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REPORT ON THE DESK STUDY ON MAC PROJECTS

I. Background

1. As foreseen in the 2002 Monitoring and Evaluation Work Programme, a desk study has been prepared by a consultant on completed MAC and MAC compressor projects. MAC recovery and recycling projects were not dealt with, as they employ different technologies and implementation modalities. The present document summarizes the desk study.

2. A brief overview of MAC and MAC compressor projects from the beginning of the Fund's operations until today is followed by a presentation of main characteristics of the completed projects reviewed, the main findings of this review, evaluation issues identified and an outline of the evaluation approach to be used in the main phase of the evaluation. As usual, for desk studies, the findings are preliminary and need further analysis and corroboration during field visits and discussions with stakeholders concerned, primarily the companies and the World Bank as the only implementing agency (except for a small project in Iran, implemented by France).

II. Overview of the MAC and MAC Compressor sector

3. Since the beginning of the Fund's operations, 23 MAC and MAC Compressor projects were approved, all for converting from CFC-12 technology to HFC-134a based MAC systems and parts. Total funding approved for these projects amounted to US $41,310,465. This amount represents 4.4% of the total funding approved so far for all investment projects. The largest number of projects has been approved for MAC projects (20 or 87%) followed by MAC compressor projects (3 or 13 %). In 1999 and 2000 there were no projects approved, and the number of likely further requests for investment projects appears to be very limited.

Table 1: Projects Overview
(According to the Inventory)

	1993	1994	1995	1996	1997	1998	2001	Total
Number of Projects Approved	3	4	7	1	2	3	3	23
Total Funds Approved	9,230,000	4,580,658	10,579,507	1,468,797	1,435,734	10,198,412	3,817,357	41,310,465
Average Size of Projects Approved	3,076,667	1,145,165	1,511,358	1,468,797	717,867	3,399,471	1,272,452	1,796,107

4. 17 projects or 74% of the approved projects were completed by the end of 2000; all of these projects were completed by the World Bank. Five of the 17 completed MAC and Mac Compressor projects received funding of more than US $2,000,000, while six projects had a level of funding of between US $ one and two million. The remaining 6 projects had budgets of less than US $1 million.

5. In terms of geographical distribution, the majority of projects are in larger countries mainly in Asia, (14 approved and 11 completed) followed by Latin America (9 approved and 6 completed projects).

6. The product range of the enterprises varied: on one end of the spectrum some produced hose assemblies only and assembled components from other suppliers (Mirgor) while others produced more components, and in the case of one enterprise (AAISA) the complete system (compressors, heat exchangers, hoses, fittings, …. etc.) was produced. As a result, the complexity and scale of the projects varied significantly, which is consistent with the enterprises product range and volume.

7. Incremental operating cost were approved only for one early project in India (in November 1993; no details of costs items are provided in the project document and the PCR). In January 1995, an OORG meeting discussed and agreed that incremental operating cost would no longer be requested for MAC projects for companies who do not charge refrigerant to the MAC system, since those costs are borne by the car manufacturers. It was also agreed that some equipment, although related to the conversion, was not or only partly eligible and that the conversion implied regularly technological up-grading and product improvements to be funded by the companies.

8. At its 26th meeting, the Executive Committee approved US$7.7 Mio for a MAC sector phase-out plan in China. China "committed to meeting the target of 31 December 2001 for CFC phase-out in new MAC production" (Decision 26/29). The implementation is almost completed and the Government announced that from January 2002 all new cars have to install HCF-134a MAC with accreditation labels. However, remaining production of CFC-12 MAC systems is not necessarily excluded with this regulation, and the transition phase for servicing existing CFC-12 based MAC systems is planned to last until 2010.

9. As its 35th meeting, the Executive Committee approved National CFC phase out Plans for Malaysia (including an investment project in the MAC sector), Thailand, Turkey and the Bahamas, which include the elimination of the remaining CFC consumption in the MAC sector (mainly for servicing).

