

2005 VERIFICATION REPORT

FOR

**PHASE-OUT IN CONSUMPTION AND
PRODUCTION OF CTC IN INDIA**

WORLD BANK

WASHINGTON, D.C., USA

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1. Introduction

As a signatory to the Montreal Protocol on Substances that Deplete the Ozone Layer (Protocol), India is obligated to phase out, among other substances, carbon tetrachloride (CTC). India falls under the purview of Article 5 of the Protocol, which provides for incremental cost funding for phasing out production and consumption of Ozone Depleting Substances for controlled applications. As a country falling under the purview of Article 5, India is the recipient of a grant from the Multilateral Fund (MLF) for the implementation of the Protocol. The World Bank is the lead implementing Agency for CTC Sector Plan Implementation Project (the “ODS IV” Project) as per the Agreement between India and the Executive Committee of the MLF (Dec. 41/95) to assist in the phase-out of CTC production and consumption for non-feedstock applications in India.

Consistent with the verification requirements of the agreement (the agreement refers to the agreement between India and the ExCom as mentioned above), the World Bank appointed an independent verification team consisted of four experts from India:

ERM India Pvt. Ltd. - Dr. Anil Bhaskar

Mukund M Chitale & Company - Mr. G V Samant
 Mr. Saurabh Chitale
 Mr. Satish Bapat

In carrying out its assignment, we visited three CTC producers and all CTC feedstock users including four CFC producers (two of the four CFC producers are also CTC producers) and eight Dichloro Vinyl Acid Chloride (DVAC)¹ producers.

2. Objective

The objective of the present verification is to “monitor compliance” to the CTC phase-out schedule for production and consumption as stipulated in the Agreement. The applicable CTC production and consumption levels for 2005 are shown in Table 1.

“Compliance” in the context of this study was to verify the following:

1. Production of CTC in the country and CTC imported into the country,
2. Verifying and confirming the CTC consumption for the feed-stock and non-feedstock use, and
3. Verifying and confirming that consumption of CTC for non-feedstock applications is within the MoEF quota limits for the year 2005.

¹ DVAC, also called cypermethic acid chloride, is an important intermediate in the manufacture of various synthetic pyrethroids.

Table 1: Maximum Allowable Consumption and Production Levels in ODP tons

Year	CTC Consumption* (Row 1 of the Agreement)		CTC Production* (Row 2 of the Agreement)	
	Allowed	Verified	Allowed	Verified
Base	11,505	N/A	11,553	N/A
2005	1,726	1,657	1,726	(15,289)**
2006	1,147		1,147	
2007	708		708	
2008	268		268	
2009	48		48	
2010	0		0	

*Consumption and production as defined by the Montreal Protocol

**The verified production level derived from the production for non-feedstock sales is 1,657 ODP tons.

Figure under the allowed limits of CTC Consumption and CTC Production are provided by the Ozone Cell and are based on the Agreement signed in April 2005.

3. Verification Framework

An extensive review of the following components was undertaken:

- (a) Total annual CTC production, including CTC production for CFC and other feedstock and non-feedstock applications;
- (b) Total quantity destroyed annually by approved technologies; and
- (c) Total annual imports and exports of CTC.

Special attention was also given to transportation of CTC from producers and from storage facilities of CTC imported at ports to the intended feedstock users to ensure that there was no diversion of CTC to non-feedstock applications.

We have been informed that the audit activity for CTC Production and feed stock use needs to be undertaken in line with para. 2 of the Agreement between India and the ExCom. The terms “production” and “consumption” as defined by the Montreal Protocol are :

- (a) “Production” means the amount of controlled substance produced, minus the amount destroyed by technologies to be approved by the Parties and minus the amount entirely used as feedstock in manufacturing other chemicals. The amount recycled is not to be considered as “production”;
- (b) “Consumption” means production plus imports minus exports.

We were informed by the Ozone Cell that only CTC sold directly from the CTC producers to or imported directly by CFC and DVAC manufacturers is considered as

CTC use for feedstock purposes. CTC supplied to dealers is considered as for non-feedstock applications. In case CTC procured from dealers is subsequently sold to feedstock users, such quantity of CTC is still treated as CTC used for non-feedstock purposes. That quantity is considered as part of the consumption subjected to the control provision of the Agreement and Article 7 of the Montreal Protocol. This simplifies the tracking system for monitoring the movement of CTC in India and preempting any possible diversion of CTC to non-feedstock or “controlled” use of CTC. It is recognized that this methodology could lead to a reported consumption figure that is higher than actual consumption. For the purpose of verifying India’s compliance with the Agreement and the Protocol, this methodology provides a more stringent measure for India’s compliance.

