



**United Nations
Environment
Programme**



Distr.
LIMITED

UNEP/OzL.Pro/ExCom/24/29
26 February 1998

ORIGINAL: ENGLISH

EXECUTIVE COMMITTEE OF
THE MULTILATERAL FUND FOR THE
IMPLEMENTATION OF THE MONTREAL PROTOCOL
Twenty-fourth Meeting
Montreal, 25-27 March 1998

PROJECT PROPOSALS: THAILAND

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

Refrigeration

- Elimination of ODSs used in the production of household refrigerators at Hitachi Consumer Products (Thailand) Co. Ltd. World Bank
- Umbrella project to convert CFC-12 commercial refrigeration to HFC-134a, and CFC-11 to HCFC-141b as the blowing agent for foam insulation at 224 small- and medium-sized enterprises World Bank

PROJECT EVALUATION SHEET THAILAND

SECTOR: Refrigeration ODS use in sector (1992): 1080 ODP tonnes (Domestic)
(1997): 750 ODP tonnes (Commercial)

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

Project Titles:

(a) Elimination of Ozone Depleting Substances Used in the Production of Household Refrigerators at Hitachi Secretariat's Recommendations

(b) Umbrella Project to Convert CFC-12 Commercial Refrigeration to HFC-134a, and CFC-11 to HCFC-141b as the Blowing Agent for Foam Insulation at 224 Small- and Medium-Sized Enterprises

Project Data	Domestic	Commercial
	Hitachi	Umbrella
ODS phase-out (ODP tonnes)	171.7	207
Proposed project duration (Mths)	12	24
Incremental capital cost (US\$)	1,191,386	3,596,270
Contingency (%)	n/a	10
Incremental operational cost (US\$)	1,215,000	5,214,265
Total project cost (US\$)	2,406,386	8,810,535
Local ownership (%)	51	100
Export component (%)		
Amount requested (US\$) {Original	1,227,257	3,148,470
{Revised		
Cost effectiveness (US\$/kg)	8.24	15.21
National Coordinating Agency	Dept. of Industrial Works, Ministry of Industry	Dept. of Industrial Works, Ministry of Industry
Implementing Agency	The World Bank	The World Bank
Technical review completed?		

Secretariat's Recommendations		
Amount recommended (US \$)		
Project impact (ODP tonnes)	171.7	t.b.d.
Cost effectiveness (US \$/kg)		
Implementing Agency support cost (US\$)		
Total cost to Multilateral Fund		

PROJECT DESCRIPTION

(a) Elimination of Ozone Depleting Substances Used in the production of Household Refrigerators at Hitachi Consumer Products (Thailand) Co., Ltd.

1. ODS consumption in the domestic refrigeration sector in Thailand was 1,080 in 1992. However, the production of household refrigerators and freezers in Thailand has increased significantly in recent years, from about 560,000 units in 1989 to approximately 2 million units in 1995. Presently, there are eight major manufacturers of household appliances. The Executive Committee has already approved projects for four enterprises in the sector leading to the phase out of 680 ODP tonnes. Thailand recently introduced a regulation banning the use of CFCs in new refrigerators from January 1, 1997.

2. Phase I project for Hitachi was approved at the 10th Meeting of the Executive Committee (1993) at US\$ 553,000. Phase I was to provide for:

- Design of refrigerator models;
- Conduct approval tests for each refrigerator model;
- Conduct approval tests for the compressors made in Thailand;
- Provide production drawings for the new models;
- Provide training on manufacturing, maintenance and quality control.

3. This proposal covers Phase II of the conversion which has already been implemented by converting to HFC-134a (refrigerant) and HCFC-141b (foam blowing agent).

4. The project seeks to request retroactive funding for equipment purchased and for the acquired technology transfer.

5. The costs incurred are those for modification of the line test room for mass production, replacement of dry air system, extension of vacuum line, additional vacuum pumps, dies, molds and jigs, and the cost of replacement of three existing vacuum forming machines used for forming of plastic inner liners with a new high capacity machine.

6. Incremental operating costs (IOC) are requested for six month duration which are associated with new HFC-134a compressors, new condensers of higher capacity, new filter/dryers, and the HFC-134a refrigerant. IOC cover also higher cost of chemicals for foaming operation and new ABS plastic material for the inner liner. IOC are calculated on basis of US\$ 9.80 per unit produced.

7. Hitachi company is using compressors of Kulthorn Kirby Compressor Company, Thailand which received assistance from the Multilateral Fund for conversion to HFC-134a technology.

Justification for HCFC-141b technology

8. Hitachi has selected HCFC-141b as a blowing agent understanding that it is a transition technology. In response to the Thai government's decision to ban the use of CFC-11 in the production of household refrigerators starting from 1 January 1997 Hitachi decided to use HCFC-141b as a transitional substance before switching to cyclopentane or other alternatives. The selection of this technology was recommended to them by their parent company in Japan which has already used HCFC-141b as a blowing agent. HCFC-141b has a thermal conductivity comparable with CFC-11 resulting in similar insulation performance.

