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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: MALAYSIA

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 polyurethane foam at Frank Chee | UNDP |
| • Conversion to CFC-free technology in the manufacture of polyurethane foam at OAL Enterprise | UNDP |
| • Conversion to CFC-free technology in the manufacture of polyurethane foam at Hi Tech Insulation | UNDP |
| • Phasing out ODS at Kean Chong Industries Sdn. Bhd. | UNIDO |
| • Phasing out ODS at Summer Technologies Sdn. Bhd., Malaysia | UNIDO |
| • Phasing out ODS at Visdamax Sdn. Bhd. | UNIDO |
| • Conversion to CFC-free technology in the manufacture of polyurethane foam at Heng Huat Furniture | UNDP |
| • Conversion to CFC-free technology in the manufacture of polyurethane foam at CT Foam | UNDP |

Refrigeration

- | | |
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| • Conversion to CFC-free technology in the manufacture of polyurethane foam at Kwang Tai Refrigeration | UNDP |
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PROJECT EVALUATION SHEET MALAYSIA

SECTOR: FOAMS ODS use in sector (1990):

415 ODP tonnes

Sub-sector cost-effectiveness thresholds: Rigid

US \$7.83/kg

Project Titles:

- (a) FRANK CHEE - conversion to CFC-free technology in the manufacture of polyurethane foam
- (b) OAL ENTERPRISE - conversion to CFC-free technology in the manufacture of polyurethane foam
- (c) HI TECH INSULATION - conversion to CFC-free technology in the manufacture of polyurethane foam
- (d) Phasing out ODS at Kean Chong Industries Sdn. Bhd.
- (e) Phasing out ODS at Summer Technologies Sdn. Bhd.
- (f) Phasing out ODS at Visdamax Sdn. Bhd.

Project Data	Rigid					
	F CHEE	OAL	HI TECH	KEAN	Summer	Visdamax
ODS phase-out (ODP tonnes)	28	7.45	18.5	16.3	12.1	18.5
Proposed project duration (months)	24	24	24	18	18	18
Incremental capital cost (US \$)	143,000	143,000	32,000	44,000	27,500	59,000
- including contingency (%)	10	10	10	10	10	10
Incremental operational cost (US \$)	50,000	15,000	71,500	81,591	61,907	80,959
Total project cost (US \$)	193,000	158,000	103,500	125,591	89,407	139,959
Local ownership (%)	100	100	100	100	100	100
Export component (%)						
Amount requested (US \$) {Original}	193,000	58,300	103,500	125,591	89,407	139,959
{Revised}						
Cost effectiveness (US \$/kg)	6.89	7.83	5.59	7.72	7.36	7.56
National Coordinating Agency	Department of Environment (DOE)			Ministry of Science, Technology & Environment		
Implementing Agency	UNDP			UNIDO		
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	415 tonnes ODP
Most recent consumption data (1993)	1360 tonnes ODP
ODS to be phased out in approved projects (as at July 1997)	1330 tonnes ODP
ODS reported to have been phased out (as at July 1997)	793 tonnes ODP
ODS to be phased-out in current proposed projects	299 tonnes ODP
Latest (1995) CFC-11 consumption reported according to Art.7	986 tonne ODP

(a) FRANK CHEE - conversion to CFC-free technology in the manufacture of polyurethane foam

1. Frank Chee will phaseout the use of CFC-11 in the manufacture of sandwich panels. The company currently has two low pressure foam dispensers: Cannon and PEC, both purchased in 1972.
2. The manufacturing operations are to be converted to HCFC-141b as an interim solution, followed by water or liquid HFC's. The capital costs include: the replacement of both low pressure machines by a 100 kg/min high pressure dispenser (US \$110,000). Trials, technology transfer and training amount to US \$20,000. Contingency costs of US \$13,000 are also included. Incremental operating costs of US \$50,000 are expected based on the use of the following chemicals: 30 tonnes CFC-11; 20 tonnes HCFC-141b and 80 tonnes premix charges.
3. Incremental operating costs for the projects were calculated using the following prices: CFC-11 US \$2.25/kg and US \$2.30/kg; HCFC-141b US \$4.00/kg and US \$3.30/kg; MDI US \$3.20; methylene chloride US \$1.00/kg and systems US \$3.00/kg; polyol and MDI for CFC technology US \$2.25/kg; for substitute technology US \$2.45/kg.

Justification for the Use of HCFCs

4. Water blown technology does not provide an acceptable end product. Therefore, the company has elected to implement HCFC-141b as an interim solution.

