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EXECUTIVE COMMITTEE
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**ELIGIBILITY OF ODS CONSUMPTION ARISING FROM EVAPORATION LOSSES
IN THE FOAM INDUSTRY**

Introduction

1. At its 26th Meeting, following consideration of a number of projects in which evaporation losses had been claimed, the Executive Committee in its Decision 26/13 (c), requested the Secretariat and the implementing agencies to:

- (a) examine in detail the technical issues of evaporation losses of ODS;
- (b) examine the question of how such losses should be taken into account in determining the eligible level of compensation to be provided to an enterprise; and
- (c) report on their findings to the Sub-Committee on Project Review at its sixteenth meeting.

Background Information

2. The issue of evaporation losses in Multilateral Fund projects relates largely to the production of rigid foams for sandwich panels for the construction of truck bodies and cold rooms and other refrigeration applications, rigid foams for making ice boxes and other thermoware products and foam blocks. It also relates to a smaller extent to the production of integral skin foam products such as automotive seats and furniture.

3. 106 rigid foam and 44 integral skin/flexible molded foam projects were submitted between the 23rd and 26th Meetings. Thirty-one of these projects were reported to have had losses of CFC-11 due to evaporation. These included 25 rigid foam projects in which CFC-11 evaporation losses of generally 30% were claimed and 6 integral skin/flexible molded foam projects in which losses of 20 and 40% were claimed in two projects and 30% in four others.

4. The review also indicated the following:

- Twenty of 31 projects in which evaporation losses were claimed were UNDP projects, while 11 were World Bank projects
- All but one of the projects (both UNDP and World Bank) in which losses were quantified and considered in the project costs were developed by the same consultant.
- In UNIDO projects, general wastes (including CFC-11 losses) were mentioned but not quantified.
- The consumption of the enterprises including evaporation losses was between 7.5 tonnes per year and 49 tonnes per year.
- Twelve enterprises pre-mix their chemicals in “open drums”, “buckets”, “paint mixer type mixing equipment” or “simple mixing equipment” and pour into moulds, cavities or presses by hand to make the foam products.
- 9 enterprises have similar mixing devices but used foaming machines to make their foam.

- Five enterprises used or appeared to use pre-mixed systems, thus reducing the mixing operations in the factory and potential for losses. However these enterprises also had losses of up to 30%.
- In almost all the projects there was no adequate description of the baseline conditions to be able to ascertain the circumstances resulting in CFC losses. For example, there is no information on how chemicals are received and stored or under what conditions the chemicals are mixed and used in production.

5. It was not clear from the project documents what constituted evaporation loss or how it was determined. However UNDP and the World Bank explained that by comparing the actual purchases of CFC-11 with purchases of the other chemicals and with the amount of CFC-11 needed for the estimated annual foam output, the consultant determined that a loss factor existed. The CFC-11 lost was included in the consumption submitted in the project proposal and also factored into the incremental operational cost calculation (reducing the level of incremental operating cost because the replacement chemicals had far lower losses so less was needed).

6. In two projects submitted by UNIDO it was reported that there were general wasteful losses but the level of losses was not indicated. Subsequently, UNIDO advised that CFC-11 losses were assessed during visits to the enterprises and were excluded from the enterprise consumption submitted in the project proposal.

7. When evaporation losses are included in ODS consumption, there is no difference in the treatment of the cost-effectiveness or eligible funding limit for a project of a company which loses a considerable amount of CFC during the foam production and one which does not.

8. The review of the project costs indicated that an increasing number of rigid foam projects are being submitted at the threshold funding limit. At the 23rd Meeting about 20% of 50 rigid foam projects submitted were at the threshold funding limit, whereas nearly 50% of 55 projects submitted at the 25th and 26th Meetings were at the threshold. Only seven of these projects can be categorised as small enterprises using the UNDP definition of less than 10 tonnes consumption. Six of the enterprises are categorised as large enterprises with greater than 30 tonnes consumption. Five of these six had a consumption of over 60 ODP tonnes.

Losses of CFC in Foam Production

9. Because CFC-11 has a low boiling point and is volatile, it can be lost during storage and handling and in the production process. Some losses may be unavoidable due to the production process being used. However losses are exacerbated by inappropriate factory practices such as the use of unsuitable processing equipment (for example, open mixing devices and tanks), and especially by the poor maintenance of otherwise suitable production equipment. The need for good factory practices to minimise losses increases when the ambient temperature is high.

10. Loss rates as low as 5 percent, and lower in some circumstances, can be achieved in enterprises which use appropriate, well maintained equipment (whether new or old). At any stage in the process, if measures are not taken to contain the mixing of chemicals, CFC-11 will evaporate. For instance, the pouring of the ingredients by hand will incur a loss of around 10 percent. Additional losses at other stages of the process can easily occur, especially at the time

when the CFC-11 is initially added to the other chemicals (the chemicals containing the CFC-11 are mixed in advance, either by the chemicals supplier or the enterprise and stored until needed). However these losses can and are minimised by enterprises which use enclosed equipment and maintain it properly. Because losses at various stages of production are cumulative, poorly managed enterprises could incur overall CFC-11 losses of 30 percent.

11. Loss minimisation is not dependent on the availability of new technology. The necessary closed mixing equipment and low pressure foam machines for use with CFC-11 have been available world wide for many years and are manufactured in a number of Article 5 countries. It is a financial decision on the part of the enterprises as to the level of losses they will tolerate, in the light of profits, the cost of waste material (including lost CFC-11), availability of capital for equipment improvement, etc.

