



TOGETHER
for a sustainable future

OCCASION

This publication has been made available to the public on the occasion of the 50th anniversary of the United Nations Industrial Development Organisation.



TOGETHER
for a sustainable future

DISCLAIMER

This document has been produced without formal United Nations editing. The designations employed and the presentation of the material in this document do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations Industrial Development Organization (UNIDO) concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries, or its economic system or degree of development. Designations such as “developed”, “industrialized” and “developing” are intended for statistical convenience and do not necessarily express a judgment about the stage reached by a particular country or area in the development process. Mention of firm names or commercial products does not constitute an endorsement by UNIDO.

FAIR USE POLICY

Any part of this publication may be quoted and referenced for educational and research purposes without additional permission from UNIDO. However, those who make use of quoting and referencing this publication are requested to follow the Fair Use Policy of giving due credit to UNIDO.

CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org

23553

Project Completion Report for Tobacco Sector Plan for CFC-11 Phase-out in China

Tobacco Sector Plan for CFC-11 Phase-out in China

Project Completion Report

**State Tobacco Monopoly
Administration**

Dec. 2007

Prepared by:

State Tobacco Monopoly Administration

College of Environmental Sciences and Engineering, Peking University

Contents

Introduction	6
Summary	6
Chapter 1: CFC-11 consumption in Chinese tobacco sector.....	9
1.1 Tobacco sector development and its demand on expanded tobacco	9
1.2 Expanded tobacco production and its CFC-11 consumption	11
Chapter 2: Actions in tobacco sector.....	12
2.1 Awareness raising	12
2.2 Phase-out policies	15
2.3 Quota system.....	17
Chapter 3: Bidding system and equipment dismantlement	20
3.1 Bidding system.....	20
3.2 Dismantlement of subsidized equipments	23
3.3 Dismantlement of unsubsidized equipments.....	29
Chapter 4: Technical assistance	30
4.1 Implementation of technical assistance	30
4.2 Development of alternative technologies.....	36
Chapter 5: Application of alternative technologies	36
5.1 Faced challenges	36
5.2 Investment in alternative technologies	36
5.3 Demand satisfaction of expanded tobacco supported by alternatives	41
Chapter 6: Contributions by Chinese tobacco sector in CFC-11 phase-out	48
6.1 Reduction of CFC-11 emission through phase-out	48
6.2 Contribution to CFC-11 phase-out by China in global tobacco sector.....	48
6.3 Achievements and experiences	50
Appendix	52

Charts

Comparison of actual CFC-11 consumption with its corresponding quota during 2001-2006.....	7
Fig. 1.1 Historical cigarette production in China (left).....	10
Fig. 1.2 Historical unit consumption of tobacco leaf in China (right)	10
Fig. 1.3 Percentage of unsubsidized equipment in 73 lines.....	11

Fig. 2.1 Dismantlement manuals for CFC-11 tobacco expansion equipment.....	14
Fig. 2.2 Dismantlement CD for CFC-11 tobacco expansion equipment	14
Fig. 2.3 Webpage for CFC-11 phase-out action in tobacco sector	15
Fig. 3.4 Recovery of cold tank and working tank in Wulanhaote Factory (right).....	29
Fig. 3.5 Dismantling notarial deed in Guiyang Factory	29
Fig. 3.1 CFC-11 dismantlement in Zhengzhou Factory	27
Fig. 3.2 Dismantling certificate in Xinjiang Factory	28
Fig. 3.3 Reclaiming certificate for dismantled equipment in Shenzhen Factory (left)	28
Fig. 4.1 General overview of technical assistances	31
Fig. 6.1 Comparision on CFC-11 consumption (predicted and actual) and its reduction	48

Tables

Dismantling inventory of CFC-11 expansion equipment during 2001-2007	8
Summary for the Sector Plan	9
Table 1.1 Demand of expanded tobacco (estimated)	12
Table 1.2 CFC-11 consumption after execution of the Montreal Protocol (estimated)	12
Table 2.1 Phase-out policies and regulations in tobacco sector	16
Table 2.2 Policy inventory for CFC-11 consumption phase-out within tobacco sector	16
Table 2.3 CFC-11 consumption by 58 factories during 2001-2006	18
Table 3.1 Implementation of bidding system	20
Table 3.2 Inventory for factories who dismantled their equipment	21
Table 3.3 Inventory of factories assigned the contracts.....	24
Table 3.4 Information for equipment dismantlement (for unsubsidized).....	29
Table 4.1 Summary of technical assistance	33
Table 5.1 Inventory of CO ₂ tobacco expansion equipment in tobacco sector	37
Table 5.2 Sum of CO ₂ tobacco expansion equipment in tobacco sector.....	39
Table 5.3 Sum of online tobacco expansion equipment in tobacco sector	40
Table 5.4 Inventory of online tobacco expansion equipment to alternative CFC-11 equipment (17 lines)	41
Table 5.5 Alternative technology and corresponding factories	42