9. The project document contains a statement in which it has acknowledged not to seek any further assistance from the Fund for conversion to ultimate non-ODP technologies.

(b) Umbrella Project to Convert CFC-12 Commercial Refrigeration to HFC-134a, and CFC-11 to HCFC-141b as the Blowing Agent for Foam Insulation at 224 Small- and Medium-Sized Enterprises.

10. The commercial refrigeration sub-sector of Thailand is composed of approximately 15 large and a number of medium and small enterprises. Total consumption in the sector is estimated at about 750 tonnes of ODP used for manufacturing of new refrigeration equipment. Additionally, about 250 ODP tonnes is used for servicing the installed equipment. The Executive Committee has approved 6 projects for large enterprises in the sub-sector leading to phase out of 86.7 ODP tonnes.

11. The project document contains the following statement: "Implementation of the project will contribute to helping Thailand to achieve the 1999 ODS consumption freeze."

12. This is a terminal umbrella project to eliminate the use of CFC's in the production of commercial refrigeration equipment at 224 small - and medium-sized enterprises. Each enterprise will be provided with technical assistance and the necessary machinery and equipment to phase out CFC-11 in foam blowing operations and CFC-12 as a refrigerant. It is estimated that the conversion will be completed at all participating companies within two years. After completion of the project at each facility, the company's old equipment will be destroyed.

13. It is estimated that these 224 enterprises, with a combined annual production level of 129,000 units, represent all manufacturers of new equipment in the commercial refrigeration subsector. The main products of these enterprises include refrigeration units, water coolers, retail food display cases and freezers that are sold to small grocery stores, schools and restaurants. A number of these 224 enterprises provide servicing of installed refrigeration equipment. They consume 168 tones of CFC-12. It is estimated that 50% of total CFC-12 consumption or 84 MT is for new equipment and the rest for servicing operations. CFC-12 consumption for servicing is not included in the total figure of ODP phase out. Total consumption of CFC-11 for foam insulation is estimated at approximately 128 MT.

14. The proposal contains general information on the production level of the group of 224 enterprises. No breakdown of the share of each enterprise in the total production figure of the 129,000 is given. A table is provided as part of the project document with the list of the companies CFC-12 consumption data per enterprise, number of vacuum pumps, pressure gauges and leak detectors installed in each which are needed to handle refrigerant charging operations. The project document indicates that each company currently utilizes hand mixing and pouring the foam. The proposal does not contain consumption data on CFC-11 for foam insulation.

15. The following justification was provided for the selection of the HCFC-141b transitional substitute: "HCFC 141b was selected as the blowing agent for the small - and medium - sized enterprises that are part of this project. Cyclopentane would have been ideal from an environmental point of view, but was rejected as uneconomical and impractical given the scope and nature of the operations at these enterprises. The enterprises understand and agree not to seek further funding from the Multilateral Fund to switch to a non-ozone depleting technology, such as cyclopentane, in the future".

16. The project covers the capital cost for equipment that will need to be rebuilt or replaced and costs associated with technology transfer and training. The equipment requested for conversion include vacuum pumps, pressure gauges, charging cylinders and leak detectors. Of the total capital costs of US\$ 3.6 million, US\$ 2.24 million is for technology transfer and training. Technology transfer and training will be provided by Kulthorn Engineering, a subsidiary company of Kulthorn Kirby, which is a major supplier of compressors.

17. Incremental operating costs (IOC) are calculated at US\$ 5.2 million for two year duration. The major portion of IOC is related to the cost of HFC-134a compressors, sourced from Kulthorn Kirby Compressor Company at US\$ 3.00 million which is calculated on the basis of incremental cost of US\$ 16.1 per compressor.

18. The total project cost is US\$ 8.8 million. However, the funding requested is for US\$ 3.1 million, which is the maximum allowed given the ODS consumption claimed in the project and the cost-effectiveness threshold established for the commercial refrigeration sub-sector.

SECRETARIAT'S COMMENTS AND RECOMMENDATIONS

COMMENTS

(a) Elimination of Ozone Depleting Substances Used in the production of Household Refrigerators at Hitachi Consumer Products (Thailand) Co., Ltd.

1. The project does not provide indications on how the implementation of the project has contributed to achieving the 1999 freeze in Thailand.

2. The Secretariat requested the World Bank to provide additional information regarding the duration of the use of HCFC-141b technology. The World Bank indicated that "the enterprise is awaiting a HFC foam technology to be available before making a choice on the final non-ODS technology."

Capital Cost

3. The company requested the cost of US\$ 708,116 relating to the replacement of the three existing vacuum forming machines used for processing of the plastic material for the inner liner in the refrigerator with one new machine.

4. The company claims that the new plastic processing machine was required because the machines used before conversion had technical limitations which prevented the new plastic liner from being produced with the required quality. The new liner is made from a modified plastic, which is compatible with HCFC-141b.

