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**Open-ended Working Group of the Parties to  
the Montreal Protocol on Substances that  
Deplete the Ozone Layer**  
Twenty-seventh meeting  
Nairobi, 4–7 June 2007  
Item 4 (b) of the provisional agenda\*

**Technology and Economic Assessment Panel and Executive  
Committee review of progress made in reducing the emissions  
from and the use of ozone-depleting substances as process  
agents and the implementation of emissions reduction techniques  
and alternative processes and products (decision XVII/6)**

**Report of the Executive Committee on the progress made in  
reducing emissions of controlled substances from process-agent  
uses**

**Note by the Secretariat**

1. The attached report from the Executive Committee of the Multilateral Fund for the Implementation of the Montreal Protocol has been submitted pursuant to decision XVII/6 adopted by the Parties to the Montreal Protocol at their Seventeenth Meeting.
2. The report is presented as submitted and has not been formally edited by the Secretariat.

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\* UNEP/OzL.Pro.WG.1/27/1.

**REPORT OF THE EXECUTIVE COMMITTEE TO THE OPEN-ENDED WORKING  
GROUP ON THE PROGRESS MADE IN REDUCING EMISSIONS OF CONTROLLED  
SUBSTANCES FROM PROCESS-AGENT USES  
(FOLLOW-UP TO DECISION XVII/6 OF THE  
SEVENTEENTH MEETING OF THE PARTIES)**

**AN UPDATE FOR THE PERIOD BETWEEN  
2005 AND 2006**

## **I: INTRODUCTION**

1. This report is prepared further to decision XVII/6 of the 17<sup>th</sup> Meeting of the Parties which requested the Technology and Economic Assessment Panel and the Executive Committee to report to the Open-ended Working Group at its 27th Meeting in 2007, and every other year thereafter, unless the Parties decide otherwise, on the progress made in reducing emissions of controlled substances from process-agent uses; the associated make-up quantity of controlled substances; on the implementation and development of emissions-reduction techniques and alternative processes and products not using ozone-depleting substances.

2. The document is essentially an update of a first report on the subject, which was prepared in response to a similar mandate under decision X/14 of the 10th Meeting of the Parties and subsequent versions, the latest of which, prepared pursuant to decision XV/7 submitted in the form of a draft to the 45th Meeting of the Executive Committee under the title “Process agent uses in Article 5 Parties and their related emission levels” (UNEP/OzL.Pro/ExCom/45/53). That report was subsequently approved and forwarded by the Executive Committee to the 25th Meeting of the Open-ended Working Group.

3. This report presents the progress that has been made up until the end of 2006 by the Multilateral Fund in assisting Article 5 countries in reducing the emissions of controlled substances from process agent use to “levels agreed by the Executive Committee to be reasonably achievable in a cost-effective manner without undue abandonment of infrastructure” (decision X/14). It lists the projects and activities that were funded in 2005 and 2006, with information on the level of funding approved, the impact and the date of completion of such projects. It takes also into consideration the progress in on-going projects as reported by implementing agencies.

4. The Executive Committee, at its 51st Meeting, considered a draft of this report, and requested the Fund Secretariat in its decision 51/35 to finalise the draft report and, subsequent to approval by the Chair of the Executive Committee of the final text, to submit this report to the 27th Meeting of the Open-ended Working Group.

## **II: OVERVIEW OF PROCESS AGENT USES OF ODS IN ARTICLE 5 COUNTRIES IN 2005**

5. To provide an insight into the magnitude of the challenge, the first report which was submitted by the Executive Committee to the 25th Meeting of the Open-ended Working Group, provided an estimate of the total consumption of ODS as a process agent in Article 5 countries using the data of 2003 and stated:

“The total identified annual process agent use in Article 5 countries for 2003 is 13,623 ODP tonnes.”