Table 5.6 Dismantling schedule and alternatives, 73 lines in 58 factories	44
Table 6.1 Reduction of CFC-11 consumption after using alternative technologies	48
Table 6.2 Tobacco production in the world during 1999-2004	49

Acronyms:

Administrative Information System (AIS)
Department of Science and Education (DSE)
Foreign Economic Cooperation Office (FECO)
General Administration of Customs (GAC)
Ministry of Foreign Trade and Economic Cooperation (MFTEC)
Multilateral Fund (MLF)
Ozone Depleting Substances (ODS)
Small and Median Enterprises (SMEs)
State Administration for Industry and Commerce (ICA)
State Development Planning Commission (SPC)
State Environmental Protection Administration (SEPA)
State Economic Trade Commission (SETC)
State Tobacco Monopoly Administration (STMA)
State Petroleum and Chemical Industry Administration (SPCIA)
Special Working Group (SWG)
United Nation Industrial Development Organization (UNIDO)

Introduction

Along with the implementation of the Montreal Protocol on Substances that Deplete the Ozone Layer, ozone protection has increased remarkably domestically and abroad. On Jul. 1st 2007, a meeting to discuss the total phase-out of CFCs and Halons in China was held in Changshu City, Jiangsu Province. The Chinese Government is committed to phase out ozone depleting substances (ODS). Since the meeting, China has phased out CFCs and Halons production and consumption, ahead of the schedule by two and a half years, in agreement with the Montreal Protocol on Substances that Deplete the Ozone Layer (with the exemption of controlled uses regulated by the Montreal Protocol).

Based on a survey carried out within the whole tobacco sector in 1997, 58 factories used CFC-11 for tobacco fluffing; they consumed 1,090 tonnes of CFC-11, accounting for 1.6% of China's total ODS consumption, and for 4.4% of the total CFC-11 consumption. Due to the peculiarity of CFC-11 tobacco expansion technology, CFC-11, once used, discharges instantly and completely. Therefore, the tobacco sector's emission of CFC-11 accounted for 8% of the total national CFC-11 emission. In March 2000, the Tobacco Sector Plan for CFC-11 Phase-out in China was approved by the Executive Committee of the Multilateral Fund. Based on this plan, the State Tobacco Monopoly Administration (STMA) and the State Environmental Protection Administration (SEPA) have established a series of policies and measures to phase out CFC-11. These include raising awareness, training, implementation of a CFC-11 quota system, spread of alternative technologies, safety and environmental friendly regulations on tobacco production, and dismantling manuals for CFC-11 tobacco expansion equipment. By Jan. 1st 2007, 1,090 tonnes of CFC-11 had been successfully phased out.

This report summarizes the activities and experiences during the execution of the Tobacco Sector Plan for CFC-11 Phase-out in China. The plan's goals were to push forward phase-out policies and measures, advance and spread the application of alternative technologies in order to contribute to global ozone layer protection.

Summary

By 2007, under the leadership of the STMA, China has phased out 1,090 tonnes of CFC-11 in the tobacco sector and dismantled 73 lines of CFC-11 tobacco expansion equipment.

In May 1998, for the implementation of CFC-11 phase-out plan in tobacco sector, the STMA and SEPA set up a joint working group, Special Working Group (SWG). With the support of the Multilateral Fund (MLF), the SWG carried out a 2 year nation-wide survey of CFC-11 consumption within the tobacco sector, and then participated in the preparation of the Tobacco Sector Plan for CFC-11 Phase-out in China. The plan included a thorough analysis of CFC-11 consumption, phase-out strategies, and prospects for the Chinese tobacco sector. In March 2000, the 30th Executive Committee Meeting of the Montreal Protocol approved the plan. With the leadership of the STMA and SEPA, and in cooperation with UNIDO, the SWG was in charge of its implementation.

