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PROJECT PROPOSAL: MALAYSIA

PROJECT EVALUATION SHEET

COUNTRY OR REGION: Malaysia

PROJECT TITLE: KEY ASSET SDN.BhD Elimination of CFCs in the
Manufacture of Integral Skin Polyurethane Foam

BUDGET: US \$690,000

INCREMENTAL COSTS: US \$690,000

ODS PHASE-OUT: 50 tonnes CFC-11 per year

COST EFFECTIVENESS¹: US \$13.8 per Kg. ODP saved

PROJECT DURATION: 1 year

IMPLEMENTING AGENCY: UNDP

NATIONAL COORDINATING AGENCY : Malaysia Department of Environment (DOE)

TECHNICAL REVIEW COMPLETED: YES X NO

SECRETARIAT'S COMMENTS

1. The project will result in an estimated annual phase out of 50 tonnes of CFC-11 through conversion to CFC reduced technology combined with the replacement of the residual CFC by HCFC-22 as an interim solution. The equipment installed, however, will be capable of using emerging ODS-free technologies.
2. The incremental capital costs of US \$480,000 cover the replacement of equipment, such as high pressure foam equipment, which will be capable to employ ODS-free technologies as they are mature.
3. The incremental recurrent costs of US \$210,000 reflect the increase in the costs of new formulations. These costs will be partially offset by the lower loss of blowing agents in blending operations.

SECRETARIAT'S RECOMMENDATION

4. The project is recommended for final approval of funding in the amount of US \$690,000.

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

PROJECT COVER SHEET

COUNTRY: Malaysia

PROJECT TITLE: KEY ASSET SDN. BHD elimination of CFCs in the manufacture of integral skin polyurethane foam

SECTOR COVERED: Foamed Plastics

ODS USE IN SECTOR: 600 CFCs (722 tons ODS) in 1991

PROJECT IMPACT: 50 TONS CFC-11 per year

PROJECT DURATION: One year, after MLF approval

TOTAL PROJECT COSTS: USD 480,000 Incremental Capital Cost
USD 210,000 Incremental Recurrent Cost

PROPOSED MLF GRANT; USD 690,000

COST EFFECTIVENESS: 2.68 USD/t/y

NATIONAL COORDINATING BODY: Malaysia Department of Environment (DOE)

IMPLEMENTING AGENCY: UNDP

APPRAISAL DATE: July 23, 1993

PROJECT SUMMARY

Key Asset SDN. Bhd. ("Key Asset") is Malaysia's largest manufacturer of polyurethane integral skin foam (ISF). Its products are aimed at the furniture and automotive market. The company is a Malaysian owned private sector enterprise. CFC-11 is currently used in the production process. Under this project, Key Asset will eliminate the use of CFCs in its production process through reduced CFC technology combined with replacement of the residual CFC by HCFC-22, resulting in an annual reduction of 50 tons ODS, based on 1993 consumption. The company realizes that the use of HCFC-22 constitutes an interim solution. However, the equipment that will be installed as part of this project will be capable to employ emerging ODS-free technologies such as carbon dioxide and HFCs as they mature. The company expects an increase of recurrent incremental operating costs of about 12% of the system value. These costs will be partly offset by lower losses in the preparation of blends and savings in cleaning solvents. A grant covering all project related costs is requested.

**PROJECT OF THE GOVERNMENT OF MALAYSIA
KEY ASSET SDN BHD ELIMINATION OF CFCs IN THE MANUFACTURE
OF INTEGRAL SKIN POLYURETHANE FOAM**

1. PROJECT OBJECTIVE

The objective of this project is to phase out the use of CFCs in the manufacture of integral skin polyurethane foam (ISF) at Key Asset SDN. BHD. ("Key Asset").

2. SECTOR BACKGROUND

The CFC consumption in the foam sector in Malaysia is estimated to have reached at least 600t in 1991. CFC-11 (polyurethane foams) and CFC-12 (polystyrene and polyethylene foam sheet) are the dominant substances in this sector, with much smaller usage of MCF, CFC-114 and CFC-115.

3. ENTERPRISE BACKGROUND

Key Asset was established in 1988 by Mr. T.K. Lim under the name "Lim Enterprise". Since then, the company has considerably expanded and in 1993 converted to a private limited company under the assumption of the name "Key Asset SDN BHD". The factory is located in Selangor and is 100% Malaysian owned. The company operates 3 low pressure "Cannon" foaming units, producing integral skin, semi rigid, polyurethane foam. Main products are arm rests, chair legs and head rests for the automotive and furniture industry in Malaysia and abroad.

4. PROJECT DESCRIPTION

Key Asset will utilize in 1993 about 50t CFC-11 in the manufacture of PU-ISF. The company is committed to phaseout the use of this substance and has selected a combination of reduced CFC technology and HCFC-22 as the ODS-replacement of choice. Existing low pressure equipment has to be replaced by high pressure, and pre-blending equipment will have to be installed for this purpose. Some additional costs for trials will occur. In addition to equipment changes, the company expects recurrent incremental costs, related to higher use of isocyanate and the use of HCFC-22. These costs will be partly offset by lower losses of blowing agent in the blending operation (more efficient blending equipment), elimination of the need of a cleaning solvent for the mixing head and the proceeds from phased out equipment.