4. Verification Methodology

The verification entailed reviews of the following information:

- (a) Production of CTC by all local producers;
- (b) Import of CTC by CTC users as well one CTC producer
- (c) Consumption of the locally procured and imported CTC by all feedstock users;
- (d) CTC sale to non-feedstock users as per the annual quotas issued by the Ozone Cell;
- (e) Registrations of all CTC producers and feedstock users issued by the Ozone Cell, Ministry of Environment and Forests (MoEF). Under the Environment Protection Act (1986), Ozone Depleting Substances (Regulation) Rules 2000 were established by the Government of India. According to the ODS Rules 2000, no person shall produce or cause to produce ODS unless he/she is registered with the Ozone Cell, MoEF. Because of this provision, all CTC producers and feedstock users have been registered with the Ozone Cell.
- (f) Registration records, maintained by CTC producers, of all CTC buyers for non-feedstock use. However, it should be noted that the end use of this CTC was not verified as it is not practical due to a large number of small users scattering throughout the country. We were informed according to the Verification Framework submitted to the 43rd Meeting of the ExCom, the final determination of India’s compliance does not require verification of non-feedstock use of CTC as it could be determined by the levels of CTC production, import/export, and feedstock use.

Key steps in the verification process include:

- (i) Obtaining enterprise-level information by having the Ozone Cell forward a questionnaire to each CTC producer and feedstock user and have the filled questionnaires returned by them prior to the site visits;
- (ii) Site visits were undertaken between 6 and 24 February 2006 to verify the actual production at the three CTC producers and to verify the use of CTC by feedstock users. In addition, the independent verification team also visited the CTC storage installations at Kandla, Gujarat, to assess the actual level of CTC imports and exports. Names of all enterprises audited by the independent verification team are included in Table 2.

Table 2: List of Enterprises Audited by the Independent Verification Team

No.	Enterprise	Category
	CTC Manufacturers	
1	SRF Limited, Jhiwana, Tehsil Tijara, District Alwar-301019, Rajasthan	Producer & Feedstock User - CFC
2	Chemplast Sanmar Limited (CSL), Veerakalpudur, Mettur Dam, Salem District 636403, Tamilnadu	Producer & Feedstock User - CFC
3	Gujarat Alkalies & Chemicals Limited (GACL), P.O. Petrochemicals-391346, District Vadodra, Gujarat	Producer
	Feedstock Users	
4	Gujarat Fluoro Chemicals Limited, Survey No. 16/3, 26,27 Taluka Ghoghmba, District Panchmahal, Ranjit Nagar, Gujarat 389380	Feedstock User - CFC
5	Navin Fluorine International Limited, Navsari Road, Bhestan, Surat 395023, Gujarat	Feedstock User - CFC
6	Bilag Industries Pvt. Limited, Plot # 306/3, II Phase, GIDC, Vapi 396 195, Gujarat	Feedstock User - DVAC
7	Gharda Chemicals Limited, B-27/29 MIDC, Dombivali (east) 421203, Thane, Maharashtra	Feedstock User - DVAC
8	Gujarat Agrochem Limited, Plot 2901 to 2906, GIDC, Panoli, Ankleshwar, Dist. Bharuch, Gujarat	Feedstock User - DVAC
9	Heranba Industries Pvt. Limited, Plot No. 1505/1506, GIDC, Phase III, Vapi, Gujarat 396195	Feedstock User - DVAC
10	Isagro Limited, Plot No. 640, GIDC, Bharuch District, Panoli, Gujarat 39116	Feedstock User - DVAC
11	Meghmani Organics Limited, Unit I, Block No. 402-3-4, 452-53-54, Village Chharodi, Tal. Sanand, District Ahmedabad Gujarat	Feedstock User - DVAC
12	Meghmani Organics Limited, Unit II, Plot No. 5001B, GIDC, Near Telephone Exchange, Ankaleshwar, District Baruch-393002, Gujarat	Feedstock User - DVAC