“Of the total identified use of some 13,600 ODP tonnes, about 13,500 ODP tonnes is CTC. Out of the remainder, 40 ODP tonnes of CFC-113 was identified in one Article 5 country, and 12 ODP tonnes of BCM was identified in a single use in one other Article 5 country.”  
and

“Ninety-seven per cent of the total identified use was reported in three countries, China (10,538 ODP tonnes), India (2,268 ODP tonnes) and D.P.R. Korea (432 ODP tonnes)”. (paras 7, 8 and 9 of document UNEP/OzL.Pro/WG.1/25/INF/4)

6. In line with past practice, this report provides an update on the consumption of CTC, a controlled substance predominantly used as a process agent in Article 5 countries, using the data reported under Article 7 of the Montreal Protocol for 2005. It shows that the total reported CTC consumption in Article 5 countries in 2005 (excluding the Republic of Korea) was 3,247.5 ODP tonnes and that the country distribution remained broadly the same as in 2003, with four countries consuming 94 percent of the total, namely China (1,060.3 ODP tonnes), India (1,644 ODP tonnes), the Democratic People’s Republic of Korea (191.4 ODP tonnes) and Pakistan (145.5 ODP tonnes).

7. While Article 7 consumption data provides a useful insight into general trends, it does not fully reflect the use of CTC in applications which might be viewed by many technical experts as process agent uses. This could include uses reported, for example, in Country Programmes or other information related to activities financed by the Multilateral Fund. This information would need only to be reported as Article 7 data subsequent to a decision of the Meeting of the Parties defining specific uses as process agent use, i.e. as controlled use. Such definitions are undertaken annually, and lead to a redistribution between controlled and other uses. While the total quantity used is reasonably well known and often verified, reported Article 7 consumption data relating only to controlled uses might sometimes appear inconsistent or might show sudden increases or changes in trend, despite a general decrease in use.

8. The Chemicals Technical Options Committee (CTOC) provided data to the Multilateral Fund Secretariat that were available to it at the end of March 2007. According to this data, CTOC received from two Article 5 Parties, Mexico and Romania, information about ODS make-up quantities in process agent uses. There are currently no Multilateral Fund supported activities for Mexico in the process agent sector, but Mexico has reported in its country programme 81 metric tonnes of CTC consumption for process agent use in 2005, and CTOC has received information for 2006 from Mexico specifying 41 metric tonnes of ODS make-up quantity for process agents. The information received by CTOC for Romania specified an ODS annual average make-up quantity of 173 metric tonnes for the years 2000 to 2002. The Multilateral Fund received data as part of the CTC phase-out agreement discussions specifying an average annual CTC use for process agents of 172 metric tonnes in those years.

### **III: PROJECTS APPROVED BY THE MULTILATERAL FUND IN 2005 AND 2006**

9. Between 2005 and 2006, the Executive Committee approved two projects in phasing out CTC in process agent applications. These were the second phase of the sector plan for phasing out CTC process agent applications in China, and the terminal phase-out management plan for CTC production/consumption for process agent use in Romania.

10. The details of these two projects are shown below:

Country	Project	Implementing agency	Date of approval	Level of funding (US\$)	Impact (ODP tonnes)	Date of completion
China	Phase out ODS process agent applications in China (Phase II)	World Bank	December 2005	46.5 million	6,000 + 14,300*	2010
Romania	Terminal phase-out management plan for CTC production/consumption for process agent use	UNIDO	December 2006	1.389 million	120	2008

\* A ceiling of 14,300 ODP tonnes is set to cover the CTC consumption by process agent applications in Table A-bis of Decision XVII/8 and any other applications that are not already covered in Phases I and II of the sector plan.