With careful preparation and organization, the Tobacco Sector Plan for CFC-11 Phase-out in China has been successfully implemented. The STMA specifically issued

CFC-11 consumption quotas. In addition, effective and efficient supervision and measures have been established and implemented, including an administrative information system (which guarantees the implementation of the Sector Plan), alternative technologies, safety and environmental friendly regulations, expanded tobacco quality standards and dismantling manuals for CFC-11 tobacco expansion equipment (which ensure a successful phase-out).

The establishment of CFC-11 quota system and its implementation play a key role in CFC-11 phase-out. On Dec. 5th 2000, the STMA issued *Notice on carrying out Freon (CFC-11) phase-out* (by the Department of Science and Education, STMA [2000] No.782), and *Method on quota management for CFC-11 consumption*. Based on the Sector Plan, the STMA and SEPA issued CFC-11 consumption quotas to all cigarette factories, limiting annual permitted consumption. The quota system includes establishment of a base quota, quota extension, enforcement, consumption supervision, and actual consumption inspection.

In 2001 and 2002, the actual amount of CFC-11 phased-out exceeded the goals set by the Sector Plan. During 2003-2006, the phase-out was completed. The quota set by the Tobacco Sector Plan for CFC-11 Phase-out in China and its actual consumption are shown in the following chart.

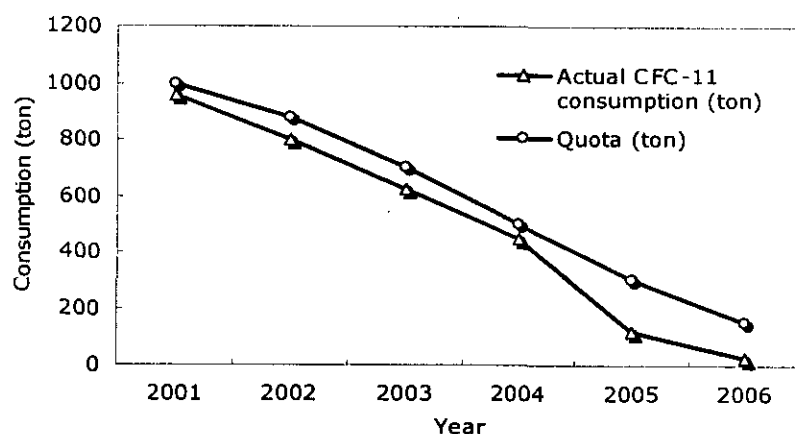


Fig. Comparison of actual CFC-11 consumption with its corresponding quota during 2001-2006

To ensure factories stop using CFC-11, and the dismantled equipment will not be transferred for continuous use within the tobacco sector, the STMA also issued *Dismantling regulation for CFC-11 tobacco expansion equipments*. Factories were encouraged to stop using CFC-11 ahead of time and successfully dismantle equipment. As soon as the Sector Plan was put into practice, officials from STMA and SEPA, and experts from UNIDO witnessed the dismantlement of CFC-11 tobacco expansion equipment in Changchun Factory on Mar. 20th and 21st, 2001, the first line dismantlement of CFC-11 tobacco expansion equipment.

Dismantling inventory of CFC-11 expansion equipment in tobacco sector is shown in the following Table.

Table Dismantling inventory of CFC-11 expansion equipment during 2001-2007

Year	Line	Factory
2001	9	Tongren Factory, Bijie Factory, Lichuan Factory, Zaoyang Factory, Chongqing Factory, Hangzhou Factory, Yuxi Changchun Factory, Wuhu Factory
2002	11	Kaifeng Factory, Wuhan Factory, Guangshui Factory
2003	13	Guiyang Factory, Beijing Factory, Hongan Factory, Tianjing Factory, Guiding Branch Factory, Danyang Factory, Luohe Factory, Harbin Factory, Chengdu Factory, Lanzhou Factory, Chuzhou Factory, Fuyang Factory, Hefei Factory
2004	12	Shenyang Factory, Meizhou Factory, Zhanjiang Factory, Lianjiang Factory, Zhangjiakou Factory, Nanchang Factory, Luohe Factory, Mianyang Factory
2005	13	Shaoguang Factory, Nanxiong Factory, Nanhai Factory, Hainan Factory, Yanji Factory, Shijiazhuang Factory, Zhumadian Factory, Xiamen Huamei Factory, Zhangjiakou Factory, Nanchang Factory, Luohe Factory, Mianyang Factory
2006	8	Zhengzhou Factory, Xinjiang Factory, Guiyang Factory, Shenzhen Factory, Guiding Factory, Zhanjiang Factory
2007	7	Hohhot Factory, Xianning Factory, Anyang Factory, Wulanhaote Factory
Total	73	

For each dismantlement, STMA and SEPA officials were on site, with officials from the local Environmental Protection Agency (EPA) to supervise the process. It was recorded by taking pictures and screening, which were then used to raise awareness within the tobacco sector and the public.

