremental Operating Costs : US\$ 11,200

NPV at 10% discount (2 yrs) : US\$ 20,000

6.3. COST EFFECTIVENESS

6.3.1 Grant Effectiveness

a. MLF Grant : US\$ 152,000

b. ODS phased out : kg 23,000

Grant Effectiveness [a/b] : US\$ 6.61/kg/y

6.3.2 Unit Abatement Costs

a. ODS Reduction Capital Costs : US\$ 132,000

b. Annual incremental costs : US\$ 11,200

c. Capital Recovery Factor(10y/10%) : 0.16275

d. ODS Reduction/year : kg 23,000

Unit Abatement Costs[(a x c + b)/d] : US\$ 1.42/kg/y

7. FINANCIAL PLAN

The enterprise requests a grant covering the total incremental cost as calculated under 6.1 and 6.2 :

US\$ 152,000
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