



United Nations Environment Programme



Distr.
LIMITED



UNEP/OzL.Pro/ExCom/8/20/Add.2
9 October 1992

ORIGINAL: ENGLISH

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

Eighth Meeting
Montreal, 19-21 October 1992

Addendum

PROJECT PROPOSALS: EGYPT

GENERAL COMMENTS

1. Proposals for "Conversion of Refrigerating Compressors to HFC-134a by Misr Compressor Manufacturing Company (MCMC)," "Phase-out of the Use of CFC-11 in the Manufacture of Flexible Polyurethane Foam at Misr Foam Company," and "Elimination of CFC-12 Used to Make Foams in 1991 (Al Sharif)" were first presented to the Executive Committee for consideration at its Sixth Meeting. At that meeting, the Executive Committee approved US \$1.5 million "to continue work on the preparation and appraisal of [these three projects and a 'Recycling and Waste Disposal' proposal]."

2. Since the Sixth Meeting, UNDP has sent two missions to Egypt to prepare and appraise these projects.

Foam Sector

3. The foam sector in Egypt consumes 722 tonnes of CFC. The foam projects recommended for approval in this request would eliminate 31 percent of the total used in the sector over the next two years.

4. Foam projects have been approved for China. Individually, they are phasing-out more and costing less. However, these projects are not considered comparable to those in Egypt.

5. The Fund Secretariat has sent comments to UNDP and spoken with Government of Egypt officials and UNDP consultants regarding issues raised concerning the proposals. As a result of these discussions, the Al Sharif proposal was resubmitted but important questions regarding incremental costs were not properly addressed.

6. A total of US \$1,442,000 is recommended in the foam sector as follows and should be applied against the US \$1.5 million already approved:

- . Phase-out of the Use of CFC-11 in the Manufacture of Flexible Polyurethane Foam at Misr Foam Company (\$503,000);
- . Phase-out of the Use of CFC-11 in Molded Polyurethane Foam Manufacturing at TAKI-VITA (\$294,000); and
- . Elimination of CFC-11 in the Manufacture of Molded Polyurethane Foams at Technopol (US \$645,000).

7. The "Elimination of CFC-12 Used to Make Foams in 1991 (Al Sharif)" (US \$1,785,000) is not recommended for consideration at this time.

Refrigeration Sector

8. The refrigeration sector in Egypt consumes 629 tonnes of ODP. The refrigeration project recommended for approval in this request would eliminate 26 percent of the total used in the sector over the next two years.

9. A total of US \$2.8 million is recommended in the refrigeration sector for the project, "Conversion of Refrigerating Compressors to HFC-134a by Misr Compressor Manufacturing Company (MCMC)."

10. It is recommended that consideration of the proposal, "Phasing-out CFCs in Refrigeration at Koldair," should be deferred until outstanding issues are resolved.

PROJECT EVALUATION SHEET

COUNTRY OR REGION: Egypt

PROJECT TITLE: Conversion of Refrigerating Compressors to HFC-134a by MISR Compressors Manufacturing Co. (MCMC)

BUDGET: US \$2,800,000

INCREMENTAL COSTS: US \$2,800,000

COST EFFECTIVENESS: US \$17 per Kg. ODP Saved Annually¹

PROJECT DURATION: Two years for construction phase.

IMPLEMENTING AGENCY: World Bank

NATIONAL COORDINATING AGENCY: Egyptian Environment Affairs Agency (EEAA)

TECHNICAL REVIEW COMPLETED: YES X NO

SECRETARIAT'S COMMENTS

1. The original project proposal, costing US \$2,490,413, was submitted to the Sixth Meeting of the Executive Committee.
2. A technical review (Annex I) for the original proposal was completed for the Secretariat by an outside consultant on 1 February 1992.
3. The Executive Committee deferred a decision on this project proposal until further information was available regarding the Licence and Technical Assistance Agreement between MCMC and Whirlpool Italia.
4. Subsequent to that decision, it was determined that the project could be funded without violating the technology licensing agreement.
5. This current proposal (US \$2.8 million) differs in cost from the original proposal by US \$310,000. This is due to revised estimates for technical support from Whirlpool Italia.
6. The project will result in an estimated annual phase-out of 324 tonnes of CFC-12.¹

7. MCMC is expecting to sell a significant amount (up to 39 percent) of the new HFC-134a compressors in the export market. However, no adjustment to incremental costs are made because MCMC's primary market is domestic and a substantial portion (over one-half) of the anticipated export market is to Article 5 and other developing countries.

