



**United Nations
Environment
Programme**



Distr.
Limited

UNEP/OzL.Pro/ExCom/31/17
7 June 2000

ORIGINAL: ENGLISH

EXECUTIVE COMMITTEE OF
THE MULTILATERAL FUND FOR THE
IMPLEMENTATION OF THE MONTREAL PROTOCOL
Thirty-first Meeting
Geneva, 5-7 July 2000

DESK STUDY ON COMPRESSOR PROJECTS

I Background

1. As foreseen in the 2000 Monitoring and Evaluation Work Programme, a desk study has been prepared by a consultant on domestic and commercial refrigeration compressor and MAC compressor projects. This study is available on request and will be placed on the web site of the Multilateral Fund Secretariat.

2. A brief overview of compressor projects from the beginning of the Fund's operations until the end of 1999 is followed by a presentation of the main evaluation issues and an outline of the evaluation methodology to be used in the main phase of the evaluation.

II Overview of the compressor sector

3. Since the beginning of the Fund's operations until the end of 1999, 49 compressor projects were approved, 71% of the projects are implemented by the World Bank, 8% by UNDP and 18% by UNIDO which started relatively late. There is only one bilateral project in this sector approved as at the end of 1999 (Japan). Total funding approved for these projects amounted to US \$71,889,805 with peaks in the years 1995 and 1997. This represents 9% of the total funding approved for investment projects until the end of 1999. The largest number of projects has been approved for domestic & commercial refrigeration compressor projects (46 or 94%) followed by MAC compressor projects (3 or 6%).

4. 26 projects or 53% of the approved projects were completed by the end of 1999, of these projects 17 were completed by the World Bank, 3 by UNDP, and 6 by UNIDO. Total expenditure for the 16 projects for which PCRs were received by the Secretariat (including counterpart funding whose purpose is not specified in the PCRs) amounted to US \$22,855,439, 15% more than the approved funding of US \$19,791,774. Expenditures for incremental capital costs were US \$21,747,204 (an increase of 25% over the US \$17,404,732 approved, including non-documented counterpart funding). On an exceptional basis, incremental operating costs were financed for two compressor projects in Thailand (THA/REF/20/INV/58 and 60) before the 22nd Meeting of the Executive Committee decided that "Incremental Operating Costs will no longer be considered for compressor manufacturers" (Decision 22/26, para 44).

Table 1: COMPRESSOR PROJECTS BY REGION
(According to 1999 Progress Reports)

Agency	Africa		Asia and the Pacific		Latin America and the Caribbean		Total		Number of PCRs Received
	Approved	Completed	Approved	Completed	Approved	Completed	Approved	Completed	
IBRD	1	1	32	15	2	1	35	17	11
UNDP	0	0	0	0	4	3	4	3	1
UNIDO	0	0	8	5	1	1	9	6	4
Japan	0	0	1	0	0	0	1	0	0
Total	1	1	41	20	7	5	49	26	16

5. In terms of geographical distribution, the World Bank focused on the larger countries mainly in Asia (15 completed projects), followed by Latin America (1 project) and Africa (1 project). UNDP completed three projects in Latin America and UNIDO completed five in Asia and one in Latin America.

6. In terms of funds approved per project, five of 26 completed compressor projects had funding levels between US \$1,000,000-\$2,000,000, while seven projects had a level of funding of more than US \$2,000,000 each. The other projects were budgeted between US \$100,000-\$1,000,000. The World Bank, followed by UNIDO, had a relatively larger portion of large-scale projects.

7. Only a minority of compressor sector projects were implemented within the project duration planned, while substantial delays occurred for the majority. This is particularly true for early projects, which concerned the World Bank more than the other agencies. According to the 16 PCRs received, three projects were completed ahead of schedule, two on time, two with up to six-month delays, five with seven to twelve-month delays, two with 13-24 month delays, and two more with delays of 25 months or more. The projects completed in 1999 for which no PCRs were received so far show a similar pattern according to the 1999 Progress Reports.