No.	Enterprise	Category
	Feedstock Users	
13	Tagros Chemicals Limited, A/4/1&A/4/2, SIPCOT Industrial Complex, Pachyankuppam, Cuddalore, Tamilnadu 607550	Feedstock User - DVAC
14	United Phosphorus Limited, 11, GIDC, Vapi 396 195, Gujarat	Feedstock User - DVAC
	CTC Storage Installations at Kandla, Gujarat	
15	CRL Terminals Pvt. Limited, Near Oil Jetty, Old Kandla (Kutch) 370 210	CTC Storage Agent
16	Kesar Enterprises Limited, Terminal #1 Near Oil Jetty, Old Kandla 370 210	CTC Storage Agent
17	Lanxess ABS Limited, Plot No. 8, Old Kandla 370 220	CTC Storage Agent
18	J.K. Synthetics Limited, Old Kandla 370 220	CTC Storage Agent
19	Friends Salt Works and Allied Chemicals, Old Kandla 370 220	CTC Storage Agent
20	J.B. Boda Surveyors Private Limited, Bunglow No. 16, Sector No. 4, Gandhidham, Kutch 370 201	Surveyor

The verification procedures employed during site visits included, amongst others, the following steps:

1. Review of the record keeping system of each enterprise such as production logs, issue logs, and dispatch logs;
2. Review of the daily raw material consumption data and daily production records for CTC and other chloromethane production;
3. Verification of annual production, imports, and local procurement of CTC. This step entails the following tasks:
 - i. An initial round of a facility tour to familiarize with the plant layout, and to meet with the key personnel;
 - ii. Verification of the data in the complete questionnaire filled by respective enterprises. This is carried out based on the documentary evidences called for by the independent verification team. The verification is done by cross-checking the data provided in the questionnaire against the production and excise records and also comprises of tracking these sets of data from the monthly records on a random basis;
 - iii. In addition to the above financial, commercial, and store records comprising of ledgers, invoices, Goods Receipt Notes (GRN), issue slips, statutory excise records, records of imported consignments including weigh bridge documents, surveyor's certificate, and others, are reviewed;

- iv. Efficacy of the documents used for these verification purposes is also tested to the extent possible. For example, imported consignments were cross checked against the purchase orders, suppliers' invoices, and surveyors' out-turn reports.
4. Mass balance analyses were conducted for the production of CFCs during the CFC audits and for the production of DVAC. The purpose is to verify whether CTC consumption for these applications is within the known and available industry norms. The process involved in the mass balance analyses includes:
 - i. Sighting the documentary evidence of the consumption of the raw materials; and
 - ii. Comparing the actual consumption with the theoretical (stoichiometric) requirement and the industry norm.²
5. Verification of cumulative inventory changes of "key" raw material (chlorine), in case of CTC producers, whether they are consistent with the production level of CTC and co-products;
6. Verification of cumulative inventory changes of "CTC", in case of CTC feedstock users: CFC producers and DVAC producers, whether they are consistent with the levels of CFC producers CFC and DVAC producers;
7. Verification of CTC destruction, if such activity is claimed by any producers or users;
8. Verification of cumulative inventory changes of CTC in transit³ to ensure no diversion of CTC intended for feedstock applications to non-feedstock applications to the extent they were made available for verification.

A summary report of the site visit made to CTC manufacturers and DVAC manufacturers is included as an annex of this report. We were informed that since a separate audit exercise for all CFC manufacturers was recently undertaken by the Bank, the detailed report of the CFC audit has been submitted to the ExCom at its 48th Meeting held in April 2006.

FINDINGS

In response of rapid reduction of the maximum allowable consumption and production levels from 2004 to 2005, an inventory of CTC of 1,607 MT was built up by the three CTC manufacturers. We were informed that this quantity has been reported by the Ozone Cell of India to the Ozone Secretariat as part of the total production and consumption in 2004. This stockpile of CTC will be used to supplement the supply of CTC in the following years when the maximum allowable consumption and production as per the Montreal Protocol and the Agreement of this Project is not sufficient. This is in line with the strategy proposed by the India CTC Sector Plan: Consumption and Production. The stockpile levels of the three CTC producers based on data supplied by them are shown in Table 3.

² The industry norm for CTC consumption in CFC production was obtained from the study report prepared by National Chemical Laboratory – the premier institution in India.

³ In "Transit" for this report means CTC in the storage facilities at the port, CTC dispatched from local CTC producers, and CTC arriving at the site of the consignee.

Table 3: Inventory at End of 2004 (Opening Stock of 2005) (MT)

Stockpile	SRF Limited	CSL	GACL	Total
CTC Inventory (as end of 2004) in MT	1,270	291	46	1,607

Note : Data as provided for verification by CTC Producers

Supply Side Audits

To verify the level of consumption and production for non-feedstock applications, the auditor undertook an audit from both the supply and demand sides. For the supply side, production and sales audits were conducted at the three CTC producers. Table 4 summarized the total production, non-feedstock and feedstock sales, imports, own feedstock use (if any), destruction, and opening and closing stocks, of each CTC producers. The quantities reported as actual sales to feedstock and non-feedstock users are based on the dispatched quantities as reported by CTC producers. The quantities of CTC imports are based on the bills of lading of all shipments arrived to India in 2005 and the outturn quantities as certified by Surveyor after discharge from ships into shore tanks.

