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EXECUTIVE COMMITTEE
OF THE MULTILATERAL FUND FOR THE
IMPLEMENTATION OF THE MONTREAL PROTOCOL
Twenty-seventh Meeting
Montreal, 24-26 March 1999

PROJECT PROPOSALS: THAILAND

This document consists of the comments and recommendations of the Fund Secretariat on the following projects:

Foam:

- Conversion from CFC-11 to water based and HCFC-141b technology in the manufacture of integral skin polyurethane foam and rigid moulded foam at Jennings Co. Ltd. — World Bank
- Conversion from CFC-11 to water blown and HCFC-141b technology in the manufacture of rigid foam (spray) at Bangkok Integrated Trading Co. — World Bank
- Conversion from CFC-11 to HCFC-141b technology in the manufacture of rigid polyurethane foam at P.E. Containers Supply Co. Ltd. — World Bank
- Conversion from CFC-11 to HCFC-141b Technology in the Manufacture of Rigid Polyurethane Foam at Plastmate Industry Co., Ltd. — World Bank
- Conversion from CFC-11 to HCFC-141b technology in the manufacture of rigid polyurethane foam at Siam M.P. Co. Ltd. — World Bank
- Conversion from CFC-11 to HCFC-141b technology in the manufacture of rigid polyurethane foam at Siam Steel International PLC — World Bank
- Conversion from CFC-11 to HCFC-141b technology in the manufacture of rigid foam at Willich Sales & Contracting Co. Ltd. — World Bank

PROJECT EVALUATION SHEET
THAILAND

SECTOR: FOAM ODS use in sector (1991): 1,510 ODP tonnes

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

Project Titles:

(a) Conversion from CFC-11 to Water based and HCFC-141b Technology in the Manufacture of Integral Skin Polyurethane Foam and Rigid Molded Foam at Jennings Co., Ltd.
(b) Conversion from CFC-11 to water blown and HCFC-141b Technology in the Manufacture of Rigid Foam (Spray) at Bangkok Integrated Trading (BIT)
(c) Conversion from CFC-11 to HCFC-141b Technology in the Manufacture of Rigid Polyurethane Foam at P. E. Containers Supply Co., Ltd.
(d) Conversion from CFC-11 to HCFC-141b Technology in the Manufacture of Rigid Polyurethane Foam at Plastmate Industry Co., Ltd.
(e) Conversion from CFC-11 to HCFC-141b Technology in the Manufacture of Rigid Polyurethane Foam at Siam M. P. Co., Ltd.
(f) Conversion from CFC-11 to HCFC-141b Technology in the Manufacture of Rigid Polyurethane Foam at Siam Steel International PLC.
(g) Conversion from CFC-11 to HCFC-141b Technology in the Manufacture of Rigid Foam at Willich Sales & Contracting

Project Data	**Integral Skin/Rigid**	**Rigid**					
	Jennings[1]	Bangkok	P. E. Containers	Plastmate	Siam M.P. Co.	Siam Steel	Willich Sales
ODS (CFC-11) phase out (ODP tonnes)	15	25.3	32	11.3	28	30	17.7
Proposed project duration (months)	24	24	24	24	24	24	24
Incremental capital cost (US$)	154,000	49,500	132,000	79,750	126,500	104,500	88,000
- including contingency (%)	10	10	10	10	10	10	10
Incremental operational cost (US$)	65,173	68,423	91,133	32,682	73,616	92,481	26,961
Total project cost (US$)	219,173	117,923	223,133	112,432	200,116	196,981	114,961
Local ownership (%)	100	100	100	100	100	100	51
Export component (%)	0	0	0	0	0	100	15
Amount requested (US$) {Original}	222,653	129,233	227,070	80,649	198,882	220,900	61,404
{Revised}	125,249	117,923	223,133	80,649	198,882	196,981	58,630
Cost effectiveness (US$/kg.)	8.35	4.89	7.83	7.83	7.83	7.26	3.65
National Coordinating Agency	Hazardous Substances Control Division Department of Industrial Works (DIW)						
Implementing Agency	IBRD						
Technical review completed?	Yes						
Secretariat s Recommendations							
Amount recommended (US $)	125,249	117,923		80,649		196,981	58,630
Project Impact (ODP tonnes)	14.35	24.1		10.3		27.1	16.05
Cost effectiveness (US $/kg)	8.31	4.89		7.83		7.26	3.65
Implementing Agency support cost (US$)	16,282	15,330		10,484		25,608	7,622
Total cost to Multilateral Fund	141,531	133,253	Pending	91,133	Pending	222,589	66,252

[1] The cost of integral skin and rigid foam components are US $70,439 and US $54,810 with corresponding cost-effectiveness of US $8.80 /kg and US $7.83/kg respectively.