III Quality of project documentation

8. The consultant made a review of the quality of the project documents (project description/project cover sheet and project completion report). Quality means completeness and consistency of information, appropriateness of the format used and quality of technical argumentation.

9. The PCRs do not always give complete information, particularly in terms of production data before and after conversion, details of equipment and operational costs, reasons for implementation delays and information about the disposal and/or destruction of equipment.

10. As main weaknesses of the documents, the consultant indicated incomplete information about production volume in the different years and, in general, a too optimistic forecast for production in the future, as well as usually incorrect, i.e. too high indirect ODS phase-out values which, in order to avoid double-counting with the ODS phase-out of the refrigeration industry, are no longer calculated, however, except for the phase-out plan for the commercial refrigeration sector in China.

11. Table 1 in Annex I shows the ranking of project documents quality by the consultant for each project reviewed. The consultant observed a difference in the quality of documentation between the agencies and for earlier and later projects. While projects approved until the end of 1993 of which the World Bank has a large share, are generally less well documented, weaknesses in PCRs do not exclusively concern earlier projects.

12. The reviewer found it difficult to follow the history of the projects regarding reasons for changed or reduced funding, and proposed that the documents could be more explicit in this respect. He also proposed that detailed argumentation should be included in the project

documents/project cover sheet, stating why funding is claimed for the replacement of standard equipment that, in principle, could be used for manufacturing CFC-free compressors as well.

IV Overall assessment of projects

13. The consultant's ranking of the overall assessment of projects differs to some extent from the one provided by the Implementing Agencies in the PCRs completed by them. Thus, based on a score from 5 to 1 points (highly satisfactory 5 points / unacceptable 1 point), the result would be:

PCRs	Total Points 59	Average 3,69
Evaluator	Total Points 50	Average 3,12

14. Out of the 16 projects with existing PCRs the ranking by the consultant was:

One class better	0
One class worse	9
Confirmed	7
Total	16

15. The most important indicator used was the difference between planned and actual achieved results, e.g. speed of completion but also by the judgement of the phase out process itself (costs, ODS phase out, validity of technical argumentation etc.).

V Lessons learnt presented in the PCRs

16. The World Bank provided the following lessons it learnt from completing three projects in China:

- (a) "The process of implementing an ODS project involves many domestic and international units and passes through many procedures & involves many tasks such as appraisal, disbursement, equipment bidding & procurement, installation, trial production, commissioning and so on. A powerful and creative leader is necessary. A stable, cooperative, active, and united lead team steered by capable individuals is the key factor to successful project implementation.
- (b) A local environment evaluation report and a guarantee letter of local funding capability should be prepared early and the support in this respect should be obtained from local relevant authorities to avoid delay in project implementation. Because of fierce market competition, the project should be finished and put into production as early as possible. The company should lower its production cost, ensure product quality, and extend the market, to ensure that the estimated objective can be achieved.
- (c) With such a small amount of technology transfer allocation, beneficiaries are unable to get the best provider of technology, but can only attract the second or

third tier technology suppliers. In the long run, the advantages and the suitability of the technology acquired will decide the true success of the conversion project. Thus, it would be preferable to be able to acquire technology from the supplier with the most experience and best reputation in the sector.

- (d) The new lubricant for HFC-134a technology absorbs water leading to a continual problem with moisture. Both storage of the lubricant and the process require better handling procedures. In order to ensure this, special training is required.
- (e) There is an assumption from the Executive Committee that there is no incremental operating cost in the MAC sector. This project has proven that there is a significant incremental operating cost. The increased incremental operating cost is linked to the higher cost of lubricant and the higher production costs involved in producing more precise compressors."

17. For three projects in Thailand, the following lessons learnt were presented by the World Bank:

- (a) "The only problems encountered were a slight delay in testing and in acquiring a new source for supplies. At first, cooling capacity was reduced, EER was decreased and noise was increased. With the assistance of Sanyo Japan, these problems were quickly resolved.
- (b) Prior to initiating the project, it is important to ensure that the technology to be adopted must be congruent with the product standards of its client and suppliers (would prevent delays)."