12. After conversion through projects funded by the Multilateral Fund, losses will be at the minimum level because the equipment provided under the project will restrict evaporation. Additionally, the replacement blowing agents are less volatile

Impact of Evaporation Losses

13. It is possible to make a foam with 40% less CFC-11 than required. However, the loss of CFC would result in a foam of higher density and poorer insulating quality than specified. Also more will be needed to fill the same space, adding to the cost of production. It is also possible in some cases, e.g. production of foam-filled thermoware, to have higher level of off-specification products or rejects due to gaps in the foam, also resulting in financial losses.

14. Thus evaporation loss results in higher manufacturing costs. It is estimated, for instance, that addition of extra ingredients to remedy the effect caused by the loss of CFC would result in 5% increase in material cost. However, in view of the paucity of baseline information, it has not been possible to assess the full extent of the financial impact of such losses in any of the Multilateral Fund projects.

15. CFC consumption in the sample of the enterprises analysed ranges from 7.5 to 49 tonnes per year. Therefore, with an average of 30% evaporation loss, the direct financial cost to the enterprises arising only from the amount of CFC lost would range from about US \$5,000 – US \$36,750 per year at a CFC unit price of US \$2,500 per tonne.

Implications for Incremental Costs

16. At present, the full quantity of CFC-11 claimed as having been purchased by the enterprise is taken into account in the calculation of incremental capital and operating costs. The effect of this on project costs is different for projects which have total incremental costs below the threshold funding limit and those which have total incremental costs above the threshold funding limit.

(i) *Enterprises with project cost below the threshold limit:*

17. The full amount of CFC claimed as consumption is included as an operating cost before conversion. After conversion, a reduced quantity of blowing agent is used since none is lost through evaporation. If a similar enterprise with the same level of production had no evaporation losses, the operating costs before conversion would be lower. Therefore the incremental operating costs would be higher and the second enterprise, with effectively no losses, would be eligible for a larger grant, since there are no savings from losses eliminated after conversion.

18. Analysis of approved projects indicates that, depending on the baseline, projects are likely to be below the threshold limit when consumption exceeds about 30 tonnes per year for the rigid foam sub-sector and about 10 tonnes for the integral skin foam sub-sector. This represents about half of the rigid foam projects and a large majority of integral skin foam projects submitted.

(ii) *Enterprises with project cost above the threshold limit:*

19. The same considerations apply for calculation of incremental operating costs. However there is an additional financial consideration related to the threshold limit. If an enterprise loses 30% of its CFC-11 due to evaporation and this loss is included in its consumption, the enterprise will be eligible to receive 30% more funding than a similar enterprise which made the same quantity of foam but had negligible losses. This occurs because the funding limit for the enterprise which incurred the losses is currently determined by the total consumption, including the amount lost. Each tonne of CFC lost would potentially result in an additional US \$7,380 (for rigid foams), or an additional US \$16,860 (for integral skin) depending on the sub-sector. This consideration outweighs the IOC calculation since the losses are included there only in relation to the CFC price of around US \$2,500 per tonne.

20. For example, an average rigid foam project in this category which manufactures foam containing a total of 10.5 tonnes of CFC-11 annually, but which reports 30% losses of CFC-11 additional to this consumption, would under present circumstances receive some US \$25,000 more than a similar enterprise which had minimised its losses. The enterprise would receive this extra funding in addition to the benefits of reduced costs (through minimisation of losses) after installation of the equipment provided under the project.

21. Currently about 50% of projects being received in the relevant sub-sectors are at or above the threshold limit. This percentage is increasing.

(iii) *Enterprises in low-volume consuming countries (LVCs)*

22. It should be noted that since cost-effectiveness thresholds are not applied to projects from low-volume consuming countries, there is no limit of cost arising from the threshold. Thus, such projects are not affected if losses are excluded from the enterprise consumption.

Conclusions

23. The following conclusions could be made:
- (a) A small level of CFC-11 losses is inevitable in the production of foam.
 - (b) Where basic but appropriate equipment is used and good factory practices are maintained, these losses can be ignored.
 - (c) The greatest potential for significant evaporation losses occurs in enterprises which do the initial mixing of CFC-11 with other relevant chemicals on their premises (as opposed to buying it 'pre-mixed'). These losses can reach 30% if the equipment is not suitable for use with volatile substances such as CFC-11, is not properly maintained, or if factory practices are poor.
 - (d) Where they are allowed to occur, evaporation losses represent real financial costs to the enterprise concerned. These include the cost of the CFC-11 lost and costs arising from the production of inferior quality foam.
 - (e) In order to confirm CFC-11 consumption it is essential to provide corroborated evidence of the amounts of CFC-11 and other ingredients claimed as having been purchased by the enterprise, as well as a clear description of the basis for establishing any CFC-11 losses.
 - (f) Inclusion of excessive evaporation losses in enterprise consumption would reward and could potentially encourage the overstatement of consumption by enterprises (to achieve higher funding levels). It would be difficult to detect in the project preparation and review process.

Recommendations

24. The Secretariat and the implementing agencies agreed to present the following recommendations for the consideration of the Executive Committee.
- (a) Reaffirming its Decision 26/13 (a) and (b) in which the Committee:
 - (i) requested the implementing agencies, in the preparation of projects, to take extreme care to ensure the reliability and accuracy of data on ODS consumption and make available to the Secretariat figures normally provided by enterprises on ODS purchased by the enterprises and ODS used in the products being produced and also;
 - (ii) requested that the enterprises for which projects were being prepared made available their relevant records to provide the best available information to the implementing agencies concerning ODS purchased and used;

- (b) To request the implementing agencies when preparing foam projects:
 - (i) to determine within the context of paragraphs (a) (i) and (ii) above, the ODS evaporation losses arising out of the production activity; and;
 - (ii) to consider as eligible ODS consumption of the enterprise losses of up to 10 per cent of the ODS purchased and used in the production of foam.