8. The OORG Refrigeration Working Group (OORG/RWG) recommended HFC-134a as an alternative to CFC-12 in domestic refrigeration in developing countries. It also recommended that conversion to HFC-134a in a developing country should be accomplished in phases. However, OORG/RWG also recommended that the first phase should involve testing of the new technology in the manufacturing process. This could be accomplished through a pilot project. It was further determined that the equipment requirements for pilot and full-scale production are essentially the same.

9. The World Bank, through the International Finance Corporation (IFC), indicated that the project proposal provides the best estimate of cost of equipment, personnel and technology transfer on the basis of information available at this time. IFC is scheduled to appraise this project after March 1993.

SECRETARIAT'S RECOMMENDATIONS

10. The project is recommended for Final Approval, and that requested funding of US \$2.8 million should be committed with the understanding that actual disbursement from the Fund would follow the disbursement schedule which will be defined by IFC during its appraisal of the project.

Endnote

1. Determined as the ratio of incremental costs to the estimated annual saving of ODP. The amount of CFC-12 saved is adjusted to domestic consumption only.

PROJECT EVALUATION SHEET

COUNTRY OR REGION: Egypt

PROJECT TITLE: Phase-out of the Use of CFC-11 in the Manufacture of Flexible Polyurethane Foam at Misr Foam Company

BUDGET: US \$415,000 - Fixed Project Costs
US \$ 88,000 - Annual Operational Costs for Four Years
(US \$22,000 per year)
US \$503,000 - Total Request

INCREMENTAL COSTS: US \$503,000¹

COST EFFECTIVENESS: US \$4.15/Kg. ODP saved²

PROJECT DURATION: Four months for construction phase; 10-year project life.

IMPLEMENTING AGENCY: UNDP

NATIONAL COORDINATING AGENCY: Egyptian Environment Affairs Agency (EEAA)

TECHNICAL REVIEW COMPLETED: YES X NO

SECRETARIAT'S COMMENTS

1. An independent technical review (Annex II) was provided following the submission of the project document.
2. The project will result in an estimated average annual phase-out of 121 tonnes of CFC-11.³
3. US \$73,000 of the project costs is attributable to completed actions for formulation transfer and process trials and plant transfer system for methylene chloride.
4. The cost of Customs duties is included in the price of encapsulation equipment in the amount of US \$6,000 according to the company concerned. The project document also indicates that a 10 percent sales tax (US \$11,000) would be added to the cost of encapsulation equipment. Both Customs duties and sales taxes are ineligible incremental costs.
5. The technical review indicated that the incremental operational costs (US \$22,000 per year) were reasonable. It also indicated that there were no net material costs included in the

estimated incremental operational costs. It is assumed that operational costs will be disbursed on an annual basis over a four-year period.

6. Operational savings are not anticipated for the project.

SECRETARIAT'S RECOMMENDATIONS

7. The project is recommended for Final Approval funding in the amount of US \$503,000 as an amendment to the UNDP 1992 work programme.

Endnotes:

1. Incremental costs include the fixed costs (\$415,000), minus \$11,000 for sales taxes and \$6,000 for customs duties included in encapsulation equipment for a total fixed cost component of \$398,000. Operational costs are estimated at \$22,000 per year for four years (total = \$88,000).
2. Determined as the ratio of incremental costs to the estimated annual saving of ODP. For CFC-11, ODS = ODP.
3. Average annual reduction in this case is defined as the CFC-11 reduction at year four of the project.

PROJECT EVALUATION SHEET

COUNTRY OR REGION: Egypt

PROJECT TITLE: Phase-out of the Use of CFC-11 in Molded Polyurethane Foam Manufacturing at TAKI-VITA

BUDGET: US \$490,000 - Fixed Project Costs

INCREMENTAL COSTS: US \$294,000¹

COST EFFECTIVENESS: US \$5.88/Kg. ODP saved²

PROJECT DURATION: Two years for construction phase; 10-year project life.