III. Main characteristics of the 12 Completed MAC Projects reviewed

10. The present review of project documents covered 12 completed MAC projects in 7 Article 5 countries for which Project Completion Reports (PCRs) were received so far (see Annex I for project overviews). All projects dealt with the conversion from CFC-12 (ODS) MAC technology to HFC-134a (ODS free) MAC technology. The enterprises involved in this conversion were producers/suppliers of A/C components to the original equipment manufacturers and MAC service market.

11. All enterprises faced certain challenges in their efforts to introduce ODS free technology. Factors contributing to challenges included:

(a) Economic and market conditions

(b) Know-how and level of experience

(c) Foreign ownership resulting in reduced funding

(d) Technical cooperation and licensing agreements

(e) Enterprise contribution to capital investment

(f) Availability of local materials

(g) Labor skills

(h) Administrative procedures

(i) Project management

(j) Suppliers selected based on lowest cost

(k) Changing technology

(l) Grant/sub-grant signature

12. Difficulties resulting from such challenges and the various ways the enterprises found to cope with them are further described in the sections below.

IV. Main findings

(a) Indirect ODS phase-out and sustainability of conversion

13. In all projects HFC-134a technology was implemented enabling car producers and workshops in the country to switch to non-ODS MAC-equipment thus realizing an indirect ODS phase-out. However, six enterprises are, in parallel to the production of MAC systems for HFC-134a, continuing to produce CFC-12 compatible systems and components in support of market demand. The quantities of CFC-12 MAC equipment produced vary but are generally limited and the demand is expected to be temporary in nature as new cars are by now in some countries fully and in others more and more equipped with HFC-134a MAC systems. In addition, there is a continuing demand for servicing existing CFC-based MAC systems. Complete phase-out is planned for the next few years in most cases where it has not been achieved yet, however, for Subros Ltd. and AAISA the plans are not clear.

14. The actual situation and the plans to achieve 100% phase out should be confirmed by field visits at the following sites:

(a) Interclima, Argentina: several CFC-12 condenser equipment was reallocated to evaporator production. Confirm that this equipment is not being utilized to produce CFC-12 condensers.

(b) Subros Ltd., India: while the conversion is completed for export products, CFC-12 MAC production is continuing for the domestic market. Phase out timing is not provided in project document nor PCR.

(c) Nippondenso Capital SDN BHD, Malaysia: CFC-12 MAC production capability was still in production, 100% phase-out was planned for 2000, needs to be confirmed.

(d) Nippondenso Thailand, Thailand: CFC-12 MAC equipment still used; 100% phase-out is expected in 2005, which needs to be confirmed.

(e) AAISA, Venezuela: CFC-12 MAC production capability is not clear, needs to be confirmed.

(f) FAACA, Venezuela: CFC-12 MAC equipment still used; 100% phase-out is expected in 2002, which needs to be confirmed.

(b) Technology choice

15. Technology selected, generally, was appropriate to allow to switch successfully to the production of non-ODS MAC systems and parts. However, it was not always the best choice in terms of cooling performance/capability. The Multi-Flow condenser cooling performance is much better than the serpentine condenser thus allowing to use smaller and lighter condensers which fit better in smaller, more economic cars.

16. The project results indicate that companies who had the benefit of a license or technical cooperation agreement and used a consultant implemented their respective projects smoother than others. Examples are: Subros managed with the help of Nippondenso to overcome difficulties for the conversion of its export products, without running into delays or cost overruns; it started ODS MAC free production for export products in 1995. Climas de Mexico with the help of a consultant succeeded to implement the project on time (only one month delay) in spite of difficulties in integrating equipment from two different suppliers.

17. Some concern exists relative to the choices made by certain enterprises:

(a) Ek Chor, China: Chose to redesign their 5-piston compressor while Haohua, also in China, selected a larger displacement 7- piston compressor technology from Sanden, Japan. In order to meet the cooling capacity requirement Ek Chor will have to use a larger condenser from Shanghai Automobile Air Conditioning (SAAC) which also converted with financial assistance from the Multilateral Fund. In time, this could put Ek Chor at a technological disadvantage and to stay competitive would require additional investment in a new and larger compressor than their current 5- piston compressor.