PROJECT DESCRIPTION

(a) Conversion from CFC-11 to Water based and HCFC-141b Technology in the Manufacture of Integral Skin Polyurethane Foam and Rigid Molded Foam at Jennings Co., Ltd.

(b) Conversion from CFC-11 to water blown and HCFC-141b Technology in the Manufacture of Rigid Foam (Spray) at Bangkok Integrated Trading (BIT)

(c) Conversion from CFC-11 to HCFC-141b Technology in the Manufacture of Rigid Polyurethane Foam at P. E. Containers Supply Co., Ltd.

(d) Conversion from CFC-11 to HCFC-141b Technology in the Manufacture of Rigid Polyurethane Foam at Plastmate Industry Co., Ltd.

(e) Conversion from CFC-11 to HCFC-141b Technology in the Manufacture of Rigid Polyurethane Foam at Siam M. P. Co., Ltd.

(f) Conversion from CFC-11 to HCFC-141b Technology in the Manufacture of Rigid Polyurethane Foam at Siam Steel International PLC.

(g) Conversion from CFC-11 to HCFC-141b Technology in the Manufacture of Rigid Foam at Willich Sales & Contracting

Sector Information

1. Baseline consumption (average 1995-1997) of Annex A Group I substances (CFCs) reported to the Ozone Secretariat 6,082.1 ODP tonnes.

2. Although the baseline consumption is 6,082 tonnes, the data show decreasing trend in the Annex A Group I (CFC) consumption. The consumption of these substances has decreased from 8,248 tonnes in 1995 to 4,448 tonnes in 1997.

3. Information from the inventory of approved projects indicate that as of November 1998 the amount of US $9.56 million had been approved for projects to phase out 1,905 tonnes of CFC in the foam sector. US $2.91 million had been disbursed and 365 tonnes CFC had been phased out.

4. The sector background information provided by the World Bank on the Thailand projects was the same as the information provided in projects presented to the 25th and 26th Meetings in July and November which was based on projections of unconstrained demand. Since the data appeared not to be consistent with the reality of the ODS consumption situation in Thailand and has also been repeated several times in Thailand projects (both UNDP and World Bank projects), it was not reproduced in this document.

Justification for the use of HCFC-141b

5. HCFC-141b is used in all the rigid foam and integral skin foam projects. The justification for use of HCFC-141b has been provided for each project by the World Bank. This is attached as Appendix I to this evaluation.

Impact of the projects on country's Montreal Protocol obligations:

6. The following statement is written in the project documents for each project. "This project will eliminate the use of (quantity) ODP tonnes, and as such is important in helping Thailand to meet the country's obligations with the Montreal Protocol." The extent of these obligations are not defined.

7. Six projects with consumption ranging from 11.3 ODP tonnes to 32 ODP tonnes with the average of 21.6 ODP tonnes have been submitted to the Meeting. If approved a total of 146.3 ODP tonnes CFC-11, about 2.4% of Thailand's baseline consumption of Annex A Group I substances will be eliminated. The residual ODP resulting from the use of HCFC-141b is 13 ODP tonnes.

Integral Skin Foam

(a) Conversion from CFC-11 to Water based and HCFC-141b Technology in the Manufacture of Integral Skin Polyurethane Foam and Rigid Moulded Foam at Jennings Co., Ltd.

8. Jennings Co., Ltd. will phaseout the use of 15 tonnes per year of CFC-11 in the manufacture of moulded rigid foam and semi-rigid integral skin foam for arm rests and shoe soles. The production is to be converted to water-based systems for the integral skin application, with temporary use of HCFC-141b in the integral skin foam arm rest application. The moulded rigid foam will convert to HCFC-141b as an intermediate option. The project includes replacement of the rigid foam low pressure dispenser by a high pressure dispenser (US $100,000). Other costs include trials (US $20,000), training and technology transfer (US $20,000) and contingency (US $14,000). The project also includes incremental operating costs for two years (US $68,653).