IMPLEMENTING AGENCY: UNDP with technical input from USEPA

NATIONAL COORDINATING AGENCY: Egyptian Environment Affairs Agency (EEAA)

TECHNICAL REVIEW COMPLETED: YES X NO

SECRETARIAT'S COMMENTS

1. This project was first presented to the Executive Committee for consideration at its Sixth Meeting with a budget of US \$1.7 million. At that meeting, the Executive Committee approved US \$1.5 million "to continue work on the preparation and appraisal of [this and three other proposed projects]."
2. An independent technical review (Annex III) was provided following the submission of the project document.
3. The project will result in an estimated average annual phase-out of 50 tonnes of CFC-11.³
4. British Vita is a minority partner of Taki Vita. The local share ownership is 60 percent. The eligible incremental costs reflect this adjustment to the total budget figure.
5. Although operational costs are not requested, the project document indicates that higher material costs of about US \$49,000 per year are expected which accounts for the absence of cost savings. The technical review indicates that it is not unusual that initial higher costs normalize after a certain period, based on competitive pressure and production scale-up.

SECRETARIAT'S RECOMMENDATIONS

6. The project is recommended for Final Approval funding in the amount of US \$294,000. This amount should be credited to the US \$1.5 million approved at the Sixth Meeting of the Executive Committee.

Endnotes:

1. Incremental costs include 60 percent of the total request.
2. Determined as the ratio of incremental costs to the estimated annual saving of ODP. For CFC-11, ODS = ODP.
3. Estimated average annual reduction after project implementation.

PROJECT EVALUATION SHEET

COUNTRY OR REGION: Egypt

PROJECT TITLE: Elimination of CFC-11 in the Manufacture of Molded Polyurethane Foams at Technopol

BUDGET: US \$645,000 - Fixed Project Costs
 US \$180,000 - Annual Operational Costs for Four Years
 (US \$45,000 per year)
 US \$825,000 - Total Request

INCREMENTAL COSTS: US \$645,000 Fixed Project Costs

COST EFFECTIVENESS: US \$11.72/Kg. ODP saved¹

PROJECT DURATION: 24 months for construction phase; 10-year project life.

IMPLEMENTING AGENCY: UNDP

NATIONAL COORDINATING AGENCY: Egyptian Environment Affairs Agency (EEAA)

TECHNICAL REVIEW COMPLETED: YES X NO **SECRETARIAT'S COMMENTS**

1. An independent technical review (Annex IV) was provided following the submission of the project document.
2. The project will result in an estimated average annual phase-out of 55 tonnes of CFC-11.²
3. This project differs from the similar Taki Vita project for two principle reasons: (1) there is no transnational ownership and (2) the production process is more complex. Eliminating the Taki Vita deduction for its transnational ownership and considering the greater complexity, the cost effectiveness measurements would be similar US \$9.8/Kg. saved (Taki Vita) versus US \$11.72/Kg. saved (Technopol).
4. There was no information provided on the components of incremental operational costs except, as indicated in the technical review, that Technopol has agreed not to apply for incremental material costs. Therefore, operational costs are not considered.

SECRETARIAT'S RECOMMENDATIONS

5. The project is recommended for Final Approval funding in the amount of US \$645,000 as an amendment to the UNDP 1992 work programme.

Endnotes:

1. Determined as the ratio of incremental costs to the estimated annual saving of ODP. For CFC-11, ODS = ODP.

2. Average annual reduction in this case is defined as the CFC-11 reduction after the project is implemented.

PROJECT EVALUATION SHEET

COUNTRY OR REGION: Egypt

PROJECT TITLE: Elimination of CFC-12 Used to Make Foams in 1991 (Al Sharif)

BUDGET: US \$1,785,000 - Fixed Project Costs

INCREMENTAL COSTS: Not determined

COST EFFECTIVENESS: Not determined

PROJECT DURATION: One year for construction phase; 10-year project life.

IMPLEMENTING AGENCY: UNDP

NATIONAL COORDINATING AGENCY: Egyptian Environment Affairs Agency (EEAA)

TECHNICAL REVIEW COMPLETED: YES ☐ NO ☐ (See comments below.)