Equipment or Components to be Destroyed or Rendered Unusable

4. There is no mention of the fate of the two replaced low pressure machines.

(b) OAL ENTERPRISE - conversion to CFC-free technology in the manufacture of polyurethane foam

1. The company OAL Enterprise will convert from the use of CFC-11 in the manufacture of insulated polyurethane panels for cold rooms to HCFC-141b as an interim solution followed by water or liquid HFCs. The company currently mixes its chemical system by an electric stirrer and hand pours the chemical mix into the panels.
2. The capital cost of conversion involves the replacement of the mechanical mixer and hand pouring with a high pressure dispenser at US \$140,000, of which US \$40,000 will be contributed by the enterprise. The capital cost associated with trials, technology transfer and training is US \$30,000, while the cost of contingency is US \$13,000. Incremental operating costs of US \$15,00 are expected on the basis of the use of the following chemicals: 8.0 tonnes CFC-11; 5.5 tonnes of HCFC-141b and 22 tonnes of premix charges

Justification for the Use of HCFCs

3. OAL has chosen to utilize HCFC-141b as an interim step until an all water blown system as a final solution can be applied.

(c) HI TECH INSULATION - conversion to CFC-free technology in the manufacture of polyurethane foam

1. Hi Tech Insulation will phaseout the use of CFC-11 in the manufacture of rigid polyurethane insulation pipes. The company currently has one Cannon C-100 RF-2 low pressure machine (1995).
2. The manufacturing operations are to be converted to HCFC-141b as an interim solution, followed by water or liquid HFC's. The capital costs include compensatory costs for the existing dispenser (US \$9,000). Trials, technology transfer and training amount to US \$20,000. Capital costs also include contingency (US \$3,000). Incremental operating costs of US \$71,500 are expected based on the use of the following chemicals: 20 tonnes CFC-11; 14 tonnes HCFC-141b, 37.5 tonnes premix charges, and 7.5 tonnes systems

Justification for the Use of HCFCs

3. Water blown technology does not provide an acceptable end product. Therefore, the company has elected to implement HCFC-141b as an interim solution.

Equipment or Components to be Destroyed or Rendered Unusable

4. There is no mention of the fate of the replaced low pressure machine.

(d) Phasing out ODS at Kean Chong Industries Sdn. Bhd.

1. Kean Chong Industries Sdn. Bhd. will phaseout the use of CFC-11 in the manufacture of rigid polyurethane foam sandwich panels. The company does not have a foam dispensing machine, since foam production is by handmix technique.
2. The chosen interim replacement is a combination of CFC-141b and water. The capital costs include the introduction of one low pressure foam machine (US \$80,000) and contingency (US \$4,000). Incremental operating costs of US \$81,591 are expected based on the use of the following chemicals: CFC-11, Polyol & MDI before conversion; HFC-141b.

Justification for the Use of HCFCs

3. Kean Chong Industries has decided that HFC-141b is the technically and economically acceptable transitional solution.

Equipment or Components to be Destroyed or Rendered Unusable

4. All equipment at foaming section and refrigerators assembling lines which was operating with CFC-11 and CFC-12 will be destroyed and evidence document will be provided by the enterprise in cooperation with the local ozone officer.

(e) Phasing out ODS at Summer Technologies Sdn. Bhd.

1. Summer Technologies Sdn. Bhd. will phaseout the use of CFC-11 in the manufacture of solar heating hot water storage boilers. The company currently has one Cannon C-60 low pressure machine with a maximum output of 60 kg/min.
2. The production is to be converted to a combination of HFC-141b and water. The capital costs include the replacement of the low pressure machine by a high pressure foam machine with a capacity of 60 kg/min (US \$25,000). Capital costs also include contingency (US \$2,500). Incremental operating costs of US \$61,907 are expected based on the use of the following chemicals: CFC-11, Polyol & MDI and HFC-141b.

Justification for the Use of HCFCs

3. Of all options, a water/HFC-141b based system is preferred from a technical and economic standpoint, even though it is considered to be an interim solution.

Equipment or Components to be Destroyed or Rendered Unusable

4. All equipment at foaming section and refrigerators assembling lines which was operating with CFC-11 and CFC-12 will be destroyed and evidence document will be provided by the enterprise in cooperation with the local ozone officer.

(f) Phasing out ODS at Visdamax Sdn. Bhd.

1. The company Visdamax Sdn. Bhd. will convert from the use of CFC-11 in the manufacture of rigid polyurethane foam sandwich panels. Visdamax does not have a foam dispensing machine, and foam production is by handmix technique. The company also has four vertical presses.
2. Visdamax is substituting a combination of HFC-141b and water for CFC-11 as auxiliary blowing agents. The capital cost of conversion involves the introduction of one high pressure dispenser of output 100 kg/min (US \$40,000). The capital cost associated with trials, technology transfer and training is US \$15,000, while the cost of contingency is US \$4,000. Incremental operating costs of US \$80,959 are expected on the basis of the use of the following chemicals: CFC-11, HFC-141b, Polyol & MDI before and after conversion.