Through the quota system, bidding system, and price agreements, 56 lines of CFC-11 tobacco expansion equipment eligible for funding by the MLF have been dismantled. The remaining 17 lines have been dismantled by the factories themselves according to requirements set by national policies.

In Sep. 2007, the last line of CFC-11 tobacco expansion equipment was dismantled in Hohhot Factory. In all, 73 lines of equipment distributed in 58 cigarette factories have been dismantled.

Along with the phase-out of CFC-11 tobacco expansion technology and its equipment dismantlement, the SEPA and STMA issued: *Development and spread of alternative technologies for tobacco expansion*. The STMA prepared and issued: *Technical specifications and quality control method for non-CFC-11 alternative technologies in*

tobacco expansion, *Effect of different tobacco raw materials on the quality of non-CFC-11 expansion tobacco*, and *Effect of different expansion technologies on the chemical constituents of tobacco*. Technical assistance has been provided by the STMA to promote alternative technologies. In 2005, the STMA also issued: *General clauses on clean production in cigarette factories (YC/T199-2005)* to set a new production standard within the tobacco sector.

CO₂ tobacco expansion technology is the best substitute for CFC-11 for tobacco expansion. The investment in CO₂ tobacco expansion equipment by tobacco factories has reached 360.75 million US dollars. Considering its high cost, some other factories have adopted online expansion technology, with a total investment of 97.2 million US dollars. The Multilateral Fund for the whole tobacco sector is only 11 million US dollars. Judging from the the huge financial gap between costs and provided funding, tremendous efforts have been made by the Chinese tobacco sector to comply with international commitments to the Montreal Protocol. On Jul. 1st 2007, at the conference *To accelerate CFCs and Halons phase-out in China*, the STMA was awarded with the Contribution Award for CFCs/Halons phase-out, delivered by UNIDO, UNEP, and SEPA for the great contribution made by the tobacco sector. The summary for Sector Plan implementation is shown in the table below.

Table Summary for the Sector Plan

Items	Contents
Phase-out objectives	58 tobacco factories used 73 lines of Freon (CFC-11) tobacco expansion equipment to produce expanded tobacco. 56 lines out of 73 are eligible for funding, were remaining of 17 are not.
Phase-out strategies	To gradually dismantle all CFC-11 equipment and issue CFC-11 quotas to regulate its annual consumption.
Implementation policies	Establishment of quota system for CFC-11 consumption. CFC-11 quotas are annually issued to each factory. Promulgate CFC-11 consumption ban within the whole sector.
Administrative system	The STMA and SEPA are responsible for the Sector Plan. SWG is in charge of organizing and managing phase-out activities. UNIDO supervisions.
Technical assistance	To improve awareness of ozone layer protection, to develop and spread alternative technologies, to improve the capacity of establishing and implementing an administrative information system.

Chapter 1: CFC-11 consumption in Chinese tobacco sector

1.1 Tobacco sector development and its demand on expanded tobacco

The tobacco sector has always made an important contribution both to the economic development and trade in China. China is the largest tobacco producer and consumer in the world. Yearly production of tobacco leaf by Chinese factories accounts for about 35% of the world's total. Chinese cigarette sales account for approximately 32% of the total. According to the data provided in the Tobacco Sector Plan for CFC-11 Phase-out in China, there were 179 tobacco factories in 1997 domestically, which produced 1,684 billion cigarettes per year,

equivalent to 1.39 million tonnes of tobacco. In 2006, when the Sector Plan was completed, the production was 2,024.2 billion cigarettes, equivalent to 40.436 million boxes, an increase of 20% compared to 1997.

Along with the steady growth of cigarette production, China's demand on expanded tobacco increased even faster. Mixing a certain amount of expanded tobacco not only improves cigarette taste and product quality, but also, more importantly, decreases tobacco leaf consumption and tar content. Expanded tobacco can both effectively reduce the harm to human health and production cost. Therefore, the application of expanded tobacco is an inevitable trend within the tobacco sector.