Rigid Foam

(b) Conversion from CFC-11 to water blown and HCFC-141b Technology in the Manufacture of Rigid Foam (Spray) at Bangkok Integrated Trading (BIT)

9. Bangkok Integrated Trading Co., Ltd. (BIT) will phaseout the use of 25.3 tonnes per year of CFC-11 in the manufacture of insulating rigid foam (spray) for boat, buoys, roof and poultry farm insulation. The production is to be converted to water-blown foam for the boat insulation and HCFC-141b for the other applications. The project includes retrofit of the Gusmer FF1600 for use with HCFC-141b (US $5,000) and replacement of the locally made dispenser by a high pressure medium output dispenser (US $25,000). Other costs include trials (US $5,000), training

and technology transfer (US $10,000) and contingency (US $4,500). The project also includes incremental operating costs for two years (US $79,733).

(d) Conversion from CFC-11 to HCFC-141b Technology in the Manufacture of Rigid Polyurethane Foam at P. E. Containers Supply Co., Ltd.
(e) Conversion from CFC-11 to HCFC-141b Technology in the Manufacture of Rigid Polyurethane Foam at Plastmate Industry Co., Ltd.
(f) Conversion from CFC-11 to HCFC-141b Technology in the Manufacture of Rigid Polyurethane Foam at Siam M. P. Co., Ltd.

10. P. E. Containers Co. Ltd., Plastmate Industry Co. Ltd. and Siam M. P. Co. Ltd., all manufacture polyethylene (PE) containers insulated with polyurethane. All three companies currently use manual operations. CFC-11 is added to the polyol in an open top premixer using a small mechanical mixer in a bucket on a scale for weighing components. The polyol blend is then mixed in a similar manner with the isocyanate, and poured directly into the cavity of the container with polyethylene as a shell.

11. The production in all three companies is to be converted to HCFC-141b as an interim step, with a likely permanent solution being water-based formulations. The conversion involves the purchase of high pressure dispensers with two mix heads each for two companies and a low pressure dispenser for the third company as well as two component premixers. The requested grants for all three companies is based on the maximum allowable grant calculated by the ODP eliminated.

12. P. E. Containers will phaseout the use of 32 tonnes per year of CFC-11. The project of P. E. Containers includes purchase of a 100 kg/min high pressure dispenser at US $110,000 with 50% enterprise contribution, an extra mixing head (US $40,000), and a 2-component premixer (US $15,000). Other costs include trials (US $10,000), training and technology transfer (US $20,000) and contingency (US $14,000). The project also includes incremental operating costs for two years (US $115,275).

13. Plastmate Industry will phaseout the use of 11.3 tonnes per year of CFC-11. The project for Plastmate includes purchase of a low pressure 60 kg/min dispenser (US $50,000), and a 2-component premixer (US $15,000). Other costs include trials (US $10,000), training and technology transfer (US $10,000) and contingency (US $8,500). The project also includes incremental operating costs for two years (US $41,273).

14. Siam M. P. will phaseout the use of 28 tonnes per year of CFC-11. This project also includes purchase of a 60 kg/min high pressure dispenser at US $100,000 with 50% enterprise contribution, an extra mixing head (US $40,000), and a 2-component premixer (US $15,000). Other costs include trails (US $10,000), training and technology transfer (US $20,000) and contingency (US $13,500). The project also includes incremental operating costs for two years (US $92,429).

(f) Conversion from CFC-11 to HCFC-141b Technology in the Manufacture of Rigid Polyurethane Foam at Siam Steel International PLC.

15. Siam Steel International PLC will phaseout the use of 30 tonnes per year of CFC-11 in the manufacture of rigid polyurethane foam for the manufacture of mobile houses. The production is to be converted to HCFC-141b as an interim step, with a likely permanent solution being water-based formulations. The project includes retrofit of an Elastogran P-80 dispenser for use with HCFC-141b (US $15,000) and a retrofit of a Nippon Hennecke MEG dispenser for use with HCFC-141b (US $40,000). Other costs include trials (US $20,000), training and technology transfer (US $20,000) and contingency (US $9,500). The project also includes incremental operating costs for two years (US $116,400).

(g) Conversion from CFC-11 to HCFC-141b Technology in the Manufacture of Rigid Foam at Willich Sales & Contracting

16. Willich Sales and Contracting is a Thai (51%)/German (49%) joint venture, manufacturing panels for insulated cold rooms as well as pipe insulation (spray/in-situ foam). It also manufactures block foam which is cut into sheets for insulation and other purposes.

