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Executive Committee of
the Multilateral Fund for the
Implementation of the Montreal Protocol

Thirteenth Meeting
Montreal, 25-27 July 1994

PROJECT PROPOSAL: PHILIPPINES

This document includes the following project proposal and the Fund Secretariat's Comments and Recommendations:

- Phaseout of the use of CFCs in the manufacture of commercial refrigerators and ice boxes at Unimagna.

PROJECT EVALUATION SHEET

COUNTRY OR REGION: Philippines

PROJECT TITLE: Phase-out of the use of CFCs in the Manufacture of Commercial Refrigerators and Ice Boxes at Unimagna

PROJECT COST: Incremental capital cost US \$940,000
Incremental operational cost US \$145,000

INCREMENTAL COST: US \$1,085,000

ODS PHASE-OUT: 23 tons of CFC-11 in 1993
6.5 tons of CFC-12
(Total ODP = 29.5 tons)

COST EFFECTIVENESS: US \$36.8 per kg ODP saved

PROJECT DURATION: Two years

IMPLEMENTING AGENCY: UNDP

NATIONAL COORDINATING AGENCY: Department of Environment & Natural Resources (DENR)

TECHNICAL REVIEW COMPLETED: YES X NO

SECRETARIAT'S COMMENTS

1. This project covers the conversion of production of commercial refrigerators and ice boxes at Unimagna to HFC-134a (refrigerant) and cyclopentane (blowing agent). The project also covers the purchase of recycling machines reducing CFC-12 emissions in service operations.
2. Implementation of this project will result in an estimated annual phase out of 23 MT of CFC-11 and 6.5 MT of CFC-12 with cost effectiveness at US \$36.8 per kg ODP saved annually.
3. The existing foam equipment will be replaced with explosion-proof high pressure foaming units, and CFC-12 charging equipment will be replaced with HFC-134a units.

4. Cyclopentane is a flammable material. Safety related modifications and training will be covered by capital costs.

5. The management of the company is committed to ODS phaseout and have done considerable preparatory work through in-house evaluation and discussion with chemical suppliers. The company will be provided with the assistance of external experts in product engineering and development as well as in production safety. UNDP will supervise the implementation of the project in close co-operation with DENR.

6. Incremental operational costs are calculated for two years using current prices. The requested operational costs cover higher cost of HFC-134a compressor and refrigerant, costs associated with the optimization of the refrigeration system and higher cost of formulation.

7. The Secretariat submitted a policy paper on the impact on the Fund of various operational cost durations in the domestic refrigeration sector. The operational cost durations will be an issue of discussion at the present meeting of the Executive Committee.

8. Unimagina selected the HFC-134a compressor supplier which can currently provide compressors with the very moderate incremental cost of about US \$2.50/unit. It is twofold less than the incremental costs of HFC-134a compressors in the projects for Egypt and Jordan.

9. The incremental operational costs will be incurred only after the full production of a new product has started, i.e., two years from the time funds are received. The incremental operational costs are likely to decrease within the coming year.

SECRETARIAT'S RECOMMENDATIONS

10. The Secretariat recommends approval of the requested capital cost at US \$940,000.

11. The approval of incremental operational costs at US \$145,000 is contingent on a decision from the Executive Committee regarding duration of the operational cost.

12. UNDP is requested to re-assess the incremental operational costs on the basis of market prices prevailing at the time when actual costs are incurred and to report back to the Executive Committee. Agency overhead costs should be adjusted accordingly.

PROJECT COVER SHEET

COUNTRY: Philippines

PROJECT TITLE: UNIMAGNA phaseout of the use of CFCs in the manufacture of commercial refrigerators and ice boxes

SECTOR COVERED: Foamed Plastics/Refrigeration

ODS USE IN SECTOR: Foamed Plastics 417t CFC-11/y
(1991) Refrigeration 722t CFC-12/y

PROJECT IMPACT: Phaseout of 23t CFC-11 and 6.5t CFC-12/y
(base 1993)

PROJECT DURATION: Two years from approval

PROJECT ECONOMIC LIFE: Ten years

TOTAL PROJECT COST: USD 940,000 Incremental Capital Cost
USD 145,000 Incremental Recurrent Costs

PROPOSED MLF GRANT: USD 1,085,000

COST EFFECTIVENESS: USD 8.00/kg/y (unit abatement cost)

COORDINATING NATIONAL BODY: Department of Environment and Natural Resources (DENR)

IMPLEMENTING AGENCY: UNDP

APPRAISAL DATES: January 11/May 2/June 6, 1994

PROJECT SUMMARY

UNIMAGNA PHILIPPINES INC, ("UNIMAGNA") manufactures electric coolers and thermoware, utilizing CFC-11 in the foam insulation and CFC-12 in the refrigeration circuit (new equipment and after sales service). Under this project, the enterprise will phaseout the use of CFCs in its manufacturing process. The non-ODS technology of choice will be based on a combination of reduced ABA and Cyclopentane for the foam and HCFC-134a for the refrigerant.