#### IV: STATUS OF IMPLEMENTATION OF ON-GOING PROJECTS AND PROGRAMMES

##### China sector plan for phasing out ODS process agent applications

###### Phase I of the sector plan

11. Phase I of the sector plan was approved in December 2002, which covered the 25 CTC and CFC-113 process agent applications included in List A of Decision X/14. The table below provides the status of implementation of the programme as of December 2006. The total CTC consumption came down from 3,382 ODP tonnes in 2003 to 460 ODP tonnes in 2006 and the consumption of CFC-113 was completely phased out in 2006. The number of plants that use CTC or CFC-113 as process agent decreased from 32 in 2001 to three in 2006. Actions which have been taken on these plants include closures, conversion to non-ODS alternatives and reducing emission levels. Table 1 in Annex I to this paper presents a summary of the progress achieved as of the end of 2006.

12. Of the three plants which continue using CTC as process agent in the production of chlorinated rubber and chlorosulphonated polyethylene (CSM), the CSM project has been experiencing difficulties in trying to reduce the level of CTC emissions. The verification report from the World Bank on CTC consumption in Phase I of the sector plan for the year 2006 has reported the following:

- (a) Jilin Chemical Industrial Co. Ltd. (JCIC) is a chlorosulphonated polyethylene (CSM) producer that uses CTC as a process agent for producing CSM products. The company has three CSM production lines with a total capacity of over 3,000 MT/a. The 1st CSM line of 1,000 MT/a was constructed in 1970 based on its own technology. The line stopped production in June 2004 and was dismantled in May 2006. The 2nd CSM line was constructed in 1989 with an annual capacity of 2,000 MT/a. Its reaction system ceased operation when the 3rd line was installed in 2005. CTC consumption ratios of the old line operations were from 0.35 to 0.38 MT/MT. Most of the lost CTC was emitted into the air and/or discharged into the water, with little remaining in the final product.
- (b) In compliance with requirements of the China PA I Sector Plan, the company signed a contract with SEPA to phase out CTC by controlling emissions, and installed its 3rd line in 2004. The new line aims to replace the two old lines and reduce the CTC consumption level from 0.35-0.38 MT/MT to 0.06 MT/MT. However, due to a malfunction of the imported solvent stripping and double-screw extrusion system, the

new line's CTC/CSM separating operation has been unsuccessful and therefore the CTC consumption level still remained high, even though a great effort has been made on the new line's process and equipment modification during 2005 and 2006.

- (c) Following the 2005 operating style, the company organized its 2006 CSM production by integrating the 3rd line's reaction system with the 2nd line's product-drying and separating system. Its 2006 the CTC consumption quota was 230 metric tonnes.
- (d) The new CSM line's process and equipment modification for reducing CTC consumption through emission control was still unsuccessful. No progress was made in 2006. Due to technical and financial reasons and, more importantly, compliance with China's environmental protection requirements, the company does not exclude the option of shutting down and dismantling all its CSM production lines before 2010.

### Phase II of the sector plan

13. Phase II, which was approved in December 2005 by the Executive Committee, targets the CTC consumed by the process agent applications contained in decision XV/6 of the 15th Meeting of the Parties, and will reduce the total consumption of CTC in these uses from an allowed maximum of around 7,000 ODP tonnes in 2006 to 994 ODP tonnes in 2010 and beyond. Table 2 in Annex I presents the list of applications, CTC consumption between 2001-2005 for each application, and the number of enterprises under each application in 2003. The strategy to achieve the reduction consists mostly of plant closure and conversion to non-ODS technology. However emission reduction is planned for two applications, chlorinated polypropylene (CPP) and chlorinated EVA (CEVA).

14. In addition to these applications, China also commits to phasing out the CTC consumption in applications listed under Table A-bis of Decision XVII/8 and any other applications which were not identified at the time of the approval of Phase II by 2009. A ceiling of 14,300 ODP tonnes is provided to cover these applications. The recent survey conducted by China reported a total consumption of about 6,000 ODP tonnes of CTC for these applications in 2006. Table 3 in Annex I provides a list of applications under decision XVII/8 in 2006 and Table 4 in Annex I contains a list of applications that were newly identified in 2006.