17. Willich Sales and Contracting Co. Ltd. Will phaseout the use of 17.7 tonnes per year of CFC-11 in the manufacture of insulating rigid foam. The production is to be converted to HCFC-141b. The project includes replacement of two low pressure foam dispensers by high pressure dispensers (US $45,000) and retrofit of the block production dispenser for use with HCFC-141b (US $15,000). Other costs include trials (US $10,000), training and technology transfer (US $10,000) and contingency (8,000). The project also includes incremental operating costs for two years (US $32,400). The eligible grant amount is adjusted to reflect 51% local ownership.

SECRETARIAT S COMMENTS AND RECOMMENDATIONS

COMMENTS

Integral Skin Foam

1. Jennings Co.:

The company manufactures both rigid polyurethane foam (RPF) and integral skin foams (ISF). For purposes of determining eligible costs it was agreed to place the two components of the project in their respective sub-sector and calculate the eligible incremental cost for each sub-sector. This resulted in the following costs:

- Eligible incremental cost for ISF: US $70,439; cost-effectiveness US $8.80/kg
- Eligible incremental cost for RPF: US $54,810; cost-effectiveness US $7.83/kg

Rigid Foam

2. Project costs of Bangkok Integrated Trading, Plastmate Industry, Siam Steel and Willich Sales and Contracting have been agreed.

3. The capital costs of P. E. Containers and Siam M. P. relating to eligible incremental costs of conversion from the hand mixing production techniques to the high pressure machines with two mixing heads, are still under discussion between the World Bank and the Secretariat. The outcome of the discussions will be communicated to the Sub-Committee on Project Review.

4. The sector background information provided in the project documents by the World Bank is out of date and may also be inaccurate. Information based on more accurate and recent data would be more relevant in demonstrating the significance of foam sector projects on the country’s ODS phase out.

RECOMMENDATIONS

1. The Fund Secretariat recommends blanket approval of the Jennings, Bangkok Integrated Trading, Plastmate Industry, Siam Steel and Willich Sales projects with the funding levels and associated support costs indicated in the table below.

Project Title	Project Cost US $	Support Cost US $	Implementing Agency
Conversion from CFC-11 to Water based and HCFC-141b Technology in the Manufacture of Integral Skin Polyurethane Foam and Rigid Moulded Foam at Jennings Co., Ltd.	125,249	16,282	IBRD
Conversion from CFC-11 to water blown and HCFC-141b Technology in the Manufacture of Rigid Foam (Spray) at Bangkok Integrated Trading (BIT)	117,923	15,330	IBRD
Conversion from CFC-11 to HCFC-141b Technology in the Manufacture of Rigid Polyurethane Foam at P. E. Containers Supply Co., Ltd.	Pending	Pending	IBRD
Conversion from CFC-11 to HCFC-141b Technology in the Manufacture of Rigid Polyurethane Foam at Plastmate Industry Co., Ltd.	80,649	10,484	IBRD
Conversion from CFC-11 to HCFC-141b Technology in the Manufacture of Rigid Polyurethane Foam at Siam M. P. Co., Ltd.	Pending	Pending	IBRD
Conversion from CFC-11 to HCFC-141b Technology in the Manufacture of Rigid Polyurethane Foam at Siam Steel International PLC.	196,981	25,608	IBRD
Conversion from CFC-11 to HCFC-141b Technology in the Manufacture of Rigid Foam at Willich Sales & Contracting	58,630	7,622	IBRD

2. The Executive Committee may wish to request the implementing agencies when preparing projects for the country to provide data in the sector background information that are accurate and relevant and demonstrate the relationship of the ODS phased out in projects in the sector with the country's overall ODS phase out programme or its obligations under the Montreal Protocol.

Annex I

Justification for selection of alternative technology

Integral Skin Foam

Jennings Co., Ltd.

1. Jennings Co. Ltd., has been informed about all replacement technologies, and has independently chose HCFC-141b as an interim solution in the rigid foam application.

2. Based on consideration of the technical and economic impacts of the proposed alternatives, the available technology choices for each of the applications are:

ISF- arm rests:	pentane, water, HCFC-141b, HFC-134a
ISF-shoesoles:	pentane, hexane, water, HCFC-141b, HFC-134a
Rigid molded foam:	pentane, water, HCFC-141b

3. For integral skin foams, based on safety and cost considerations, the choice is for water-based systems for both the arm rests and the shoesoles. There may be a supply problem with water-based systems for the arm rest application, in which case the enterprise will use HCFC-141b while the enterprise works with suppliers to have water-based systems available.