TECHNICAL ASSESSMENT

The project is reviewed and supported with amendments by Bert Veenendaal, UNDP Foam Sector Expert. His comments are attached.

PROJECT OF THE GOVERNMENT OF THE PHILIPPINES

UNIMAGNA PHASEOUT OF THE USE OF CFCs IN THE MANUFACTURE OF COMMERCIAL REFRIGERATORS AND ICE BOXES

1. PROJECT OBJECTIVE

The objective of this project is to phase out the use of CFCs in the manufacture of electrical coolers and thermoware at UNIMAGNA.

2. SECTOR BACKGROUND

The CFC consumption in the foam sector in the Philippines is estimated to have reached about 420t in 1991 (ref.: Table 1). CFC-11 (polyurethane foams) and CFC-12 (polystyrene foam sheet) are the dominant substances in this sector.

CATEGORY	CFC-11	CFC-12
Polyurethane Foams (PUF)		
Flexible PUF	25	
Rigid PUF Appliances	285	
General Insulation	90	
Extruded Polystyrene Foams		17
TOTAL	400	17

Table-1: CFC-Use in the Foam Industry in the Philippines
(1991; metric tons)

The consumption of CFCs in the same year for the refrigeration/ air conditioning sector is estimated at 766t. Approximately 12% of this amount was related to the commercial refrigeration, 17% (131t) to domestic refrigeration and the remainder to transport, centrifugal A/C and mobile A/C.

3. ENTERPRISE BACKGROUND

UNIMAGNA in Sucat, Paranaque (Metro Manila) is a wholly Philippine owned company. The company was established in 1991 and employs currently about 135 people. It sold in 1993 in excess of 21,000 commercial refrigerators and 30,000 ice boxes for beverage refrigeration. Current capacity is 30,000 refrigerators and 72,000 ice boxes. The company also operates a refurbishing/service operation (repair of 7,000 units in 1992). Attached is the layout providing an overview of the different assembly lines (Annex 1).

Insulation foam is made with two low pressure dispensers: one for ice boxes and one for refrigerators. The refrigeration units are in house assembled from external sourced parts (i.e. compressors).

4. PROJECT DESCRIPTION

UNIMAGNA will utilize in 1994 about 25 tons CFC-11 and 7 tons CFC-12. Management of the company is committed to the phaseout of these ODS and has done considerable preparatory work through in house evaluations as well as discussions with chemical suppliers. All considerations and preparations have been documented in a 90 page feasibility study which is the base of this project document.

It has decided to replace CFC-11 in foam by a combination of reduced ABA and increased water and CFC-12 will be replaced by HFC-134a.

Capital cost include replacement of low pressure foam dispensing equipment by high pressure explosion proof equipment and related safety features, evacuation/charging equipment for the refrigerant, trials, testing, training and incremental recurrent cost.

5 TECHNOLOGY

5.1 OVERVIEW

There are currently three main directions in the development of CFC-free systems for thermoset insulation foams (generally employed together with or after the employment of reduced CFC-technology):

- o CFC-11 > partial water/HFC-141b > ?
- o CFC-11 > partial water/ HCFC-22, 142b > HFC-134a, 152a
- o CFC-11 > partial water/[cyclo] pentane.

In addition, compounds such as perfluoroalkanes, HCFC 123, fluorinated ethers and 2-chloropropane have been suggested, but are immature in technology, limited available or toxicologically contested.

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 cell structure remains an option, specifically in "lesser demanding" systems such as water heaters and thermoware, where dimensional changes--although costly-- are possible.

The second one--also called the "gas" solution--utilizes a gaseous mixture of physical blowing agents, requires high pressure equipment, and sometimes extensive adjustments. The final step in this process is seen as the introduction of (gaseous) HFC's.