Table 4: Summary of Supply Side Audits (MT)

CTC Producers	Opening Stock	Production	Sales		CTC for VCM	Own Feedstock Use	Imports	Closing Stock
			Feedstock	Non-Feedstock				
SRF Limited	1,270	5,680	4,095	521	-	4,291	2,570	613
Chemplast Ltd.	291	5,282	3,360	764	64	1,351	-	34
GACL	46	6,471	6,005	462	-	-	-	50
Total	1,607	17,433	13,460	1,747	64	5,642	2,570	697

The 36.8 MT figure presented in Table 4 is the closing stock at the chloromethane plant, excluding the closing stock of about 3 MT for the CFC plant. We were informed that this closing stock of 3 MT has been reported previously in the CFC verification report.

The quota for production of new CTC for sale to the non-feedstock market in 2005 was fixed by the Ozone Cell at the level of 523 MT for each of the three CTC producers. The quota and the actual sale of CTC made by each of the three CTC producers are summarized in Table 5.

Table 5: Quota and Actual Sale of CTC for Non-Feedstock Use (MT) in 2005

	SRF Limited	CSL	GACL	Total
CY 2005 Quota (MT)	523.000	523.000	523.000	1,569.000
Actual Production for Non-Feedstock Sale (MT)	520.720	523.000	462.157	1,505.877

In addition to the above quantity, an additional quantity of CTC of 241 MT was drawn by CSL from its stockpile. As per the Montreal Protocol definition for “production” and “consumption”, this quantity sold by CSL does not constitute as part

of the CTC production and consumption in 2005. Therefore, the total sales to non-feedstock use or consumption in 2005 is 1,747 MT less 241 MT from the stockpile, which is equal to 1,506 MT or 1,657 ODP tons. *The actual production and sales to non-feedstock use (or consumption) of 1,657 ODP tons, is well within the target of 1,726 ODP tons.*

CSL's stockpile of CTC produced prior to 2005, which could be made available to non-feedstock users in the future, is reduced by 241 MT. The balance of CTC stockpile available for future sales to non-feedstock use at the beginning of 2006 is shown in Table 6.

Table 6: Stockpile of CTC for Non-Feedstock Uses (MT) at the Beginning of 2006

Stockpile	SRF Limited	CSL	GACL	Total
CTC Inventory (as end of 2004) in MT	1,270	50	46	1,366

Demand Side Audits

The overall mass balance of CTC for CTC producers, CFC and DVAC manufacturers, is provided in Table 7. The mass balance analysis for each CTC producer and each CFC manufacturer is shown. We are informed by Ozone Cell that the feedstock use of CTC for production of DVAC is not controlled by the Montreal Protocol, and as such DVAC manufacturers are not beneficiaries to the MLF grant funds. We were also informed that there exists confidentiality agreements between the Ozone Cell and DVAC manufacturers, due to which the mass balance for the DVAC industry is presented in Table 7 are in an aggregated form. The auditor's detailed analyses of CTC mass balance for each individual enterprise is available at the Ozone Cell.

The auditor team verified all the figures presented in Table 7 in accordance with the established procedures described above. The quantities of CTC imports are based on the outturn quantity of all shipments arrived to India in 2005. In 2005, there was no record of any exports of CTC.

All feedstock users maintain good records of all the documents required for the audit process, except Heranba. Hence, the audit has to be conducted on the basis of the dispatch records of DV acid chloride.

In case of GFL, the CTC consumption reported in the 2005 CFC Verification Report is 5,432 MT. The audited figure in this report shows 5,425 MT. The difference of 7 MT represents the quantity of CTC that GFL purchased from dealers. Since the amount sold by dealers is counted as non-feedstock applications by the Ozone Cell, the feedstock use of CTC is, therefore, 7 MT less than the figure reported earlier.

For NFI, the CTC consumption as feedstock in 2005 is 4,130 MT including dormancy loss verified by us with the records of J B Boda – Surveyors and storage agent M/s J.K. Synthetics of 21 MT and balance 74 MT which has not been supported by consumption records. We were informed that the quantity reported earlier as CTC for CFC production is 3,882 MT giving a difference of 248 MT of which 130 MT was used for produced difluoro benzophenone (DFB). NFI has submitted a study report

prepared by an independent expert showing that CTC used in this process is totally converted to the final product. We were informed that the Ozone Cell is requesting that a more extensive review of this process to confirm the use of CTC for production of DFB as feedstock to be carried out by a reputable chemical institute or expert and submitted to the Ozone Cell before end of September 2006. We were also told that if the study proves otherwise, the quantity will be added to the 2005 consumption and thereby appropriate adjustments to stockpile of 2004 will be made.