SECRETARIAT'S COMMENTS

1. This project was first presented to the Executive Committee for consideration at its Sixth Meeting with a budget of US \$2.6 million. At that meeting, the Executive Committee approved US \$1.5 million "to continue work on the preparation and appraisal of [this and three other proposed projects]."
2. This proposal is similar to the Plásticos Molanca foam project that was approved at the Seventh Meeting of the Executive Committee.
3. A new project proposal, UNEP/OzL.Pro/ExCom/8/20/Add.1, was submitted by the Government of Egypt following Fund Secretariat discussions with UNDP. The main differences between the original proposal and the new proposal are that it appears that a different technology is being requested based on the type of equipment requested; and, the costs of substitute substances are different.
4. While the original proposal indicates that existing equipment will be retrofitted, the new proposal only describes new equipment.
5. The price of the substitute substance, butane, differed by almost \$0.90/Kg. Both price quotations were substantially higher than local prices.

6. While a technical review (Annex V) was submitted for the first document, no technical review was received for the second project document.

SECRETARIAT'S RECOMMENDATIONS

7. Due to the incompatibility of the proposals submitted for this project, the Fund Secretariat recommends that consideration of this project should be deferred pending the preparation of a firm proposal.

PROJECT EVALUATION SHEET

COUNTRY OR REGION: Egypt

PROJECT TITLE: Phasing-out CFCs in Refrigeration at Koldair

BUDGET: US \$ 272,000 - Fixed Project Costs
US \$1,548,000 - Annual Operational Costs for Four Years
(US \$387,000 per year)
US \$1,820,000 - Total Request

INCREMENTAL COSTS: Not determined

COST EFFECTIVENESS: Not determined

PROJECT DURATION: Four-year construction phase; 10-year project life.

IMPLEMENTING AGENCY: UNDP

NATIONAL COORDINATING AGENCY: Egyptian Environment Affairs Agency (EEAA)

TECHNICAL REVIEW COMPLETED: YES ☐ NO ☒

SECRETARIAT'S COMMENTS

1. A technical review was not provided for this project.
2. The project will result in an estimated average annual phase-out of 18 tonnes of CFC-12.
3. An incremental operational cost analysis was not provided.
4. Over 50 percent of the fixed project costs requested concern the CFC-12 reclamation station (US \$145,000). At its Seventh Meeting, the Executive Committee approved US \$65,000 for the "recovery and recycling of CFC-12 from domestic refrigerators being serviced or rebuilt at a refrigerator production plant" in Turkey. The Koldair reclamation station would provide "CFC reductions in both the manufacturing and the maintenance operations." The additional costs for the Koldair CFC-12 recycling programme were not explained.
5. The reclamation station can only recycle CFC-12. Additional stations would be required for recycling HFC-134a and HCFC-22.
6. A US \$21,000 training programme is included in the request.

7. The balance of the fixed cost request concerns the conversion of a 17 gallon per hour water cooler manufacturing process from CFC-12 to HCFC-22 and the conversion of a 9 gallon per hour water cooler manufacturing process from CFC-12 to HFC-134a. The total fixed costs requested for these activities are US \$106,200.

8. Although HCFC-22 is a proven and well-established compressor, no information was provided to verify the environmental and technical soundness of the HFC-134a compressors. Since costs for the HCFC-22 and HFC-134a components are not disaggregated, an allocation for the HCFC-22 compressor conversion was not possible.

9. The document does not discuss the purchase arrangements with the supplier of HCFC-22 and HFC-134a compressors and, whether or not, a licensing agreement would be included.

SECRETARIAT'S RECOMMENDATIONS

10. Since the CFC-12 reclamation station costs more than twice as much as a recycling and recovery project already approved for Turkey, the cost differential should be explained before it can be considered for funding.

11. Without an incremental operational cost analysis, operational costs cannot be considered for funding.

12. Since a technical review was not prepared for the project, capital costs for HFC-134a cannot be considered for funding.

13. Based on these considerations, consideration of this project should be deferred until such time as these remaining issues can be resolved.

ANNEX I

ADRIAN M. ROWAN, P.E.
Engineering Consultant
Refrigeration

238 Park Forest Boulevard
Englewood, Florida 34223
(813) 475-8244

178 Sunrise Lake Road
R.F.D. #1 Orwell, VT 05760
(802) 537-4623

Please note my current FAX number is 813-475-3993.

Date: February 1, 1992

To: Dr. O.E. El-Arini
Chief Officer
Interim Multilateral Fund For The
Implementation of The Montreal Protocol

From: Adrian M. Rowan P.E.
Engineering Consultant

Subject: Egypt's Proposal for Conversion of
Refrigeration Compressors.

