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DRAFT GUIDELINES FOR CALCULATING INCREMENTAL COSTS IN THE TOBACCO SECTOR

Introduction

1. The Executive Committee decided at its Eighteenth Meeting to request the Secretariat to prepare draft guidelines on the tobacco sector for consideration at the Twentieth Meeting of the Executive Committee (UNEP/OzL.Pro/ExCom/18/75).

2. For the preparation of this paper, the Secretariat sought information from UNEP IE Information Clearinghouse and industry sources on the prevalent replacement technology in this sector, and re-analyzed the only tobacco expansion project approved by the Executive Committee. Furthermore, the Secretariat requested the opinion of the Technical and Economic Assessment Panel (TEAP) regarding the classification of CFCs uses in the tobacco sector.

3. This document has incorporated relevant comments received from UNEP and the World Bank on a draft paper distributed to the implementing agencies.

Background information

4. The main objective of using expanded tobacco in manufacturing cigarettes is to reduce production costs since less mass of tobacco is used per cigarette. Tobacco leaf shrinks when harvested, processed and stored. To restore its size to almost the original size, it is expanded by impregnating with a volatile compound followed by sudden contact with a heated gas. The tobacco is removed from the heated gas in a separator unit and the volatile compound is recovered, for further reuse, by cooling and compressing. During the expansion process, the nicotine and tar content is reduced.

5. The use of CFC-11 for tobacco expansion started in the nineteen seventies. RJ Reynolds Tobacco Co. (USA) developed and patented a process known as G-13C, by which tobacco leaf could be expanded to about 70% of its original size.

6. The most common replacement technology for the CFC-11 expansion process is the carbon dioxide process, which was co-developed and patented by AIRCO Industrial Gases (USA) and Philip Morris. The process known as the "Dry Ice Expanded Tobacco" process (DIET) could expand tobacco leaf to its original size.

7. Other replacement technologies have been developed. These include: (i) propane technology, which is not yet commercially available; (ii) nitrogen process which requires maintenance of very high pressure resulting in higher energy costs, achieving tobacco expansion ratio between 60 to 70%; and (iii) steam process which achieves very low expansion ratio (20 to 30%) resulting in higher operating costs as more tobacco per cigarette would be needed.

Classification of tobacco expansion as a process agent

8. The Parties to the Montreal Protocol are scheduled to take a decision on process agents at their 9th Meeting in 1997 and have asked the TEAP's Process Agent Task Force to undertake further investigations of the technical and economic aspects related to process agents.

9. In 1995 the TEAP's report proposed a definition of process agents that might have included tobacco expansion. While at that time, the TEAP and its Process Agent Working Group recommended that tobacco expansion need not be considered under this definition, however, the current Process Agent Task Force is still working on new definitions of process agents which might include tobacco expansion.

The tobacco sector in Article 5 countries

10. According to approved country programmes, in 1993 only three Article 5 countries used CFC-11 for tobacco expansion, namely, China (2,100 tonnes), Philippines (350 tonnes) and Cameroon (one tonne).

11. It appears, however, that several countries did not include CFC consumption in the tobacco sector in their country programmes. Therefore, the size of the tobacco expansion sector in Article 5 countries cannot be accurately assessed.

12. In 1991, one enterprise in the Philippines consumed 350 tonnes of CFC-11 to expand 5,900 tonnes of tobacco annually. The company was the largest ODS user in the country, accounting for nearly 16% of its total ODS consumption.

13. The China tobacco industry consists of 180 cigarette and cigar factories, with an annual production of 32 million cigarette cases (50,000 cigarettes in a case), amounting to 1.6 million tonnes of tobacco. An unconstrained growth of tobacco expansion in China would increase CFC consumption from 2,100 tonnes in 1993 to 9,000 tonnes by the year 2000 (UNEP/OzL.Pro/ExCom/15/20).