Based on this demand side audit, it is confirmed that the total consumption of CTC for feedstock use (CFC and DVAC) is 30,708 ‘*’ MT plus another 64 MT for VCM operations at CSL. Hence, the non-feedstock consumption or consumption as defined by the Montreal Protocol can be calculated as follow:

$$\begin{aligned}\text{Consumption} &= \text{Opening Stock} + \text{Production} + \text{Import} - \text{Feedstock Use} - \text{Destruction} \\ &\quad - \text{Closing Stock} - \text{Stockpile} \\ &= 7,053.63 + 17,433.28 + 15,645.66 - 30,708 - 64 - 7,613.96 - 241 \\ &= 1,505.61 \text{ MT}\end{aligned}$$

The analysis of India’s compliance with the Montreal Protocol requirements and national production and consumption limits as per the Agreement is shown in Table 8.

* Based on the Definition of Production & Consumption as per Montreal Protocol. Issues for Production and Imports into country are considered in the computation.

Table 7: Overall CTC Mass Balance for the Period: 1 January 2005 – 31 December 2005 (MT)

CTC Feedstock User/Producer	Opening Stock	Production	Sales		Local Purchase of CTC or Issue for Feedstock				Total Local Purchase	Imports	Feedstock Use	VCM Use	Closing Stock
			Feedstock	Non-Feedstock	GACL	SRF	CSL	Others					
CTC/CFC Producers													
SRF Limited	1,270	5,680	4,095	521		4,291				2,570	4,291		613
Chemplast Ltd.	291	5,282	3,360	764			-			-	1,351	64	34
GACL	46	6,471	6,005	462			0			-	-		51
Gujarat Fluoro Chemicals Ltd.	2,710	-			-	-	105	-	105	5,663	5,425		3,053
Navin Fluorine International Ltd	814	-			251	-	540	-	790	3,900	4,130		1,374
Total	5,131	17,433	13,460	1,747	251	4,291	645	-	895	12,133	15,197		5,125
DVAC Industry	1,923	-	-	-	5,755	4,094	2,715	-	12,564	3,512	15,511		2,489
Total	7,054	17,433	13,460	1,747	6,005	8,385	3,360	-	13,459	15,646	30,708	64	7,614

Note: The use of CTC at Navin Fluorine International Limited includes 130 MT of Difluorbenzophenone use of CTC. It also includes 74 MT of losses relating to CTC for which detailed explanations were not made available from Navin Fluorine International Limited.

Table 8: Analysis of Production and Consumption as per the Montreal Protocol

Production	MT
Gross Production	17,433
Quantity Used for Feedstock*	31,268
Quantity Used for VCM (Feedstock)	64
Production	(13,899)

Consumption	MT
Production	(13,899)
Import	15,646
CTC produced before 2005	(241)
Export	-
Consumption	1,506

*The quantity used for feedstock included the quantity of CTC consumed by CFC and DVAC manufacturers in 2005, which is 30,708 MT, and the change in the inventory in 2005 from the production and import (560 MT). This is based on the fact that CTC produced or imported but not used in 2005 will be used for feedstock purposes in the following years. Given the quota on non-feedstock sales established by the Ozone Cell, this unused quantity in 2005, the change in the inventory in 2005 (7,614 – 7,054 = 560 MT), will not be made available to the market for non-feedstock or controlled use.

Conclusions

The production and consumption of new CTC for non-feedstock use in 2005 is 1,506 MT or 1,657 ODP tons. This remains within the maximum allowable limit of 1,722 ODP tons.

As per Article 7 reporting requirements, the 2005 production and consumption levels for India are -15,288.9 ODP tons (-13,899 MT) and 1,657 ODP tons (1,506 MT), respectively.

India is, therefore, in compliance with the 2005 production and consumption stipulated in the Agreement and also in compliance with the Montreal Protocol.

The 2004 stockpile of CTC that could be made available to supplement the CTC demand in the non-feedstock applications from 2005 onwards is 1,607 MT. A total of 241MT of CTC was withdrawn from this stock in 2005 by CSL and was made available to the consumption sector. The balance of the 2004 stockpile for future use is 1,366 MT.