Reference: " Conversion of Refrigerating Compressors To
HFC-134a By MISR Compressors Manufacturing
Co. (MCMC)"

Dear Dr. El-Arini:

Per your request I have reviewed the subject document
and my comments follow:

1. As you have observed this project write up is
based in a large part on the document " EGYPT- COUNTRY
PROGRAM FOR PHASEOUT OF OZONE DEPLETING SUBSTANCES,
November 1991" with some expansion , modifications and
additions.

2. Project Financing

Under E.3. OWNERSHIP it is interesting to note the
diversity of ownership in this company. The presence of
Philips N.V. which is now owned by Whirlpool, USA as a
part owner will provide a flow path for technical
assistance that will encompass both European and North
American know how ,not only in the use of CFC-12 in
compressors but also the technology relating to 134a as
it comes on line in the developed countries.

It was my understanding that the participation of
the International Finance Corporation (IFC) was
solicited in order to complete the base project of
manufacturing compressors utilizing CFC-12 and was not
related to the switch to alternate refrigerants.

3. Technology

3.1 In F. TECHNOLOGY OF THE PROJECT , the various design modifications required to change CFC-12 compressors to 134a are discussed. Due to the thermodynamic differences in the two refrigerants the 134a compressor will need a slightly larger displacement in order to obtain the equivalent refrigeration effect (capacity). In a reciprocating compressor, of the type that will be produced by MCMC, displacement is the volume between the top of the piston travel and the bottom of the piston travel .This is why in F. 2 (1) a. they refer to a "bigger stroke" and the changes that make this happen. MCMC plans to make 7 different capacities of compressors to cover the needs of their customers. This means they will have 7 different displacements in their CFC-12 compressor line. If we identify these capacities as 1 through 7 with one being the smallest capacity and 7 being the largest capacity , then when MCMC shifts to 134a they can use the basic compressor mechanism of their number 2 CFC-12 design for their smallest capacity 134a compressor and so on up the line of capacities until they reach the number 7 capacity where they may have to make a change to the crank throw and piston wrist pin location to obtain the desired highest capacity . This approach will not result in identical capacities to their previous CFC-12 line but will provide an entirely adequate range of capacities for their customers needs.

3.2 The nature of 134a is such that for the same evaporator temperature on the cooling side of the system and the same temperature of the condenser on the hot side of the system the compressor compression ratio is higher than with CFC-12. The suction pressure is lower and the discharge pressure is higher. This situation focuses attention on the cylinder clearance volume or "dead volume". This volume is that remaining between the top of the piston and the bottom of the valve plate which closes off the top of the cylinder when the piston is in the uppermost position in its stroke and includes valve port openings. The high pressure gas remaining in this volume when the piston starts its downward travel has to re-expand to below the suction pressure before any new gas can be drawn into the cylinder thus it is highly desirable to minimize this volume regardless of what refrigerant is being used. As indicated in the proposal ,thinning the valve plate and reducing the exhaust port size wouldimprove this situation. It is my opinion that in the continuing thrust for higher efficiencies these steps may well have already been taken on the CFC-12 models.

3.3 As indicated the electrical motor output will have to adjusted to match the compressor using 134a in order to maintain efficiency and the winding wire insulation will have to be modified to be compatible with the new refrigerant.

4. Equipment List

As indicated in the country program the switch to 134a presents a major challenge to compressor manufacturers and must be supported by adequate product and material evaluation and testing. Thus the need for test facilities and equipment listed in the proposal. As the two different refrigerants and two different oils can not be interchanged in the same test apparatus, some of the equipment on the list will be near duplicates of that used for CFC-12. Compressor calorimeters are an example of this situation.

4.1 The noise test category in this proposal has been increased from that shown in the Country Program. Due to the higher compressor head pressure inherent with the use of 134a the industry does have a concern about increased noise emission from the compressor, thus if MCMC 's planned basic noise testing facilities were inadequate this increase in expenditure may be appropriate.

4.2 Also the seperate oil plant for polyester oil is necessary because the polyester oil use with 134a and mineral oil used with CFC-12 must not be mixed and MCMC will be using both at the same time.

4.3 The washing machine for incoming steel parts can not be considered an incremental cost associated with 134a. The point is made that the interior of the compresor must be free of all foreign material in order to reduce the risk of plugging the small bore capillary tube which is used as the expansion control device on most refrigeration systems. This is certainly true but it is the same requirement with CFC-12 as with 134a.