(b) AAISA, Venezuela: Serpentine condenser technology was selected by the company; while this is an improvement compared to the baseline technology, it is not the accepted technology for HFC-134a. In order to meet the capacity of the multi-flow condenser a larger serpentine condenser would be required. In time, this could put AAISA at a distinct disadvantage requiring additional capital to produce a newer condenser technology.

(c) SAAC, China: spent time and money evaluating serpentine condenser fin density and found out that they have to use the multi flow condenser, which could have been known in advance.

18. While taking into account that during the mid-1990ies the knowledge of ODS-free technologies was not the same as today, field visits might assess whether sufficient technical assistance was made available to the companies to ensure that the most appropriate technology

was selected, that advantageous technology transfer or license agreements were established, and that the bidding documents contained all the necessary equipment specifications.

(c) Implementation delays

19. Only a few MAC and MAC Compressor projects were implemented within the project duration planned, while substantial delays occurred for the others. According to the 12 PCRs received, two projects were completed ahead of schedule, one with up to six-month delays, two with seven to twelve-month delays, three with 13-24 month delays, and four with delays of 25 months or more. Delays resulted from the late signature of some Governments of grant agreements, which are required as framework for all World Bank projects. Some delays occurred also in signing sub-grant agreements between the company and the financial intermediary, partly because of difficulties of companies to raise the required counterpart funding. Other issues were:

(a) Difficulties to define and to agree upon equipment specifications

(b) Long process to identify reliable local suppliers and other negotiations with suppliers

(c) Protracted negotiations with local governments

(d) Licensing issues

(e) Internal company management

(f) Administrative/procedural problems

20. Most enterprises started their conversion efforts prior to sub-grant signature; this pro-active approach contributed significantly to limiting the delays. In all cases, ODS free production for new MAC equipment started in time to meet market demand of car manufacturers.

(d) Cost/budget

21. Total expenditure reported for the 12 projects for which PCRs were received by the Secretariat amounted to US $35,683,444, 59% more than the approved funding of US $22,489,073. This includes high reported cost for incremental operating costs in some projects in China which were approved in 1995 but without funding for incremental operating cost. Expenditures for incremental capital costs were US $27,084,909, 33% more than US $20,323,053 approved, including large amounts of more or less specified counterpart funding.

22. While in the majority of projects incremental capital costs were kept within budgets approved, in several cases, actual costs were above budget; in all cases, the enterprises absorbed the additional costs. The increases in incremental capital costs were due to various reasons including:

(a) Lack of exact knowledge of equipment required

(b) Replacement/rework of equipment that did not function as desired

(c) Under-estimating the requirements

23. In most cases the increase in incremental capital cost could be attributed to the enterprise lack of knowledge and experience, which could have been avoided with appropriate technical cooperation agreements and/or the hiring of a knowledgeable consultant. In other cases, it might have been the desire of the enterprise to upgrade its capacities.

(e) Fate of Old Equipment

24. While satisfactory evidence of the fate of old equipment was provided for the majority of projects reviewed, several PCR's lacked appropriate evidence and/or the issue was not addressed. In some of these cases, production of CFC-based MAC systems was foreseen for a transitional period beyond financial completion of the project and submission of the completion report. In these cases, the NOUs should verify that the transition period is not extended and to assure that the old equipment is destroyed or disposed of. Further information is required for the following projects:

(a) Mirgor, Argentina; not addressed (indicates "not required")

(b) Subros, India; Phase two needs to be specified.

(c) Nippondenso Capital SDN BHD, Malaysia; old equipment still used in production in 1999, was supposed to stop in 2000.

(d) Nippondenso, Thailand; still used in production according to PCR, plan to stop in 2005.

(e) AAISA, Venezuela; not addressed, unknown status.