Based on the requirement for expanded tobacco and CFC-11 phase-out, 10-year mid-term objectives have been set by the STMA in 1997:

To carry out new national guidelines and lower tar and nicotine content by 20%.

To decrease costs, improve productivity, and promote competition among cigarette factories.

To fund alternative technologies.

To achieving these goals, research and development of alternatives is crucial, since it decreases unit tar and nicotine content and cuts production costs. To decrease unit contents of tar and nicotine, tobacco products require at least 15% of expanded tobacco on average. During 1997-2007, the output of tobacco products was about 1.39 million tonnes with no substantial increase, while the proportion of expanded tobacco grew from 4% to 15%. The demand of expanded tobacco still has a substantial growth possibility. However, the major expanded tobacco technology, CFC-11, faces being phased out. This can possibly cause an imbalance of supply and demand, challenging the stable and healthy development of the tobacco sector.

Historical cigarette production and unit tobacco leaf consumption in China are shown in the following Fig.1.1 and Fig. 1.2, respectively.

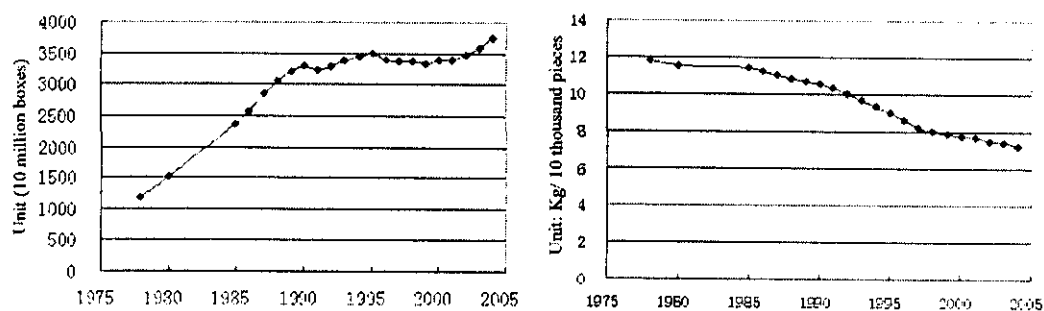


Fig. 1.1 Historical cigarette production in China (left)

Fig. 1.2 Historical unit consumption of tobacco leaf in China (right)

According to the cigarette production and unit consumption of tobacco leaf shown in Fig. 1.1 and 1.2, there has been a continuous increase in cigarette production along with a reduction of unit tobacco leaf consumption. Expanded tobacco contributes to this reduction.

1.2 Expanded tobacco production and its CFC-11 consumption

At the beginning of 1970s, some developed countries such as the United States and Japan began to use CFC-11 as a tobacco expanding agent. By the mid-1980s, about 150 thousand tonnes of expanded tobacco were produced worldwide, with 6,000 tonnes of CFC-11 consumed annually. In 1986, Guangzhou Factory brought in the first line of CFC-11 tobacco expansion equipment. In 1987, China imported another two CFC-11 types. In 1989, the first line of domestically made CFC-11 expansion equipment was put into operation. CFC-11 tobacco expansion equipment has the following advantages: compact size, low chamber pressure, safe operation, and low energy consumption. CFC-11 tobacco expansion equipment was quickly adopted by major tobacco producers all over China.

In Nov. 1997, China formally prohibited installing new CFC tobacco expansion equipment. 56 lines out of the total 73 were installed before Jul. 25th 1995, which were eligible to be funded by the Multilateral Fund. The remaining 17 units, 23% of the total, were installed after that time, and therefore not eligible for funding. The percentage is shown in Fig. 1.3.

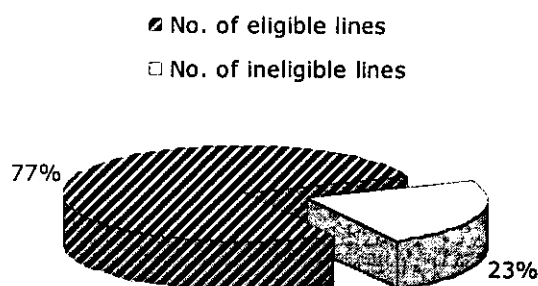


Fig. 1.3 Percentage of unsubsidized equipment in 73 lines

To meet the demand of expanded tobacco, some tobacco factories chose to install CO₂ tobacco expansion equipment to replace dismantled CFC-11 expansion equipment. This kind of new equipment cost about 10-11.25 million US dollars each. In addition, since CO₂ equipment is much bigger, tobacco factories had to build new workshops, creating considerable additional costs.