4.4 The washing machine for rubber parts is an unusual request because there are no rubber parts inside the compressor.

4.5 While the suggested retooling and gauging expenditures may be overstated for the specific purposes mentioned in the list the total amount does not seem unreasonable for the required design changes. For example there will be some tooling and gauging required for the electric motor changes.

5. Personnel requirements

There is an arithmetic error in the Country Program at the bottom of page A2-5 . The \$687,000 should be \$684,00. The Egypt proposal is correct.

6. Technology Transfer Expenses

Under Technology Transfer Expenses there is an item for 7 compressors at \$15,000 each which I do not understand. It sounds like they plan to produce some hand made prototype compressors or have them made for them. They have a good point in that there will be expenses involved in assembling prototypes for the various tests and they may well spend \$105,000 in this area. If they are in a position to start testing before their own production facilities are capable of supplying parts, they should be able to obtain compressors, motors and parts from Whirlpool Italia at nominal costs. They will need many more than 7 compressors to complete their evaluation program.

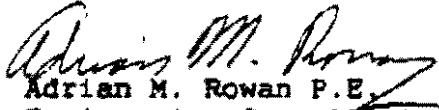
6.1 Although the funds may not be expended exactly as delineated in the project proposal , I believe the total for Technology Transfer is appropriate and reasonable.

Comment on alternative refrigerants:

HFC-134a and its associated polyester oils continue to be the alternative refrigerant to CFC-12 that the refrigeration industry throughout the world is committing their resources to develop. Mercedes is in production with HFC-134a in their automobile air conditioning systems and household refrigerator and freezer compressors designed for the use of HFC-134a are currently available from such diverse companies as Panasonic in Japan and Danfoss in Denmark. Environmental interests are attempting to promote HFC-152a as it has a slightly better Greenhouse Effect and may have a slightly improve efficiency over HFC-134a, although the ozone depletion effect is equivalent. HFC-152a has a flammability problem which keeps it from any serious consideration by the refrigeration industry. The consortium made up of North American appliance manufactures and the U.S. Departments of Energy and Environment is attempting to mount calorimeter tests on HFC-152a to determine its efficiency in refrigeration systems, however they are having difficulty in establishing a test site that is equipped to handle the flammability hazard.

The so called " drop in " refrigerants such as the ternary blends patented by Dupont are not being given serious attention by the refrigeration industry. It is possible that blends may have a role latter on when refrigeration systems utilizing CFC-12 need servicing and CFC-12 is no longer available.

Sincerely yours,


Adrian M. Rowan P.E.
Engineering Consultant
238 Park Forest Blvd.
Englewood, FL 34223

Ph. 813-475-8244
FAX 813-475-3993

ANNEX II

RAPPA INC.	TELEFAX
104 Fieldstone Drive LaPorte IN 46350 Ph : (219) 362 4450 Fax: (219) 326 6047	Date : October 9, 1992 Pages: 2 From : Bert Veenendaal To : UNDP Att : Mr. Frank Pinto
Subject: MISR Foam Project	

RECEIVED
OCT 10 1992

I have reviewed the information provided as part of the project to phase out the use of CFCs at MISR Foam Co.

This information is composed of:

- o The original project as formulated with the help of UNDP,
- o Proposed modifications from a review by the Worldbank,
- o Information on incremental operational costs, submitted in a later stage by MISR Foam Co.

The Worldbank proposed to increase the original project costs by \$ 100,000, based on perceived higher need of safety features and training. We have agreed to this, and increased the proposed budget accordingly.

MISR Foam Co. submitted information stating higher incremental operational costs related to higher formulation costs. We disagree with the submitted information, and have not included it in the cost considerations. The company bases its conclusions on not fully matured formulations. It is commonly known in the industry and stated in the literature, that the use of Methylene Chloride (MC), once a company has fully mastered the technology, has not to be more expensive than CFC-11. The project proposal reflects this. In addition, the proposal includes a visit of a UNDP consultant to assist in the fine tuning of formulations and the resolution of any remaining processing problems.

The choice of technology is supported, provided the implementation of sufficient safety features and training, as proposed in the project. The technology is mature, and, for instance, currently used by more than 70 % of the manufacturers in the USA and Canada. While the indoor and outdoor emissions are expected to comply with current Egyptian standards, the design is such that the more stringent workplace conditions could be met, and that potential future need to capture emissions will be facilitated through a centralized process exhaust.