25. In cases, where old equipment can still be used for several years, either for CFC-based MAC systems or ODS-free production, its value could reduce funding for incremental capital cost. This was applied in cases where the value of such equipment was considered to be significant. In other cases, like for Nippondenso Thailand, it was agreed not to reduce project funding by the remaining value of the old equipment, which was to continue to produce CFC-12 spare parts. This decision was based on the low book value of the equipment. This may seem a reasonable approach; however, accounting practices from one company to the other or one country to the other may differ, thus rendering the book value difficult to establish and to compare. Another way of handling this issue is to figure out the likely lifetime of the equipment and depreciate its value accordingly. If the enterprise chooses to keep the old equipment in production, then the project funding should be reduced by an equivalent amount.

(f) Quality and completeness of project documentation

26. The consultant found that documents for the majority of projects were relatively easy to follow and made it possible to understand what was done. Such easy understanding though requires good knowledge of the MAC sector. Information that was not clear or not addressed is covered in above sections, for example with regard to production figures for HFC-134a and CFC-12 products and the dates for final phase-out as well as regarding equipment destruction.

27. Unfortunately, for five completed projects, the PCRs are not yet submitted by the World Bank, reportedly due to difficulties of the financial intermediaries to collect all relevant data from the beneficiary enterprises.

(g) Additional remarks

28. The following considerations are preliminary and need further corroboration through discussions with NOUs, companies and the World Bank:

(a) HFC-134a MAC technology is changing rapidly in an effort to enhance performance and to reduce weight and size to meet ever-increasing market and regulatory requirements. The question is how to draw a clear line between investments required for the conversion and those made for modernization and changing requirements of car manufacturers.

(b) The level of capability/know-how and resources vary from company to company and country-to-country. While the technology for conversion might be in the public domain, certain enterprises did not seem to fully anticipate the complexity of its implementation. The basic technology may be available but know how and experience are not.

(c) Some companies sought professional advice and included costs for consultants and/or licensing agreements in their proposal, others did not, resulting in some cases in difficulties and implementation delays. This could have been avoided had the project design been better tailored to the specific situation, technical capability and approach of the beneficiary company. To do so, there might be a need for additional technical advice for some of the enterprises during preparation and implementation of conversion projects.

(d) Difficulties were indicated by some companies in following/understanding World Bank procedures and requirements. Conducting a training seminar, on site, for key individuals of the enterprise (early in the process) might eliminate the majority if not all associated issues.

V. Main evaluation issues

29. The following list contains the main issues requiring clarification after the desk review:

(a) How to assure a smooth but definite ODS phase-out when the market still demands CFC-12 compressors and parts, first for new cars and then also for servicing old ones?

(b) Check production figures before and after conversion and verify the extent of continuing parallel production of CFC-12 MAC systems for installation into new cars and for servicing existing CFC-based MAC systems.

(c) What policy regulations and controls have to be in place to ensure that (i) no more CFC-MAC systems are allowed to be installed in new cars and that (ii) old cars are gradually being retrofitted for the use of HFC-134a MAC systems or effectively serviced through R&R schemes thus avoiding ODS emissions to the maximum extent possible?

(d) How successful has been the implementation of the MAC sector plan in China which incorporated commitments to introduce policies for final CFC phase-out in the sector?

(e) Were incremental capital costs appropriately determined, taking into account deductions for technological up-grading and product improvement?

(f) What are the lessons learnt with regard to the best forms of technology transfers (license agreements, knowledge transfer from the parent company where applicable, use of independent consultants, cooperation with suppliers, and combinations of these modalities)? Is, in some cases, more technical assistance needed for project preparation and during implementation?

(g) Trace the fate of the old equipment, which is supposed to be destroyed or dismantled, and discuss possible and cost effective ways of rendering such equipment unusable. If most of the equipment can be used for either ODS-based or non ODS-based production, the question of how to define and organize the destruction of equipment and the commitment of the producers of MAC compressors and other parts to reduce and later stop the production of CFC-12 compressors and related parts needs particular answers.

(h) Evaluation approach

30. For half of the 12 projects reviewed, it is suggested that some further information should be obtained so that greater transparency can be achieved. The list of projects foreseen for field visits has not been finalised yet. It will also aim to achieve a geographical, sub-sectorial and chronological balance of projects selected.