[Cyclo] pentane technology is lately commercial introduced in Germany and constitute non ODS technology.

HFC-134a is internationally the most widely employed and accepted technology to replace CFC-12 as a refrigerant.

5.2 SELECTION

UNIMAGNA has selected CFC-11 increased water technology in combination with Cyclopentane. the decision is based on the permanent character of this solution in combination with the cost effectiveness. CFC-12 will be replaced--following international trend--by HFC-134a.

5.3 IMPACT ON THE PRODUCTION PROCESS

The use of Cyclopentane and HFC-134a will require substantial changes in the production process and storage facilities. Required equipment modifications and additions include:

- **Storage tank**
 - Separate, explosion proof storage of the Cyclopentane, mixing station, polyol and isocyanate.
- **Equipment**
 - new high pressure foaming machine
 - new charging and vacuum systems
 - new gas and leak detector.
- **Production**
 - construction of new production area for the new process
 - modification of machinery and foaming mould
 - electrical systems
 - explosion proof motors and switches
 - installations of electrical control cabinets.
- **Auxiliary safety devices**
 - upgraded ventilation system
 - fire protection system in foaming area
 - extra fire extinguishers
 - sealing of electrical control cabinet
- **Training**
 - a test room for reliability test
 - fire safety training
 - production training both local and overseas
 - training on handling of new equipment

Production area will be separated from other working areas for protection against fire hazards. Production and maintenance personnel will be trained in the safe handling of hydro-carbons, in addition to production training. Start-up trials will be made to adjust for the different foaming volume and permeability.

6. PROJECT COSTS

6.1 SUMMARY OF PROJECT COSTS

Incremental Capital Costs.....USD	940,000
Incremental Recurrent Costs.....USD	145,900

TOTAL PROJECT COSTS.....USD 1,085,000

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6.2 CAPITAL COSTS

The following incremental capital costs are expected, related to this project:

BLOWING AGENT

o 2 High pressure foam dispensing units incl. freight & installation, @ USD 350,000...USD	520,000
o Storage system for pentane incl. piping.....USD	40,000
o Jig modifications.....USD	45,000
o Venting for jigs, machine.....USD	45,000
o Gas detecting systems.....USD	50,000
o Trials/testing.....USD	25,000
o Technology transfer/training.....USD	20,000

SUB-TOTAL..... USD 745,000

REFRIGERANT

o Charging & Vacuum system.....USD	25,500
o Oil moisture check equipment.....USD	12,500
o Trials, testing, training.....USD	40,000
o Technology transfer.....USD	20,000

SUBTOTAL.....USD 98,000

o Recovery/recycling equipment.....USD	5,000
o Safety pre/post audit.....USD	5,000
o Contingency.....USD	87,000

TOTAL INCREMENTAL CAPITAL COSTS.....USD 940,000

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6.3 RECURRENT INCREMENTAL COSTS

The company expects recurrent incremental costs based on higher material cost and formulation changes. These costs are expected to amount to USD 95,350/y. Net present value of these costs for 2 years at 10% discount amounts to **USD 145,000**. Annex-A provides more detailed information.

6.4 UNIT ABATEMENT COSTS

- | | | | |
|----|---|-----|----------|
| a) | Incremental Capital Costs..... | USD | 940,000 |
| b) | Project Life Time..... | | 10 years |
| c) | Incremental Recurrent Costs..... | USD | 83,300 |
| d) | CFC Consumption (1994)..... | kg | 29,500 |
| f) | Capital Recovery Factor (@ 10% interest)..... | | 0.16275 |

UNIT ABATEMENT COSTS $[\{a(f) + c\}/d]$USD/kg/y 8.00

7. FINANCING PLAN

The company requests disbursement of USD 1,085,000, representing all eligible incremental costs.

8. PROJECT IMPLEMENTATION

8.1 MANAGEMENT

UNDP in close cooperation with DENR will oversee the this project.

8.2 PROCUREMENT

UNDP will arrange the project procurement. UNDP would cooperate with the local UNDP office and with DENR.

8.3 SCHEDULE

[illegible]

9. REQUIRED REGULATORY ACTION

The project requires the preparation of an environmental impact statement. As it will not result in any additional emissions, effluents or wastes it meets all applicable Philippine Government regulations.

10. PROJECT IMPACT

This project will eliminate the use of at least 32 tons of CFCs in the first year of implementation. Market growth indicates that this may increase by 3-8% annually in subsequent years. The project employs commercially and environmentally acceptable technology.