The calculation of the effect on operational costs is

complicated by the current rapid--artificial-- price increases for CFCs. Before this development, it was thought in the USA, that the use of MC was competitive to CFC-11. Lower costs of MC were offset by a higher need of catalysts and a somewhat lower yield factor. Some companies claim a lower use of MC, and therefore even net savings, but this is not generally accepted. The fact that traditionally the US market was about equally shared by both compounds, indicates comparable operational costs.

The project allows for \$ 22,000 in incremental operational costs, that are not material related. These costs will cover ongoing medical screening, safety and emergency response training, and operation/maintenance of the equipment. We feel these costs to be reasonable, as the plant does currently not have these procedures in place.

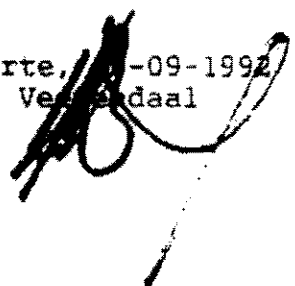
MISR Foam has already converted to MC, but underestimated the required changes in processing, formulating and safety provisions. For this reason, this project concentrates on the correction of the plant safety conditions and on process and safety training. In addition, it will pay for reasonable start-up costs. MISR Foam might have experienced higher costs, as was stated to us, but these are related to the particular way that the company elected to pursue the CFC phase-out, and should not be reimbursed.

The company should however be commended for its initiative, and its responsive attitude.

There are no current standards available as to what a conversion as proposed should cost. Estimates, prepared for the USEPA in 1987 indicate about \$ 190,000 for ventilation retrofitting in situations comparable to MISR Foam. This project requires \$ 130,000 for the same purpose, and appears so with reasonable. Costs for safety and training are however higher than average. This is related to the current level of safety awareness in this plant. Overall, the costs seem reasonable to favorable compared to similar projects performed by the undersigned in the last four years (\$ 500,000- 800,000).

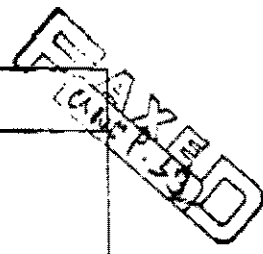
We propose to approve the investment part of the project as proposed. We do not feel competent to make a recommendation on incremental operational costs. Guidelines on a base line for raw material prices are needed. A baseline of 1988 would result in 22,000/year. A base line of 1991 or 1992 would almost certainly result in operational savings.

LaPorte, -09-1992
Bert Verdaal



ANNEX III

RAPPA Inc.	TELEFAX
104 Fieldstone Drive LaPorte IN 46350 Ph : (219) 362 4450 Fax: (219) 326 6047	Date : October 9, 1992 Pages: 1 From : Bert Veenendaal To : UNDP Att : Mr. Frank Pinto
Subject: Taki Vita Project	



I have reviewed the information provided for the project to phase out the use of CFCs in the production of molded polyurethane foams at Taki-Vita Co.

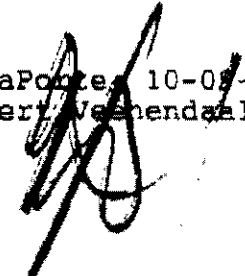
The phased approach, elected in this project, is considered the most feasible in this case. It allows an immediate phase-out of 75% of the current CFC use after installation of high pressure equipment. Phase-out of the remaining 25% is not limited by technology, but by the approval process of Taki-Vita's customers. These customers--mainly automotive industry--require extensive prototyping and testing prior to product approval.

The approach is discussed with, and agreed upon by Taki's current supplier, ICI.

The equipment costs are indicative prices from one equipment manufacturer, and will have to be confirmed in writing and through competitive bids.

The higher material costs are confirmed by ICI, but will need close monitoring during the project duration. It is not unusual that initial higher costs normalize after a certain period, based on competitive pressure and production scale-up.

LaPorte, 10-09-1992
Bert Veenendaal



ANNEX IV

FAXED
OCT 10 1992

RAPPA Inc.	TELEFAX
104 Fieldstone Drive LaPorte IN 46350 Ph : (219) 362 4450 Fax: (219) 326 6047	Date : October 9, 1992 Pages: 1 From : Bert Veenendaal To : UNDP Att : Mr. Frank Pinto
Subject: Technopol Project	

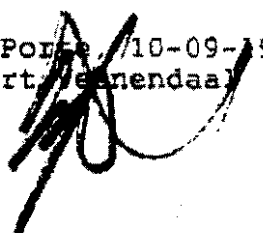
I have reviewed the project to phase out the use of CFCs in the production of molded polyurethane foams at Technopol Egypt SAE.