14. China did not use CFC expansion equipment until 1986 when the Government procured two G-13C process units from RJ Reynolds Tobacco Co. In 1989, China manufactured an indigenous model (YP-1) with similar characteristics to the G-13C model, at a unit cost of US $200,000.

15. By 1993, 70 locally-manufactured expansion units were in operation in the country to expand 0.16 million tonnes of tobacco, with a total CFC consumption of 2,100 tonnes.

16. The Government of China will allow the number of expansion units to increase to 100 units in 1996, with a total CFC-11 consumption of 3,000 tonnes. In 1997, the production of CFC-11 units will cease, and by the year 2005, CFCs in this sector will be phased out.

Past experience

17. The 9th Meeting of the Executive Committee approved US $4.72 million for the conversion of the entire tobacco expansion sector in the Philippines, under the World Bank programme.

18. The total incremental costs of the project were calculated as the difference between the capital costs for replacing existing CFC-expansion with a DIET process and the baseline costs, plus the net incremental operating costs (operating savings minus operating costs) estimated for a 15-year period discounted at a 10% rate.

19. The capital investment cost (i.e., project cost) was estimated at US $11.81 million (net present value). The baseline cost was US $3.8 million, corresponding to the higher cost calculated according to the following two techniques:

i) the cost of new CFC-11 expansion equipment as a future payment and discounted to the present year, or

ii) the depreciated value of the existing CFC-11 expansion equipment.

20. Thus, by deducting the capital investment cost (US $11.8 million) to the baseline cost (US $3.8 million), the total eligible incremental capital cost amounted to US $8 million.

21. The net operating savings were calculated at US $4.02 million for the full economic life of the project (15 years). The existing agreement with the technology provider, stipulated payment of royalty fees for the use of the DIET plant until May 1998, when the lifetime of the patent expires. After that date, operating savings would be accrued, as the operating costs of the DIET process were projected to be lower than the CFC-11 process.

22. The World Bank has reported that the new equipment will be installed by mid-1997. Since the project is still under implementation; actual incremental costs/savings would be available only after the project is commissioned.

Draft guidelines for calculation of incremental costs in tobacco expansion projects

23. In the absence of experience with implementation of projects in this sector, and pending a judgment by TEAP on the classification of CFC-11 use in tobacco expansion as a process agent, the following draft guidelines are conceptual at this stage.

Capital costs

24. Industry sources informed the Secretariat that the main part of CFC-11 based equipment cannot be used when switching to CO_2. Therefore, new production equipment suitable for CO_2 must be installed.

25. If the same methodology used in the Philippines tobacco expansion project were to be applied, the baseline cost would be either the cost of new CFC-11 expansion equipment calculated as a future payment and discounted to the present year; or the depreciated value of the existing CFC-11 expansion equipment, whichever amount is higher.

26. Capacity of CFC-11 expansion process (baseline equipment) and that of CO_2 process should be the same. If the minimum capacity delivered by the CO_2 process is higher than the baseline, the difference should be calculated and accounted for as a capacity increase. This capacity increase should be quantified and deducted from the capital cost.

27. Thus, the eligible incremental capital cost (ICC) should be calculated according to the methodology adopted by the Executive Committee at its Eighteenth Meeting (UNEP/OzL.Pro/ExCom/18/75 Decision 18/25):

$$IC = [CC - NPV(FI)] + NPV[FB_b - Fb_p]$$

where,
IC is the incremental cost
CC is the capital cost of the conversion project
FI is future baseline investments (that would have occurred absent the conversion)
Fb_b is the future baseline benefits (that would have occurred absent the conversion)
Fb_p is the future benefits of the conversion project
NPV refers to the net present value of a stream of costs/benefits

28. The projected investment and benefits profiles of the enterprise (with and without the conversion project) should be reviewed by the technical reviewer and the implementing agency to ensure broad consistency with the technological and commercial practices of the enterprise.