Justification for the Use of HCFCs

3. Of all options, a water/HFC-141b based system is preferred from a technical and economic standpoint, even though it is considered to be an interim solution.

Equipment or Components to be Destroyed or Rendered Unusable

4. All equipment at foaming section and refrigerators assembling lines which was operating with CFC-11 and CFC-12 will be destroyed and evidence document will be provided by the counterpart in cooperation with the local ozone officer.

Impact of Project on 1999 Freeze

5. Since all these projects are expected to be completed by the end 1998, it is considered among the priorities of the country to meet the 1999 freeze target.

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

1. The incremental operating costs of the projects are under discussion to harmonize the prices of CFC-11 and HCFC-141b. The final project costs will be submitted to the Sub-Committee on Project Review.

PROJECT EVALUATION SHEET **MALAYSIA**

SECTOR: FOAMS ODS use in sector (1990): 415 ODP tonnes

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

Project Titles:

(a) HENG HUAT FURNITURE - conversion to CFC-free technology in the manufacture of polyurethane foam

(b) CT FOAM - conversion to CFC-free technology in the manufacture of polyurethane foam

Project Data	Integral Skin	
	HENG HUAT	CT FOAM
ODS phase-out (ODP tonnes)	50	14
Proposed project duration (months)	24	24
Incremental capital cost (US \$)	467,500	472,000
- including contingency (%)	10	10
Incremental operational cost (US \$)	652	1,218
Total project cost (US \$)	468,152	473,218
Local ownership (%)	100	100
Export component (%)		
Amount requested (US \$) {Original}	467,500	236,000
{Revised}		
Cost effectiveness (US \$/kg)	9.35	16.86
National Coordinating Agency	Department of Environment (DOE)	
Implementing Agency	UNDP	
Technical review completed?	Yes	Yes

Secretariat's Recommendations:		
Amount recommended (US \$)	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 (1990) reported in country programme	415 tonnes ODP
Most recent consumption data (1993)	1360 tonnes ODP
ODS to be phased out in approved projects (as at July 1997)	1330 tonnes ODP
ODS reported to have been phased out (as at July 1997)	793 tonnes ODP
ODS to be phased out in current proposed projects	299 tonnes ODP
Latest (1995) CFC-11 consumption reported according to Art. 7	

(a) HENG HUAT FURNITURE - conversion to CFC-free technology in the manufacture of polyurethane foam

1. Heng Huat Furniture will phaseout the use of CFC-11 in the manufacture of molded foam for the automotive and furniture industries. The company currently has two low pressure Cannon dispensers (1993 and 1994), one carousel carrier system, and loose molds for cushions and mattresses.
2. The manufacturing operations are to be converted to water blown technology, with addition of LCD technology due to quality considerations in pillow manufacturing. The capital costs include:

for Line 1: the replacement of one low pressure machine by a high pressure foam dispenser with output 60 kg/min (US \$100,000); the integration of a release agent applicator (US \$6,000); the introduction of both a mold heating tunnel (US \$30,000) and a mold heating oven (US \$35,000);

for Line 2: the introduction of a LCD system including the replacement of the other low pressure machine by a high pressure dispenser (US \$185,000); the integration of a CO₂ storage (US \$24,000), and finally local installation (US \$5,000). Trials, technology transfer and training amount to US \$40,000. Contingency costs of US \$42,500 are also included. Incremental operating costs are expected for water based (US \$27,375) on the basis of the use of the following chemicals: 36.5 t CFC-11; 54.75 t MDI. Incremental operating benefits are also expected for LCD technology (US \$27,750) based on the use of the following chemicals: 13.5 t CFC-11; 3.75 t CO₂. The calculated incremental operational savings are small.

3. The following prices were used for calculation of incremental operational costs: CFC-11 US \$2.25/kg; CO₂ US \$0.70/kg; MDI US \$2.00/kg.

(b) CT FOAM - conversion to CFC-free technology in the manufacture of polyurethane foam

4. The company CT Foam will convert from the use of CFC-11 in the manufacture of molded foam for the automotive and furniture industries. CT Foam operates two low pressure machines, Cannon (1993 and 1991), models C-100 FL2 and C-60 FL2, respectively. The company also uses three automated oval carrier systems and single molds for mattresses.
5. CT Foam is substituting water blown formulations for CFC-11 as an auxiliary blowing agent. The second production line is to be converted to LCD technology due to quality considerations in pillow manufacturing. The capital costs include:

for Line 1: the replacement of one low pressure machine by a high pressure foam dispenser 100/50 (US \$110,000), and the introduction of both a mold heating tunnel (US \$30,000) and a mold heating oven (US \$35,000);

for Line 2: the introduction of a LCD system including the replacement of the other low pressure machine by a high pressure dispenser (US \$185,000); the integration of a CO₂ storage (US \$24,000), and finally local installation (US \$5,000). Trials, technology transfer and training amount to US \$40,000. Contingency costs of US \$43,000 are also included. Incremental operating costs are expected: for water based (US \$7,875) on the basis of the use of the following chemicals: 10.5 t CFC-11; 15.75 t MDI. Incremental operating benefit are also expected for LCD technology (US \$7,175) based on the use of the following chemicals: 3.5 t CFC-11; 1.0 t CO₂. The calculated incremental operational savings are small.