### **India**

15. In July 2003, the Executive Committee approved in principle a total of US \$52 million to assist India in complying with the Montreal Protocol control schedule for the production and consumption of carbon tetrachloride (CTC), and had disbursed approximately US \$41 million to the programme by the end of 2006. Under the programme, India commits to reducing the consumption of CTC used as process agent and as a solvent from a baseline of 11,505 ODP tonnes to zero by 2010. Progress in implementation by the end of 2005 is reported as follows:

Sector	Consumption in 2001 ODP tonnes (1)	Consumption in 2005 ODP tonnes (2)	Reduction achieved ODP tonnes (1)-(2)	Number of Projects Completed
Process agents	1,916	1,657	5,004	18
Solvent	4,745			30
<b>Total</b>	6,661	1,657	5,004	

**Romania**

16. The terminal phase-out management plan for CTC production/consumption for process agent uses is to phase-out the remaining CTC consumption by 2007 as a process agent in the country in the manufacture of di(ethylhexyl)-peroxydicarbonate (DEHPC), an intermediate chemical used in the manufacture of polyvinyl chloride (PVC). DEHPC became a controlled use in 2005 by Decision XVII/6 taken at the 17th Meeting of the Parties. The phase-out will be accomplished by changing the process agent in the second stage of production from CTC to the hydrocarbon isododecane.

17. Through the completion of the project in 2007, Romania will have completed its phase out of CTC consumption since DEHPC is the last application where CTC is still used as controlled substance.

## Annex I

**Table 1: Summary of implementation of phasing out CTC and CFC-113 as a process agent (Phase I) as of December 2006**

ODS	Application number	Products	Annual consumption (ODP tonnes)				No. of Plants		Actions
			2003	2004	2005	2006	2001	2006	
CTC	C3	CR	965	1,963.52	210.5	208	8	2	4 plants closed in 2004 and 1 plant closed 2005, 1 plant closed in 2006 and 2 still active
	C4	Endosulfan	359	0	0	0	2	0	Both closed in 2005
	C7	CSM	1,338	1,343.5	230.4	252	3	1	2 closed and dismantled, 1 for emission control
	C12	CP-70	694	225.4	0	0	12	0	11 closed and 1 converted to non-ODS
	C17	Ketotifen	6	0	0	0	1	0	Converted to non-ODS technology
			<b>Total</b>	<b>3,362</b>	<b>3,532.5</b>	<b>440.93</b>	<b>460</b>		
CFC-113	C9	PTFE	21.5	13.5	4	0	6	0	1 plant merger, and 5 converted to non-ODS

**Table 2: Status of implementation of Phase II**

**ODS consumption of each application between 2001-2005 and number of production lines of each application in 2003**

ODS used	Applic- ation No.	Product	Annual consumption of ODS (t/a)					Total number of production lines 2003
			2001	2002	2003	2004	2005	
CTC	PA19	Cyclodime	230.95	180.55	152.85	231.46	258.34	9
CTC	PA20	CPP	2,303.98	3,157.15	2,505.32	1,922.71	2,339.53	15
CTC	PA21	CEVA	188.68	208.22	225.08	313.98	271.27	4
CTC	PA22	MIC derivatives	718.35	627.58	574.54	724.08	724.49	6
CTC	PA23	MPB	623.23	587.61	679.95	632.26	631.59	3
CTC	PA24	DCMP	0.00	0.00	0.00	0.00	0.00	0
CTC	PA25	Imidacloprid	487.54	726.10	264.81	148.25	180.71	4
CTC	PA26	Buprofenzin	213.09	199.38	316.87	437.98	457.13	3
CTC	PA27	Oxadiazon	14.25	24.70	57.00	5.00	23.27	3
CTC	PA28	CNMA	108.80	133.13	136.12	86.00	182.60	1
CTC	PA29	Mefenacet	22.24	8.11	6.93	12.51	36.26	1
CTC	PA30	DCBT	16.03	0.00	0.00	0.00	0.00	0
		<b>Sub-Total CTC tonnes</b>	<b>4,927.14</b>	<b>5,852.53</b>	<b>4,919.47</b>	<b>4,514.24</b>	<b>5,105.19</b>	<b>49</b>
BCM	PA31	BPS	0.00	0.00	0.00	-	-	-
		<b>Total ODP tonnes</b>	<b>5,419.87</b>	<b>6,437.77</b>	<b>5,411.4</b>	<b>4,965.66</b>	<b>5,615.71</b>	<b>49</b>