29. Capital costs should not include costs of patents.

Operating costs

30. The two major components of operating costs/savings in tobacco expansion are the patent royalty fee, applicable to both CFC-11 and CO_2 processes, and the costs associated for raw materials, energy and labour.

31. In some cases, the license agreement for the G-13C equipment stipulates a royalty fee of US $0.10 per pound on all tobacco treated, and has a duration of the last-expired G-13C patent unless terminated earlier. In other cases, the license agreement stipulates a royalty fee of US $0.12 per pound for the first 50 million pounds, and US $0.09 for each pound produced thereafter for the lifetime of the patent. It is to be noted that if royalty fees were to be passed on to the end-user, the incremental cost per package of cigarettes would be about US $0.004.

32. The license agreement between the technology provider and the enterprise is, however, negotiable. It may depend on several factors, which include inter alia, the existing license agreement, expiration date, equipment capacity and production. However, the Executive Committee is requested to decide whether royalty fees should be paid for by the Multilateral Fund for this sector.

33. The amount of raw materials, electricity and fuel used for tobacco expansion varies depending on the compound used for expanding tobacco. The higher expansion ratio achieved by the CO_2 process will result in 25% less tobacco compared with the CFC-11 process, as indicated by industry sources. Table 1 demonstrates the operating costs of the two technologies as applied to a plant that processes 5.9 million kilograms of raw tobacco. Information in this table could be used as a guide in the calculation of incremental operating costs/savings.

Conclusions and recommendations

34. Final guidelines on calculations of incremental costs in the tobacco sector could not be developed, at this time, for the following reasons:

i) The actual size of the tobacco expansion sector in Article 5 countries is not known. Of the 76 country programmes completed, only three countries, namely Cameroon China and Philippines, reported CFC-11 consumption in this sector;

ii) The classification of CFC-11 as a process agent for tobacco expansion is still under discussion by TEAP's Process Agent Task Force. Based on the recommendation by the Panel, this matter would be discussed at the 1997 Meeting of the Parties; and

iii) There is no experience available in the Multilateral Fund of implementation of projects in this sector. The only project approved is expected to be completed in late 1997.

35. Therefore, the Executive Committee may wish to adopt on a trial period and on a case-by-case basis, the methodology proposed in this paper. The guidelines should be adjusted according to the outcomes of the discussion of the Parties on the classification of CFC-11 as a process agent and the completion report of the project approved and under implementation in this sector.

36. Furthermore, the Executive Committee may wish to consider whether royalty fees should be paid for by the Multilateral Fund for this sector.

Table 1

COMPARISON OF OPERATING COSTS OF CFC-11 AND CO2 EXPANSION PROCESSES

Amount of expanded tobacco (kg/year)		5,900,000
CFC-11 equipment capacity (kg/hr)		192
C)2 equipment capacity (kg/hr)		567
Expansion ratio	CFC-11	75%
Expansion ratio	CO2	100%

Description		Unitary cost (US$)	Quantity to expand one kg of tobacco		Unitary cost to expand one kg of tobacco	
			CFC-11 process	CO2 process	CFC-11 process	CO2 process
CFC-11	(kg)	4.00	0.036		0.14	-
CO2	(kg)	0.16		0.500	-	0.08
Air	(m3)	0.21	0.018	0.045	0.0038	0.0094
Steam	(kg)	0.01	1.469	1.200	0.0147	0.0120
Water	(l)	0.0004	9.900	79.672	0.0040	0.0319
Natural gas	(kg)	0.12		0.136	-	0.0163
Sub-total (unitary cost)	(US$/kg)				0.1664	0.1496
Total production cost	(US$)				981,937	661,966
Operating time	(hours)				30,729	10,406
Electricity	(kwh)	0.09			2,766	937
Labour	(US$/man-hour)	1	48	48	1,475,000	499,471
GRAND TOTAL	**(US $)**				**2,459,703**	**1,162,373**