5. The Secretariat questioned the eligibility of the new vacuum forming machine on the following considerations:

- The use of a new plastic material is a standard requirement in transition to HCFC-141b technology. Several kinds of plastics are available in the market to accommodate individual requirements of manufacturers of domestic appliances;
- The Executive Committee approved more than one hundred projects on conversion to HCFC-141b technology in the refrigeration sector including four projects in Thailand for companies which are using plastic material similar to those used by Hitachi company without requiring a new vacuum forming machine;
- Technical reports prepared by TEAP and the OORG Working Group on the Insulation Foam dedicated to technical implications of conversion to the HCFC-141b foam contain no indications on the necessity to replace vacuum forming equipment;
- The Secretariat conducted extensive consultations with chemical companies manufacturing plastic materials compatible with HCFC-141b and some major manufacturers of domestic

appliances in Northern America and Japan which are using HCFC-141b foam technology, plastic material and vacuum forming equipment similar to those replaced by Hitachi company. It was indicated that there are several more cost-effective options available to accommodate HCFC-141b technology other than replacement of the costly vacuum forming equipment.

- New equipment is related to the transitional technology which should be replaced in the near future in accordance with the corporate policies at Hitachi Japan.

6. The Secretariat also questioned the eligibility and the costs of other capital equipment items requested in the project such as extension of the line test room for mass production, replacement of the existing dry air system and replacement of foaming molds and jigs. This is the first time any of these items have been included in projects involving conversion to HCFC-141b and HFC-134a.

Operating Cost

7. The Secretariat sought justification for high incremental operating costs associated with a significant increase in the size of condensers. These costs were challenged by the technical reviewer of the project. A conclusion on the eligibility of these costs can only be made after examining testing data, however the company refused to release the requested data on the basis of confidentiality.

8. The World Bank has deferred the request for incremental operating costs associated with compressors until the methodology for Decision 22/26 has been finalized.

9. The Secretariat and the World Bank are still discussing the eligibility and the level of funding of incremental costs in the above mentioned project. The Sub-Committee on the project review will be informed accordingly.

(b) Umbrella Project to Convert CFC-12 Commercial Refrigeration to HFC-134a, and CFC-11 to HCFC-141b as the Blowing Agent for Foam Insulation at 224 Small- and Medium-Sized Enterprises.

10. The project proposal indicates that implementation of the project will contribute to achieve the 1999 freeze in Thailand.

11. The Secretariat sought clarification from the World Bank on a range of issues concerning the CFC consumption of the enterprises included in the project. In particular, the Secretariat indicated to the World Bank that the data provided on the production level and CFC consumption for each enterprise may not be adequate to establish the eligibility of the funds requested. In particular, there is no information on the number of refrigeration units manufactured by each enterprise to support the total production figure of 129,000 units per year. Annual production levels are used to determine the CFC consumption of an enterprise. Thus, the CFC consumption used for manufacture, as opposed to servicing, cannot be established, and no basis is provided for the figure of 50% of total CFC, used for servicing equipment (which is not eligible). The

Secretariat requested additional information to ascertain that all the listed 224 enterprises are producers of new refrigeration equipment, to establish the consumption of each enterprise. The World Bank had advised that it was not possible to obtain specific information on the production level of each enterprise. The World Bank confirmed that all the 224 are commercial refrigerator producers. Only aggregate information was available which was based on a survey conducted by the Thai Department of Industrial Work and by Kulthorn Kirby Engineering.

12. The consumption of each enterprise is also needed to establish compliance with Decision 19/32 related to umbrella projects. Decision 19/32 which stipulates that no individual enterprise proposal in a terminal umbrella project may have a cost-effectiveness value more than 100 per cent above the threshold. The World Bank proposed that the requirements of Decision 19/32 could be met by prorating the CFC consumption for each enterprise and calculating a cost-effectiveness value. Under this methodology, each enterprise would be funded exactly at the threshold level.

13. Additionally, the Secretariat pointed out that on the basis of the quantities of foaming chemicals used by each enterprise, the CFC-11 consumption in total was around 50% of that indicated in the project document. This would effect the total grant level which is calculated for this group of enterprises on the basis of the cost-effectiveness threshold value of the sector multiplied by the CFC consumption.

Capital Cost

14. The major portion of capital cost (US\$ 2.24 million) is for technology transfer and training which is calculated by multiplying US\$ 10,000 by the number of enterprises. US\$ 2.24 million is proposed to be allocated to Kulthorn Kirby Engineering as a provider of technology. (It is to be noted that Kulthorn Kirby Engineering is a subsidiary of Kulthorn Kirby Co. Ltd., which received US\$ 1,494,234 from the Multilateral Fund including cost of technology transfer for the conversion of its compressor plant).

Operating Cost

15. Regarding operating costs, the Secretariat questions the very high incremental cost for HFC 134a compressors of US\$ 16.1/unit given the fact that the main products covered by the project are (refrigerators, freezers and water coolers used in small grocery shops, schools and restaurants.) These products require small capacity compressors at much lower incremental cost per unit.

16. The eligibility of these cost items was not pursued as they will not be included within the level of funding available under the cost-effectiveness threshold.

17. The Secretariat and the World Bank are still discussing the eligibility and the level of funding of incremental costs in the above mentioned project. The Sub-Committee on Project Review will be informed accordingly.