5. TECHNOLOGY

5.1 OVERVIEW

There are several options to replace CFCs in the production of IS PUF, such as:

- o CFC-11 > HCFC-141b > ?
- o CFC-11 > HCFC-22 > HFC-134a, 152a
- o CFC-11 > (cyclo)pentane

In addition, compounds such as Methylene Chloride, HCFC 123, and water blown technologies have been suggested, but these are immature in technology, limited available or limited applicable. The first solution--also called the "liquid" solution--employs technology that is closely related to the existing one. The final step in this process is not yet decided. One potential solution is HFC-356, but full water blown foam with improved skin formation remains an option, specifically in "lesser demanding" systems. The second one--also called the "gas" solution--utilizes a gaseous mixture of physical blowing agents, requires high pressure equipment, and process adjustments. The final step in this process is seen as the introduction of (gaseous) HFC's. Pentane technology is lately commercial introduced on several occasions, but its flammable character requires safety conditions and limits its use.

5.2 SELECTION

A combination of reduced CFC technology and the use of HCFC-22 is selected by the company as an alternative that is:

- o Proven technology in processing and product performance,
- o Environmentally acceptable,
- o Available in the Malaysian market,
- o Easily to convert to complete CFC-free technology.

5.3 IMPACT ON PRODUCTION PROCESS

The use of reduced CFC technology as well as the use of HCFC-22 will require the employment of high pressure foam production equipment. In addition, the current manual procedure of blending CFC-11 with the polyol system will have to be replaced by a pressurized, closed system. The new equipment will, as a side effect, eliminate current losses of CFC in the blending operation (up to 20%) and also allow the elimination of the use of a solvent to clean the mixing head, thus partially offsetting higher raw material costs. As skin building is a critical performance factor of the blowing agent, in addition to the foam building function, extensive trials will be needed to assure performance as close as possible to the existing quality. This will be performed initially at supplier location--to adjust the chemical composition--followed by local trials--to test under ambient conditions on production scale.

6. PROJECT COSTS

6.1 CAPITAL COSTS

The following is a summary of the expected costs of investment and related activities (in USD):

DESCRIPTION	SUBTOTAL	TOTAL
o Foam equipment		
3 high pressure units	330,000	
Freight	10,000	
Installation	10,000	
Spare Parts	10,000	
Value obsolete equipment	(10,000)	350,000
o Pre-Blender	70,000	
Freight, Installation	10,000	80,000
o Trials, Start-Up		10,000
o Contingency and Rounding		40,000
TOTAL INCREMENTAL CAPITAL COSTS		480,000

Equipment prices are based on prices from Cannon-Asia (Singapore).

6.2 OPERATING COSTS

Chemical suppliers have indicated an overall price increase for the new formulations of 12%:

o Current costs 420yt @ 2,500.....USD	1,050,000
o 12% Price increase.....USD	126,000
o Savings on CFC useUSD	30,000
o Savings on cleaning agent.....USD	10,000
o RECURRENT INCREMENTAL COSTS.....USD	86,000
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o Net Present Value (4y; 10 % discount).....USD	210,000
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6.3 UNIT ABATEMENT COST

a) ODS Reduction Project Costs	USD	480,000
b) Annual Incremental Costs	USD	86,000
c) Project Useful Life		10 years
d) ODS reduction/y	kg	50,000

Unit Abatement Costs [(a/c + b)/d]	USD/kg/y	2.68
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7. FINANCING PLAN

The company requests the reimbursement of the complete project costs estimated on

USD 690,000

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8. PROJECT IMPLEMENTATION

8.1 MANAGEMENT

UNDP will oversee the implementation of this project and provide technical assistance.

8.2 SCHEDULE

Implementation schedule will start with MLF approval of the project and will end after trials have confirmed that acceptable product can be made in the new configuration. A detailed activity schedule is provided in the following table:

TASK	TIME FOR COMPLETION					
	Q1	Q2	Q3	Q4	Q5	Q6
1. Preparation MLF Approval Procurement Preparation Order Confirmation	x	x x				
2. Installation Arrival, Customs Machine installation Start-up, Trials			x	x xx		

8.3 PROCUREMENT

UNDP will oversee the procurement, assisted by Westech/Malaysia.

9. PROJECT IMPACT

This project will eliminate the use of at least 50 tons of CFCs in the first year of implementation. The project employs commercially available and environmentally acceptable technology.

KEYASSET.MAY
93-10-06/03

RAPPA Inc.

Consultants

Herb Veenendaal
Chemist
Certified Environmental Trainer

KEY ASSET SDN BHD

SCOPE

The project is concerned with the elimination of CFCs in the manufacture of integral skin polyurethane foam.

RELEVANCY AND ADEQUACY OF INFORMATION

The project documents provide sufficient information.

TECHNICAL SOUNDNESS

The chosen route of CFC 11 replacement by a combination of reduced CFC (which means water blown) and HCFC 22 is a good solution. It points already in the direction of the permanent solution which is most likely will be full water blown. Such technology is at the moment not fully commercialized for integral skin foams that are not subject to post treatment.

COMPARISON WITH OTHER PROJECTS

This project can be compared with Dasa Windu Agung in Jakarta, Indonesia. The choice of technology is the same. Cost comparison is not possible because Dasa is manufacturing other foams that are integrated into the same project.

ENVIRONMENTAL ISSUES

HCFC 22 constitutes an interim technology as a residual ODP value will remain. The project correctly indicates this and points to HCFCs or fully water blown systems as the ultimate solution. This is supported.

SAFETY ISSUES

There are no particular safety issues related to the choice of technology.

COST EFFECTIVENESS

Overall, cost effectiveness is acceptable in the current situation. Price monitoring in the future is necessary as HCFC prices have the tendency to come down at the moment, based on sufficient supply and anticipated HCFC reductions in developed countries.

OTHERS

None.

RECOMMENDATION

The project is supported.