Table 1.1 and Table 1.2 show the demand of expanded tobacco (estimated) and CFC-11 consumption after execution of the Montreal Protocol (estimated).

Table 1.1 Demand of expanded tobacco (estimated)

Year	1999	2000	2001	2002	2003
Total output of expanded tobacco (tonnes)*	78,000	98,000	122,000	153,000	200,000
CO ₂ equipment output (tonnes)	49,000	63,000	80,000	103,000	140,000
CFC-11 equipment output (tonnes)	29,000	35,000	42,000	50,000	60,000

* Based on long term planning for tobacco sector development authorized by the STMA.

Table 1.2 CFC-11 consumption after execution of the Montreal Protocol (estimated)

Year	1999	2000	2001	2002	2003
Total CFC-11 consumption (tonnes)	1,700	2,000	2,300	2,600	2,900

In May 1998, the SEPA and STMA organized the SWG. With the assistance of the UNIDO, this group includes the Centre of Environmental Sciences, Peking University, and Zhengzhou Tobacco Research Institute of China National Tobacco Corp. It has conducted a survey of CFC-11 consumption within the tobacco sector and prepared the Tobacco Sector Plan for CFC-11 phase-out. In Sep. 1999, the Sector Plan was completed and submitted to the 29th Executive Committee of the Multilateral Fund by the UNIDO. In Mar. 2000, it was approved by the 30th Executive Committee. The total fund for CFC-11 phase-out was 11 million US dollars and the implementation schedule was from Jan. 1st 2001 to Dec. 31st 2006.

Chapter 2: Actions within the tobacco sector

2.1 Awareness raising

The STMA conducted training to facilitate the implementation of the Sector Plan and enhance awareness within the management staff and employees in tobacco factories, as well as the public.

a. Tobacco sector awareness

The STMA organized several meetings at various levels to issue information materials and raise initiative. In Aug. 1999, the Department of Science and Education (DSE) and the Planning Department, STMA, the Foreign Economic Cooperation Office (FECO), and SEPA, jointly held the first meeting for CFC-11 phase-out in Changchun City. Representatives from 58 cigarette factories and the Provincial Tobacco Monopoly Bureaus attended. It aimed to raise initiative for ozone layer protection, primarily by phasing out CFC-11. Mr. Xiong Kang, Director of the 3rd Division of FECO, introduced national policies and programs for ODS phase-out; Mr. Ren Min, Director General of DSE, STMA, called on the interests of factories to make arrangements and work hard for CFC-11 phase-out. The phase-out schedule of CFC-11 expansion tobacco equipment was agreed upon at this meeting.

After the Tobacco Sector Plan for CFC-11 Phase-out in China was approved, phase out began primarily through communication and education. In Dec. 2000, the SEPA and STMA jointly held the second meeting for CFC-11 phase-out within the tobacco sector in Guangzhou City. In total, 200 participants from the SEPA, STMA, Provincial Tobacco

Monopoly Bureaus, and 58 cigarette factories attended. Pan Bixing, the Minister of the STMA, Ren Min, the Director General of DSE, STMA, and Xiong Kang, the Director of 3rd Division of FECO, SEPA, addressed their remarks, respectively. The representatives discussed the report provided by the SEPA and STMA. This meeting helped the participants improve their understanding of ozone layer protection, CFC-11 phase-out processes, and their responsibility to implement the phase-out plan.

In Dec. 2002, the OFEC, SEPA, DSE, and STMA held meetings to review CFC-11 phase-out in Beijing. Yu Mingfang, Director of Integrated affairs, Division of the DSE, STMA, reported on the progress. Song Xiaozhi, Deputy Director General of the OFEC, SEPA, Wang Yanting, Director General of the DSE, STMA addressed their remarks, respectively. The attendants exchanged their implementation experience and discussed how to improve management and supervision. Communication and education helped personnel to understand phase-out policies and actions.

b. Training

Technical training was conducted to improve staff management capability and to enhance awareness and skills of alternative technologies. The SWG was responsible for organizing training. From 2001 to 2006, total input costs for training reached nearly 200,000 US dollars. A series of activities had been launched including the introduction of alternative technologies, policies, regulations, and sharing of phase-out experiences. The trainees include government officials and staff from 58 cigarette factories. Training took the form of workshops, courses, conferences, discussions, and online learning. Training content includes information about ozone layer protection, the Montreal Protocol, phase-out policies, regulations, and alternatives.