Equipment or Components to be Destroyed or Rendered Unusable

6. No information regarding the disposal of the replaced equipment is provided in the above projects.

Impact of Project on 1999 Freeze

7. The preparation of the above projects is consistent, and essential for the stated goal of 100% CFC-11 phase out in foam making by 1999.

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 UNDP.

- 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.

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

PROJECT EVALUATION SHEET **MALAYSIA**

SECTOR: REFRIGERATION ODS use in sector (1993): 1360 ODP tonnes

Sub-sector cost-effectiveness thresholds: Commercial 15.21 US \$/kg
Rigid PU Foam 7.83 US \$/kg

Project Title:

Conversion to CFC-free technology in the manufacture of polyurethane foam at Kwang Tai Refrigeration

Project Data	Commercial refrigeration/Rigid PU Foam
	Kwang Tai Refrigeration
ODS phase-out (ODP tonnes)	29
Proposed project duration (months)	24
Incremental capital cost (US \$)	292,000
- including contingency (%)	
Incremental operational cost (US \$)	69,500
Total project cost (US \$)	361,500
Local ownership (%)	100
Export component (%)	
Amount requested (US \$) {Original}	361,500
{Revised}	
Cost effectiveness (US \$/kg)	12.46
National Coordinating Agency	Department of Environment (DOE)
Implementing Agency	UNDP
Technical review completed?	Yes

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

PROJECT DESCRIPTION

Conversion to CFC-free technology in the manufacture of polyurethane foam at Kwang Tai Refrigeration

1. ODS consumption in the foam sector is estimated at 1360 MT (1993); it has grown from 590 t in 1989. There is no information on the ODS consumption in the commercial refrigeration sub-sector. The Executive Committee approved three commercial refrigeration projects, phasing out 128.3 ODP tons.
2. DOE regulations currently prohibit the use of ODS in flexible foams. By the end of 1999, all CFC consumption in the manufacture of foams is scheduled to be phased out.
3. The company is the leading manufacturer of panels, commercial refrigerators and cold rooms in East Malaysia. It has two production locations, and is in the process of building a new production facility. Future growth is expected at about 40% per year. The company also used about 10 t HCFC-22 for refrigeration in 1996, which is not covered under this project. The implementation of this project will result in the phasing out of 29 t ODP.
4. The company currently manufactures all products without the benefits of standard production equipment. Annual production includes approximately 2200 units of freezers, refrigerators, cabinets and miscellaneous products, and 1,800 cub. m. of insulation panels.
5. The companies will convert from CFC-11 to HCFC-141b for its foaming. It is recognized as an interim technology, and will convert to a water or HFC based system. Two new high pressure dispensers (with company contribution) will be purchased, as well as a motorized cart on a rail system for the panel manufacturing. Incremental operating costs are calculated on the bases of purchasing premixed polyol.

Justification for HCFC-141b technology

6. This technology provides the best energy efficiency, and the lowest investment costs. Water-based systems are frequently more expensive than other CFC-free technologies due to reductions in insulation value, and higher densities required by lower cell stability. The relatively high investments for safety costs tend to limit pentane use to relatively large CFC users. Additional investments required to convert to CFC-free systems will be at the company's expense.
7. This project selected HFC 134a to replace CFC-12 use. New compressors and lubricants, evacuation/charging equipment, modification of the refrigeration system, and leak detector are required. Two vacuum pumps, one recycling unit, and a leak detector are requested in the project proposal.

8. Incremental operating costs are for chemicals and components and are requested for two years.
9. No statement is made concerning the destruction of the replaced equipment

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

1. The proposal indicates that the enterprise manufactures all products without having standard production equipment. Funding for two new high pressure dispensers and a new motorized cart are requested at US \$ 200,000. The Secretariat requested UNDP to provide information on the baseline equipment which was not part of the proposal. In the absence of such information the verification of the incrementality of the requested equipment is not possible. UNDP was requested also to explain the necessity for the recycling unit.
2. The Secretariat is still awaiting the requested information. The Sub-Committee on Project Review will be informed accordingly.