11. ANNEXES

Annex-A: Plant layout

Annex-B: Detailed calculation of recurrent incremental costs

Annex-C: Technical Assessment

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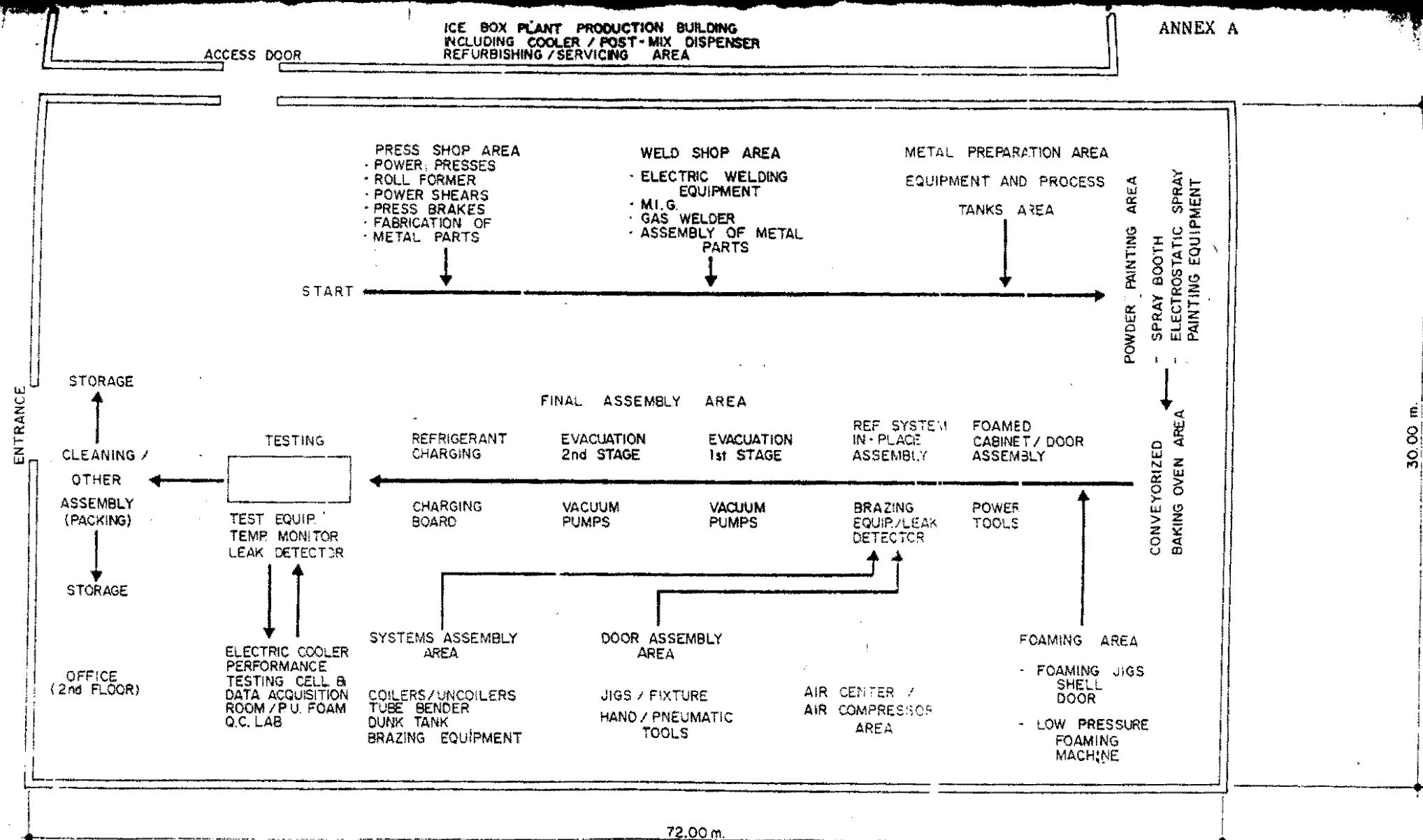