31. The general objective of field visits will be to verify that the conversion has effectively taken place or will do so shortly and will be sustained, and that the countries will realize the final phase-out in the MAC sector in due time. It is to clarify whether and to what extent CFC-12 based MAC systems are still being installed into new cars, and what the plans of the industries and the intentions of the Governments are to end this practice. Furthermore, the requirements of the replacement and servicing market for CFC-12 based MAC systems and parts need to be analyzed.

32. During the field visits, an evaluation report format similar to the revised PCR format for investment projects will be used. Moreover, specific questions will be formulated for each project. The role of related non-investment projects and policy regulations as well as the remaining tasks in the sector to achieve full ODS phase out will be analyzed. Common features of projects and policies in a country will be summarized in a country report.

33. The draft case studies will be circulated to the countries visited and to the implementing agencies for their comments. This will be followed by the elaboration of a synthesis paper for presentation to the 38th Meeting of the Executive Committee.

Overview of Results
by Project

Country / Project	Date Approved	Original Approved Planned Date of Completion	Revised Approved Planned Date of Completion	Actual Date Completed	Original Approved Funds	Total Funds Approved Including Adjustments	Funds Disbursed	Indirect ODS - Phase-out	Equipment Utilization	Fate of Old Equipment	Technology Choice	Project Timing in Terms of Market Demand	Cost / Budget
ARGENTINA													
a) Mirgor ARG/REF/15/INV/17	Dec-94	Dec-95	Jul-97	Jun-99	35,632	31,550	30,510	Conversion completed. Should be capable to sustain ODS free production permanently.	Limited HFC-134a prod. in 97. Full production in 2000. Equip. idle from 94 to 97?? Was the new Equip. adapted and used for CFC-12 production? Should have known O.E.'s plans (Conversion 3 years in advance of market demand is too much).	Not included. Indicates that it is not required. Should be required to assure definite termination of CFC-12 production.	Used approved / proven methods & components for HFC-134a conversion.	Completed in advance. Equipment purchased in 1994 (per invoice).	Within budget.
b) Interclima ARG/REF/15/INV/15	Dec-94	Dec-95	Jul-97	Jun-99	1,983,430	1,669,391	1,611,622	Conversion completed. Should be capable to sustain ODS free production permanently.	Good; HFC-134a component production started as equipment ready (late 97/ early 98). Full production in 2000.	Utilized in the production of HFC-134a compatible evaporators.	Good; utilized widely accepted Parallel Flow type condensers for HFC-134a conversion.	Completed in advance of O.E. demands. 4-month delay compared to plan is not critical considering market conditions.	Within budget: good. Budget was reduced to reflect change in ownership (partial foreign).
c) Sistemaire ARG/REF/18/INV/40	Nov-95	Nov-96	Nov-00	Sep-00	2,370,550	969,822	969,822	Conversion completed. Should be capable to sustain ODS free production permanently.	Good; HFC-134a MAC system production started as equipment became ready (1996).	Good: Retooled or destroyed.	Good; complete MAC units were produced consistent with approved /proven materials and designs for HFC -134a conversion.	Considered acceptable. One machine was delivered late due to O.E. approval. Production stared in 96 with imported component.100% HFC-134a production in 1997.	Within budget: good. Budget was reduced to reflect foreign ownership.