18. UNIDO reported the following lessons from three projects implemented in China:

- (a) "It was difficult to find a contractor for the technology transfer, since there were only limited number of independent hermetic compressor manufacturers with experiences of HFC-134a compressors, who are willing to give access to their technologies at the level of funding approved. This would be an issue for future compressor projects under the Multilateral Fund Secretariat.
- (b) A number of compressors have to be re-designed as totally new. Calorimeter tests have been required to optimize the compressor's design and the size of the electric motor".

19. UNDP reported the following particular lessons learnt while implementing a project in Colombia:

- (a) "There was serious disagreement between the enterprises and the Government on the issue of taxation. Neither the companies nor the Government would sign the Hand-Over Protocols until the enterprises received assurances that they would not be liable for taxes on equipment purchased through Multilateral Fund grants. It took a long time for this to be resolved, including a high-level UNDP/UNOPS

visit to Colombia for meetings with the Environment and Finance Ministries. Governments should try hard to solve these issues before project implementation starts.

- (b) Following completion of the conversion activities, Compresores Andinos lost its major client (HACEB, a company in the same UNDP umbrella project). Compresores Andinos owners decided that they would not be able to replace this major client and that the company was therefore not profitable anymore. The company was therefore closed down. It shows that market forces can seriously impact the viability of an enterprise after conversion to non-ODS substances."

VI Main evaluation issues

20. The consultant reviewed 18 completed projects until the end of 1998 for which 16 project completion reports (PCRs) were available. The list of these projects showing their main features is provided in Annex I. Evaluation issues emerging from this analysis are the following:

- (a) Reliability of production figures before and after conversion and verification of the extent of continuing parallel production of CFC-12 compressors for servicing existing CFC-based refrigerators, but also for possibly producing new ones.
- (b) Appropriateness of the technology choice in the sense of providing a sustainable solution, i.e. little likelihood of returning to the previous ODS use, as well as offering a final solution in the sense of not requiring further conversion at a later time. Questions were particularly raised with regard to conversion to HCFC-22, which was the preferred solution in the Chinese commercial refrigeration sector. The other issue is the predominant conversion to HFC-134a, while in only one completed project, conversion to hydrocarbon compressors has been chosen. Later, the Executive Committee approved three more compressor projects for conversion to hydrocarbon technology.
- (c) Eligibility of equipment required for conversion: there is no principal difference between the production and testing equipment needed for CFC-12 and HFC-134a compressors, except that for the production of the latter, the requirements for cleanliness are higher. If the equipment is largely identical, which part of the funded cost was necessary and hence eligible, supporting the phase-out process directly?
- (d) Related to this is the question of the sometimes high cost of equipment which is important to answer in view of the relatively large budgets for incremental capital costs.
- (e) Related to the eligibility question is the one of disposal and destruction of ODS based production equipment. If most of the equipment can be used for either ODS-based or non ODS-based production, the question of destruction of equipment and commitment of the compressor producer to reduce and later stop the production of CFC compressors needs particular answers.

- (f) Lessons to be learnt with regard to the most effective management approaches chosen for organizing the conversion project with a minimum of implementation delays.

VII Possible evaluation approach

21. A possible evaluation approach could be to organize visits to five or six projects in various countries, particularly China, by a competent technical expert, accompanied by the Senior Monitoring and Evaluation Officer and/or the responsible Project Officer in the Secretariat as well as a representative of the implementing agency, if possible.

22. Details of evaluation issues and methodology, the composition of the team, and the sample of countries and projects would be further developed, taking into account also outstanding PCRs to be received during the next months, if the Executive Committee considers such an evaluation as desirable in the context of discussions on the draft 2001 Monitoring and Evaluation Workplan, foreseen for the 32nd Meeting in November 2000.