EXHIBIT 2
UNIMAGNA PHILIPPINES, INCORPORATED
ELECTRIC COOLER PRODUCTION PLANT BUILDING

ACCESS ROAD

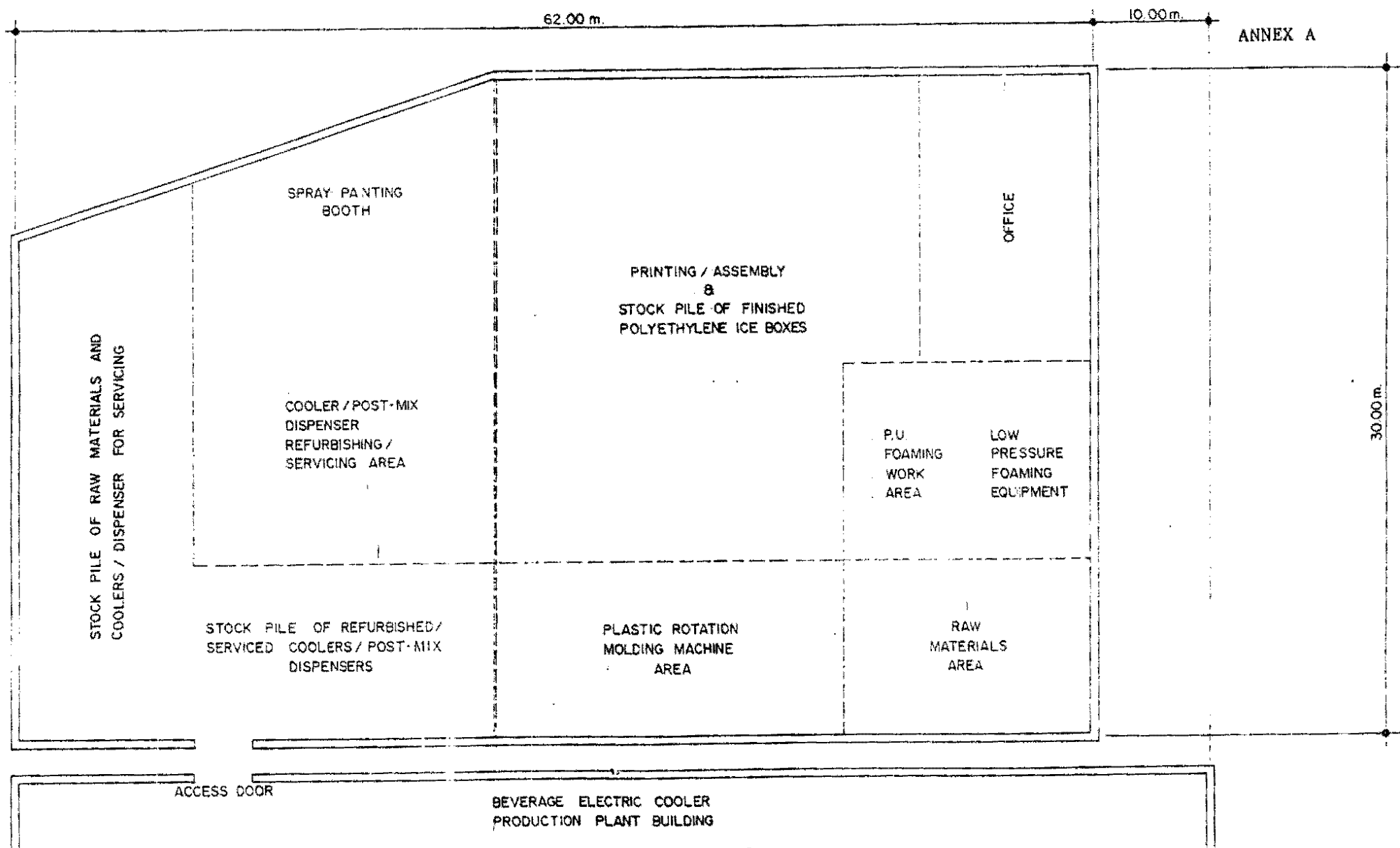


EXHIBIT 2a
POLYETHYLENE ICE BOX - PRODUCTION PLANT BUILDING
(INCLUDING COOLER/POST-MIX DISPENSER SERVICING AREA)



Department of Environment and Natural Resources

Environmental Management Bureau

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RECEIVED
JUN 23 1994

FAX MESSAGE

DATE : 22 June 1994

FOR : **MR. BERT VENEENDAAL**
Certified Environmental Trainer
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FROM : **RACHEL A. VASQUEZ**
Coordinator, Montreal Protocol Secretariat
ENVIRONMENTAL MANAGEMENT BUREAU
Dillman, Quezon City, PHILIPPINES
Fax No. (632) 973-254

This has reference to the comments by the Fund Secretariat on the four (4) Philippine Projects for submission to the Executive Committee for approval.