CHINA													
a) Shanghai Ek Chor CPR/REF/17/INV/129	Jul-95	Jul-96	Jun-98	Jan-96	961,000	961,000	933,000	Conversion completed.Should be capable to sustain ODS free production permanently.	Good; HFC-134a MAC compressor production started as equipment became ready 12/97.	Good: unusable equipment was properly listed and disposed.	Acceptable; redesigned 5-piston compressor to be compatible with HFC-134a.	Acceptable, although overall delays of 13 months; delayed start up due to sub-grant agreement signature taking place only in 7/96. Completion with in 18 months is reasonable lead-time w/o TCA. Production started in 1995 with imported compressor parts. Local production started in 12/97. 100% HFC-134a production started in 3/99.	Marginal; several items above budget Enterprise absorbed additional costs. Approved grant is a fraction of actual conversion cost.
b) Yueyang Hengli CPR/REF/18/INV/148	Nov-95	Nov-97	Dec-98	May-99	1,767,961	1,767,961	1,767,961	Conversion completed. Should be capable to sustain ODS free production permanently.	Good; HFC-134a MAC compressor production started as soon as equipment was delivered (12/97).	Good: unusable equipment was properly listed and disposed.	Good. Utilized widely accepted / proven technology for the condenser and the compressor.	Acceptable; although overall delay of 18 months. Project start up delayed due to late sub-grant agreement signature in 8/96. Additional delay due to Nitrogen producing machine issues (9 months) Another delay factor is that the company became listed in the stock exchange in 97, which was followed by management change in 98. CFC free Production started for cars end 97, for busses in 8/98. 100% HFC-134a production achieved in 6/99.	Acceptable, although several items are above budget and additional, non lanned equipment was purchased: To replace newly purchased but not useful equipment (Nitrogen). Machining centers 10 times costlier than planned. Testing stand cost almost doubled compared to plan. Leak detector 50 times more costly. Enterprise absorbed additional costs. Approved grant is a fraction of actual conversion cost.
c) Shanghai Automobile Air Conditioning (SAAC) CPR/REF/18/INV/150	Nov-95	Nov-96	Apr-97	Dec-96	1,642,330	1,642,300	1,642,300	Conversion completed. Should be capable to sustain ODS free production permanently.	Good; HFC-134a compatible productivity production started as soon as equipment became ready (4/97).	Good: unusable equipment was properly listed and disposed.	Good; utilizes widely accepted / proven technology compatible with HFC-134a.	Good, only one-month delay; sub-grant agreement signature in 9/96 (almost a year after ExCom's approval). Early project start up in 1/95 (approved in 11/1995) Initial ODS free production in 4/97 was first in China. Delay in full ODS phase-out due to market demand 100% HFC-134a production achieved in 1/99.	Acceptable; Two major pieces of equipment were not planed: detection. Flat tube forming and cutting machine. Enterprise absorbed additional costs. Approved grant is a portion of actual conversion cost.