Completed Overview of Compressor Projects
(According to data from 1999 Progress Report, Inventory, PCRs, and Consultant)

Code	Implementing Agency	Sector ¹	Pre Conversion	Post Conversion	Date Approved	Date Completed	Approved Funds US \$	Funds Disbursed US \$	PCR Received	Overall Project Assessment ² by		Quality of Project Documentation ³	
										Implementing Agency	Consultant	Project Document	PCR
BRA/REF/13/INV/15	UNIDO	D	R12	R134a	Jul-94	Jul-94	221,200	221,200	X	1	2	3	4
BRA/REF/17/INV/20	UNIDO	D/C/I/A C	R12 R502	R134A R404A	Jul-95	Dec-98	460,339	451,991	X	2	2	2	2
CPR/REF/13/INV/77	IBRD	D	R 12	R134a	Jul-94	May-97	1,280,000	1,280,000	X	3	3	3	2
CPR/REF/16/INV/110	IBRD	C/I	R12	R22	Mar-95	Sep-98	2,710,000	2,710,000	X	2	3	3	3
CPR/REF/16/INV/114	IBRD	C/I/AC	R12	R12	Mar-95	May-99	2,874,000	2,758,919	X	2	3	2	3
CPR/REF/17/INV/129	IBRD	MAC	R12	R134a	Jul-95	Jan-96	961,000	961,000	X	3	3	2/3	2
CPR/REF/19/INV/165	UNIDO	D	R12	R600a	May-96	Dec-98	899,030	462,234	X	3	3	1/2	2
CPR/REF/20/INV/185	UNIDO	D	R12	R134a	Oct-96	Oct-99	2,250,000	2,000,545	X	3	3	1	3
CPR/REF/22/INV/211	UNIDO	D	R12	R134a	May-97	Dec-98	962,175	962,175	X	1	1	1	1
COL/REF/13/INV/07	UNDP	D	R12	R134a	Jul-94	Oct-97	313,650	290,271	X	3	4	2	2
EGY/REF/08/INV/08	IBRD	D	R12	R134a	Oct-92	Jul-97	2,100,000	1,850,000	X	3	4	3/4	4
IND/REF/10/INV/09	IBRD	D	R12	R134a	Jun-93	Dec-97	364,551 ⁴	364,551	X	2	3	4	4
IND/REF/11/INV/12	IBRD	MAC	R12	R134a	Nov-93	Nov-98	1,710,000	1,375,607		N.A.	N.A.	4	N.A.
MEX/REF/15/INV/32	UNDP	D	R12	R134a	Dec-94	Nov-95	1,035,864	1,035,864		N.A.	N.A.	1/2	N.A.
THA/REF/10/INV/21	IBRD	D	R12	R134a	Jun-93	Jan-97	658,793	629,123	X	2	3	3	3
THA/REF/10/INV/22	IBRD	D	R12	R134a	Jun-93	Dec-95	600,370	579,790	X	2	3	3	4
THA/REF/20/INV/58	IBRD	D	R12	R134	Oct-96	Jan-97	647,025 ⁵	898,157	X	3	3	N.A.	3
THA/REF/20/INV/60	IBRD	D	R12	R134a	Oct-96	Jan-97	741,684	714,231	X	2	3	N.A.	3/4

1. Definition: D = Domestic, C = Commercial, I = Industrial, AC = Air Conditioning, MAC = Mobile Air Conditioning

2. Overall Assessment: 1 Exceptionally successful
2 Highly satisfactory
3 Satisfactory
4 Less satisfactory
5 Unsatisfactory

3. Quality assessed by the Consultant in terms of: Completeness and quality of information, appropriateness of the format used, technical argumentation, logical and correct
Ranking: 1 very best / 2 best / 3 fair / 4 still sufficient / 5 poor

4. US \$674,551 As Per Inventory

5. US \$927,025 As Per Inventory

N.A. = Not available