I am in agreement with the chosen strategy, which is coordinated with and supported by the dominant supplier of polyurethane systems in Egypt, and Technopol's current supplier, ICI. This support is crucial because of the complexity and variety of the products manufactured by Technopol.

The project includes some on site testing equipment. This is needed, because of the multitude of testing that Technopol has to perform to achieve approvals for reformulated products. Out of house testing would be counter productive.

I expect that the project will result in higher raw material costs for Technopol. These are, however, very difficult to calculate due to the variety of products and potential technologies. Technopol has agreed not to apply for incremental material costs. This benefits the cost effectiveness, that is naturally not very good for this capital intensive type of production.

LaPorte, 10-09-1992
Bert Veenendaal



ANNEX V

RAPPA Inc.	TELEFAX
104 Fieldstone Drive LaPorte IN 46350 Ph : (219) 362 4450 Fax: (219) 326 6047	Date : October 9, 1992 Pages: 2 From : Bert Veenendaal To : UNDP Att : Mr. Frank Pinto
Subject: Al Sharif Project	

RECEIVED
OCT 13 1992

I have reviewed the information provided for the project to phase out the use of CFC-12 in the production of extruded polystyrene (XPS) and polyethylene (XPE) at Al Sharif Plastic Factories.

The technology selected is acceptable and mature. Because of the explosive nature of hydrocarbons, extensive safety features are necessary. The project provides these, in my opinion, sufficiently.

For a better understanding it may be useful to regroup the project costs as follows (000 \$):

ACTION	GENERAL	XPS	XPE	AUX.
1) Selection of contractor	30			
2) Site inspection	30			
3) Implementation				
3.1 XPS		250		
3.2 XPE			400	
3.3 Building	200			
3.4 General safety	300			
3.5 Installation	30	30	30	
3.6 Spare Parts	15	20	20	
4) Laboratory & Monitoring	50			150
5) Technology/Training				
5.1 Technology		100	100	
5.2 Training	30			
TOTAL	685	400	550	150
GRAND TOTAL	1,785			

The breakdown is admittedly somewhat arbitrarily, but provides a good indication of the costs per segment.

For instance, just installing XPS would induce the general and the XPS-specific costs (\$ 1,085,000). This, again, can be compared with the estimated costs for such a conversion

in the 1991 "Montreal Protocol Technology Assessment" (\$ 1,000,000). This comparison shows the Al Sharif project to be in an acceptable--but upper-- range of the industry standard. The solicitation of additional bids, as foreseen in the project, is expected to bring the project closer to the mentioned standard.

Al Sharif has the capability to produce XPE and XPS, but produces currently only XPS. The company claims to need the XPE capability for the future, enabling the choice of the most economic and suitable resin in any situation. This claim could not be verified, but is in view of the competitiveness of the industry, credible.

Al Sharif also claims the need to have in-house capabilities for product testing. It is true, that the new products will have to be tested on physical properties and acceptability for their purpose (mostly food related). The argument can, however, be made that initial product testing could be farmed out, or included in the technology transfer. Continuous quality control would be desirable, but is not directly related to this project. In summary, we support the need of laboratory equipment, but feel that the benefits go beyond this project.

Ongoing incremental costs can be divided in direct production costs (material) and indirect production costs (operation of safety devices, ongoing safety training, maintenance). The latter are estimated to be \$ 90,000/y. From this amount, about 65,000, or 5% of the equipment value, is related to maintenance. This is lower than standard (7-10%), but takes into account that only incremental costs should be listed, i.o.w., existing maintenance costs have to be subtracted. Material costs will, as indicated in the project, provide costs savings. For an precise calculation, the following additional information is needed:

- c A base year for material costs.

- c A verified price level for butane.

It is proposed to approve the project under exclusion of the laboratory equipment (\$ 1,635,000).

It is further proposed to withhold \$ 635,000 from this amount until information is available that allows proper calculation of the incremental material costs.

LaPorte 10-09-1992
Bert Mandaak