4. For the rigid moulded foam application, due to the relatively low consumption, conversion to pentane is not cost-effective. Estimated costs for conversion are upwards of US $400,000. Based on the process limitations of conversion to water-based formulations at this time, the only remaining choice is for HCFC-141b.

5. The enterprise has been informed that HCFC's are transitional substances. It has also been informed that under present Multilateral Fund rules, they will not be able to seek additional funding from the Multilateral Fund at a later date to convert to zero-ODP technologies.

Rigid Foam

Bangkok Trading and Contracting Co. Ltd.

6. Bangkok Trading and Contracting Co. Ltd., has been informed about all replacement technologies, and has chosen HCFC-141b as an interim solution in the rigid foam application.

7. Based on consideration of the technical and economic impacts of the proposed alternatives, the available technology choices for each of the applications are:

Boat Insulation:	HCFC-141b or water
Other Spray applications:	HCFC-141b

8. For the boat insulation application, the foam serves the purpose of providing flotation as well as insulation. The baseline density of this foam is already 48.5 kg/m^3; therefore, a density increase in not necessary, even with water-based formulations. In this case, it is suggested to apply water-based technology.

9. For the other spray foam applications, the only feasible technology alternative is HCFC-141b. Therefore, the enterprise decided to apply HCFC-141b as an interim technology in all applications except for boat insulation.

10. The enterprise has also been informed that HCFC's are transitional substances. It has also been informed that under present Multilateral Fund rules, they will not be able to seek additional funding from the Multilateral Fund at a later date to convert to zero-ODP technologies.

P. E. Containers

11. P. E. Containers has been informed about all replacement technologies, and has chosen HCFC-141b as an interim solution in the rigid foam application.

12. Based on consideration of the technical and economic impacts of the proposed alternatives, the only feasible alternative is HCFC-141b. Cyclopentane and water-based systems are not currently commercialized in Thailand for this application.

13. The enterprise has also been informed that HCFC's are transitional substances. It has also been informed that under present Multilateral Fund rules, they will not be able to seek additional funding from the Multilateral Fund at a later date to convert to zero-ODP technologies.

Plastmate Industry Co. Ltd.

14. Plastmate Industry Co. Ltd. has been informed about all replacement technologies, and has chosen HCFC-141b as an interim solution in the rigid foam application.

15. Based on consideration of the technical and economic impacts of the proposed alternatives, the only feasible alternative is HCFC-141b. Cyclopentane and water-based systems are not currently commercialized in Thailand for this application.

16. The enterprise has also been informed that HCFC's are transitional substances. It has also been informed that under present Multilateral Fund rules, they will not be able to seek additional funding from the Multilateral Fund at a later date to convert to zero-ODP technologies.

Siam M. P. Co. Ltd.

17. Siam M. P. Co. Ltd. has been informed about all replacement technologies, and has chosen HCFC-141b as an interim solution in the rigid foam application.

18. Based on consideration of the technical and economic impacts of the proposed alternatives, the only feasible alternative is HCFC-141b. Cyclopentane and water-based systems are not currently commercialized in Thailand for this application.

19. The enterprise has also been informed that HCFC's are transitional substances. It has also been informed that under present Multilateral Fund rules, they will not be able to seek additional funding from the Multilateral Fund at a later date to convert to zero-ODP technologies.

Siam Steel International PLC

20. Siam Steel International has been informed about all replacement technologies, and has chosen HCFC-141b as an interim solution in the rigid foam application.

21. Based on considerations of the technical and economic impacts of the proposed alternatives, the only feasible alternative is HCFC-141b. Pentane and water based systems are not currently commercialized in Thailand for this application. Elastogran has repeatedly stated that it will not retrofit its equipment for use with pentane, and most likely the MEG dispenser cannot be retrofit either.

22. The enterprise has been informed that HCFC's are transitional substances. It has also been informed that under present Multilateral Fund rules, they will not be able to seek additional funding from the Multilateral Fund at a later date to convert to zero-ODP technologies.

Willich Sales & Contracting Co. Ltd.

23. Willich Sales & Contracting Co. Ltd. has been informed about all replacement technologies, and has chosen HCFC-141b as an interim solution in the rigid foam application.

24. Based on consideration of the technical and economic impacts of the proposed alternatives, the only feasible alternative is HCFC-141b. Cyclopentane and water-based systems are not currently commercialized in Thailand for this application.

25. The enterprise has also been informed that HCFC's are transitional substances. It has also been informed that under present Multilateral Fund rules, they will not be able to seek additional funding from the Multilateral Fund at a later date to convert to zero-ODP technologies.