Overview of Results by Project

Country / Project	Date Approved	Original Approved Planned Date of Completion	Revised Approved Planned Date of Completion	Actual Date Completed	Original Approved Funds	Total Funds Approved Including Adjustments	Funds Disbursed	Indirect ODS - Phase-out	Equipment Utilization	Fate of Old Equipment	Technology Choice	Project Timing in Terms of Market Demand	Cost / Budget
INDIA													
a) Subros Ltd. IND/REF/11/INV/12	Nov-93	Nov-95	Mar-97	Nov-98	1,710,000	1,710,000	1,414,708	Export Market: Conversion completed. Should be capable to sustain ODS free production permanently. Domestic Market: Not achieved. CFC-12 MAC production is continuing. Plan for phase-out is not provided.	Good; HFC-134a compatible productivity production started as soon as equipment became ready.	Phase one: Good - unusable equipment was properly listed and disposed. Phase two: No information.	Good; utilized already developed and proven technology from a world wide supplier of MAC systems. Technology is compatible with HFC134a.	Acceptable; Sub grant agreement signature 6/95 (Delayed pending agreement between the World Bank and the Government of India). Start of production in 1995 (Limited quantities). Full production in 10/96 (Export Market). Delay in production due to local supplier problems, and administrative issues.	Acceptable; Incremental capital costs are within 1% of approved plan. Actual incremental operating costs reported are 4-times higher than approved. Needs further justification/explanation.
MALAYSIA													
a) Nippondenso Capital Sdn Bhd MAL/REF/18/INV/75	Nov-95	Nov-99		Nov-98	2,232,718	2,047,661	2,047,661	Capacity for CFC-12 phase-out was established. Should be capable to sustain ODS free production permanently. All CFC-12 MAC production capacities are still operating, and expected to stop in 2000; this is not confirmed, however.	Good; HFC-134a compatible production started as soon as equipment became ready.	Not acceptable: CFC-12 equipment still in operation. Should have been destroyed in 2000, needs confirmation.	Good; utilized already developed and proven technology from a world wide supplier of MAC systems. Technology is compatible with HFC134a.	Acceptable; Sub grant agreement signature 12/96 Conversion started in 1992. Start of production in 1994 (compressor & condenser). All MAC system, production start-up 1998. Delay in production start up due to technology transfer & changes in production process (receiver/dryer, rubber coating machine).	Acceptable incremental capital costs exceeded plan by 20% approx.
MEXICO													
a) Climas de México MEX/REF/24/INV/78	Mar-98	Oct-99		May-00	2,359,812	2,359,812	2,344,752	Conversion completed. Should be capable to sustain ODS free production permanently. CFC-12 MAC production stopped with the sale of baseline equipment for scrap in August 2000.	Good; HFC-134a compatible productivity production started as soon as equipment became ready.	Good: disposed as planned.	Good; utilized already developed and proven technology compatible with HFC134a from a world wide supplier of MAC systems.	Good; Sub grant agreement signature in 9/98 Start of production on schedule in 2000.	Good: within budget.
THAILAND													
a) Nippondenso Thailand THA/REF/13/INV/37	Jul-94	Jul-95		Dec-93	141,500	141,500	137,379	Capability for CFC-12 phase-out was implemented. Should be capable to sustain ODS free production permanently. All CFC-12 MAC production capability still operating, and expected to stop in 2005; however, this is not confirmed.	Good; HFC-134a compatible productivity production started as soon as equipment became ready.	Not acceptable: CFC-12 equipment still in operation. Expected to stop production in 2005.	Good; utilized already developed and proven technology from a world wide supplier of MAC systems. Technology is compatible with HFC134a.	Good; Sub-grant agreement signature in 12/96 Conversion started in 1993; start of new production in 1993.	Acceptable; Within 10% increase of budget.
VENEZUELA													
a) AAISA VEN/REF/11/INV/20	Nov-93	Sep-96	Sep-97	Jun-98	620,000	4,420,000	4,420,000	Capability for CFC-12 phase-out was implemented. Should be capable to sustain ODS free production permanently. CFC-12 MAC production capability is not clear.	Good; HFC-134a compatible productivity production started as soon as equipment became ready.	Not acceptable: CFC-12 equipment status unknown: Evaporator, Condenser, Hose Identified (only) 6 compressor test machines and the detrex degreaser: 4 comp. mach. awaiting retrofit. Degreaser: non operational, not destroyed and still on property.	Acceptable: Evaporator: Good Condenser: acceptable, but should have used Multi-Flow instead of serpentine design. Compressor: Good, used HFC-134a technology from Nippondenso. Hose: Good .	Good; Sub-grant agreement signature in 7/95. Conversion started in 1995 with imported heat exchangers. Start of new production in 1/1999.	Good; Non-approved additional costs were covered by the enterprise.

Country / Project	Date Appro-ved	Original Approved Planned Date of Comple-tion	Revised Approved Planned Date of Comple-tion	Actual Date Completed	Original Approved Funds	Total Funds Approved Including Adjust-ments	Funds Disbursed	Indirect ODS - Phase-out	Equipment Utilization	Fate of Old Equipment	Technology Choice	Project Timing in Terms of Market Demand	Cost / Budget
b) FAACA VEN/REF/11/INV/19	Nov-93	Nov-95	Sep-97	Feb-98	3,480,000	3,100,000	3,100,000	CFC-12 phase-out capability was established. Should be capable to sustain ODS free production permanently. CFC-12 MAC production for the replacement market still on-going; is expected to stop in 2002 (needs confirmation).	Good; HFC-134a compatible production started as soon as equipment became ready.	Acceptable: CFC-12 equipment was identified, however still in operation. Expected to stop production in 2002.	Good; utilized already developed and proven technology compatible with HFC134a. from a world wide supplier of MAC systems.	Acceptable; Sub grant agreement signature in 2/95. Conversion started in 1993. Start of new production in 12/95 through 1998 (100% HFC-134a for O.E. 1997).	Good; Non-approved additional costs were covered by the enterprise. ($5,000 approx. from contingency not spent)