We were informed that you are presently working in Montreal with the Fund Secretariat to make the necessary revisions and lobby for project approval. May we be informed on whether you have commented on the UNMAGNA, Phils. proposal the costs which the Fund Secretariat finds too high. In this regard, please send us the revised project proposals of these four (4) projects at the earliest time possible for us to make the necessary endorsements.

Please find herewith the attached copy of the said comments sent to us by UNDP, Manila.

Rachel A. Vasquez
RACHEL A. VASQUEZ

RELE/ra/Vasquez/ra

Please find attached the project as the Secretariat is willing to endorse. I suggest acceptance. I will include the latest handwritten changes in the computer

6th Floor, Philippine Heart Center Bldg., East Avenue, Dillman, Quezon City, Metro Manila, Philippines 2008
Telephone nos. 97-82-84; 97-86-96; 97-86-09 or 923-13-01 to 50 locs: 3622, 3627, 3616 FAX no. (63-2) 97-82-84

103/RRUB/XTN/01/94

Perk

ANNEX-B

INCREMENTAL RECURRENT COSTS

The use of all water/Cyclopentane blown foam triggers price consequences, related to the use of a different foam formulation as well as different chemicals.

The use of HFC-134a as refrigerant triggers price consequences based on higher cost of the refrigerant as well as mechanical /electrical parts.

1. ASSUMPTIONS

- o CFC-11 price - USD 2.40/kg
- o CFC-12 price - USD 3.00/kg
- o Cyclopentane price - USD 2.20/kg
- o MDI - USD 2.20/kg
- o 1 part CFC-11 replaced by water/CO₂ requires 1.4 parts of MDI
- o 1 part of CFC-11 replacement requires 0.7 parts of Cyclopentane
- o 1 part of CFC-12 replacement requires 0.85 parts of HFC-134a

2. MATERIAL COST

BLOWING AGENT

Before: 23t CFC-11 @ USD 2,400.....	USD	65,200
After: 17t MDI @ USD 2,20.....	USD	37,400
9t Cyclopentane @ USD 2,200.....	USD	19,800

Additional material benefit/y.....	USD	2,800
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REFRIGERANT

Before: 5.50t CFC-12 @ USD 3,000.....	USD	16,000
After: 4.95t HFC-134a @ USD 8,000.....	USD	39,600
Higher cost of compressor, drier, capillary: 21000 @ USD 3.00.....	USD	63,000

Additional material cost/y.....	USD	86,100
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TOTAL INCREMENTAL RECURRENT COST.....	USD	83,300
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This amounts at a discount rate of 10% over two years of operation to a Net Present Value (NPV) of

USD 145,000

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TECHNICAL REVIEW

PREPARED BY: Bert Veenendaal
UNDP Foam Sector Expert

DATE: June 13, 1994

1. COUNTRY OF ORIGIN: THE PHILIPPINES
2. PROJECT TITLE: UNIMAGNA phaseout of the use of CFC-11 in the manufacture of commercial refrigerators and ice boxes
3. (SUB)SECTOR: Foamed Plastics/Refrigeration
4. CP RELATIONSHIP: Included
5. TECHNOLOGY:

The choice of technology of the company is the use of Cyclopentane as a blowing agent and of HFC-134a as a refrigerant. Both choices are supported. Cyclopentane constitutes a "permanent" replacement technology. The company is sufficiently safety conscious to allow the employment of a flammable substance. Cyclopentane operating cost are practically matching those of CFC-11 in the Philippines.

The choice of HFC-134a as refrigerant is currently generally accepted as the best available technology
6. ENVIRONMENTAL IMPACT: Cyclopentane is highly flammable. The company is aware of this and will work with external experts to provide the necessary safety through equipment and operation. The compound has no ODP and a low GWP.

HFC-134a has no ODP but a significant GWP--although much lower than CFC-12
7. PROJECT COSTS: The unit abatement cost are reasonable (USD 8.68 compared with Lian Pang/Malaysia 0.84 and Sanden/Thailand 12.78)
8. IMPLEMENTATION: Adequate
9. RECOMMENDATION: The project is recommended for approval