**Table 3: Use of CTC for PA applications under Decision XVII/8 in 2006 (metric tonnes)**

No.	Application No. in Dec. XVII/8	Process agent applications <sup>1</sup>	CTC purchase in 2006, MT	Reported by
1	44	Prallethrin/ ES-Prallethrin	165.70	SEPA
2	45	2-Methoxybenzoylchloride	19.80	SEPA
3	46	O-Nitrobenzaldehyde / M-Nitrobenzaldehyde	420.48	SEPA
4	49	Benzophenone	675.26	SEPA
5	51	3-Methyl-2-Thiophenecarboxaldehyde	12.00	SEPA
6	54	2-Thiophene ethanol	103.30	SEPA
7	56	Levofloxacin	66.00	SEPA
8	57	Cinnamic acid	247.58	SEPA
9	59	3,5-DNBC/triiodoisophthalic	17.50	SEPA
10	60	Fipronil	28.00	SEPA
11	61	Processing of Aluminium, Uranium	67.20	SEPA
12	63	3,3,3-trifluoropropene	638.64	SEPA
13	64	Triphenylmethyl chloride	596.70	SEPA
14	65	Tetrachloride dimethylmethane	300.72	SEPA
15	66	4,4-difluorodiphenyl ketone	240.14	SEPA
16	67	4-trifluoromethoxybenzenamine	357.11	SEPA
17	68	1,2-benzisothiazol-3-ketone	280.60	SEPA
18	68	1,2-Benzisothiazol-3-Ketone	205.30	SEPA
	<b>Total Table A-bis uses in MT</b>		<b>4,442.03</b>	

<sup>1</sup> As defined by Table A-bis of Decision XVII/8.

**Table 4: Use of CTC for new PA applications identified in 2006 (metric tonnes)**

No.	Application No. in Dec. XVII/8	New process agent applications <sup>2</sup>	CTC purchase in 2006, MT	Reported by
31	NA	Chloromethane-sulfoniceaster	3.90	SEPA
32	NA	2-(p-Bromomethylphenyl) propionic acid	90.00	SEPA
33	NA	2-methoxy-3-methylpyrazine	7.10	SEPA
34	NA	4-(trifluorometoxy)aniline (TFAM)	82.93	SEPA
35	NA	4-Bromoanisole	8.00	SEPA
36	NA	4-Bromo-benzenesulfonyl	68.45	SEPA
37	NA	4-Chloro-2-Trichloromethyl pyridine	30.00	SEPA
38	NA	Chloropyrazine	14.20	SEPA
39	NA	diamino pyrazole sulphate	20.00	SEPA
40	NA	Dichloro-p-cresol	29.40	SEPA
41	NA	Dope	190.00	SEPA
42	NA	Doxofylline	17.30	SEPA
43	NA	Ethly $\gamma$ -chloroacetoacetate	75.57	SEPA
44	NA	Ethyl-4Chloroacetoacetate	20.00	SEPA
45	NA	Ozagrel	15.90	SEPA
46	NA	PVDF	36.38	SEPA
47	NA	Single-ester	3.00	SEPA
48	NA	Ticlopidine	19.80	SEPA
49	NA	Using as G.I.	9.90	SEPA
50	NA	$\beta$ -Bromopropionicacid	3.00	SEPA
51	NA	Acrylamide (N-(1,1-dimethyl-3-oxobutyl) (DAAM)	29.85	SEPA
		<b>Subtotal new process agent applications in MT</b>	<b>774.68</b>	

<sup>2</sup> To be reviewed and add to the list of process agent applications by the MOP at a future meeting.