The SWG issued dismantling manuals for CFC-11 tobacco expansion equipment within the tobacco sector (Fig. 2.1). These manuals including the scheme, preparation, approach, possible problems and solutions, and planned results. Training CDs that recorded the dismantlement process (Fig. 2.2) were also provided.



Fig. 2.1 Dismantlement manuals for CFC-11 tobacco expansion equipment



Fig. 2.2 Dismantlement CD for CFC-11 tobacco expansion equipment

c. Public awareness

Ozone layer protection and ODS phase-out were publicized by the media, raising public environment awareness and creating favorable circumstances for phase-out.

Since 2001, information of CFC-11 phase-out in tobacco sector has been published by newspapers, magazines, and on the internet. Periodicals such as *Action on Ozone Layer Protection*, *Tobacco Science and Technology*, *Domestic and Abroad Tobacco*, *China Environment News* have followed the phase-out progress, policies, and measures and reported on the ozone layer destruction by ODS. The bi-monthly *SWG Special Journal on the Advancement of CFC-11 Phase-out in Tobacco Sector* has also publicized phase-out actions.

The Internet plays an important role in public communication, providing a very effective tool for information transmission. Fig. 2.3 displays the webpage for CFC-11 phase-out actions. It promptly reports on the Sector Plan's implementation. The site includes information about project management, its progress, alternatives, dismantlement of CFC-11 tobacco expansion equipment, and annual reports.



Fig. 2.3 Webpage for CFC-11 phase-out action in tobacco sector

2.2 Phase-out policies

In cigarette production, tobacco expansion is an important technological procedure, directly impacting the quality of cigarettes and production costs. Since CFC-11 expanded tobacco has special advantages such as cost, product quality, and resulting profits, most factories were reluctant to voluntarily phase out CFC-11 equipment ahead of the schedule. Furthermore, alternatives that could maintain regular production required substantial financial investment. In order to promote early phase-out, policies and measures were used to persuade the factories. On Dec. 5th 2000, the STMA issued *Notice on phase out Freon (CFC-11) in tobacco sector* (Department of Science and Education, STMA [2000] No.782) and announced *Management regulation on quota of CFC-11 consumption*. The method prescribes that the STMA and SEPA annually issue CFC-11 consumption quotas to cigarette factories based on the Sector Plan.

The STMA also issued *Implementation method for the dismantlement of CFC-11 tobacco expansion equipments*, encouraging factories to stop CFC-11 consumption and dismantle CFC-11 expansion equipment as early as possible to prevent CFC-11 consumption transfer.

The Administrative Information System (AIS) was established to monitor Sector Plan implementation through data transfer, reports, and inspection. AIS eases data sharing and CFC-11 consumption monitoring. Tobacco companies can check remaining cigarette productivity dependent on CFC-11 and available amount of expanded tobacco. As a means of supervision and enforcement, the AIS ensures a successful phase-out.

To accelerate the application of alternative technologies, the STMA promulgated the *Norms for application of CFC-11 alternative technology and safety*, and revised the *Quality standards for expanded tobacco*, etc.

On Dec. 11th, 2006, the STMA and SEPA jointly issued a ban of CFC-11 consumption

within the tobacco sector, beginning Dec. 31st, 2006. This marks the successful phase-out within the Chinese tobacco sector.

Table 2.1 Phase-out policies and regulations in tobacco sector

Date	Titles	Publishing departments
2000.12.5	<i>Notice on phase out Freon (CFC-11) in tobacco sector (the DSE, STMA [2000] No.782) Attached: The management regulation on quota of CFC-11 consumption; Implementation method on dismantlement of CFC-11 tobacco expansion equipment.</i>	STMA
2006.12.11	<i>Ban: Since Dec. 31st, 2006, CFC-11 consumption is banned in tobacco sector.</i>	SEPA & STMA

In Nov. 1997, the SEPA, State Development Planning Commission (SPC), State Economic Trade Commission (SETC), and State Administration for Industry and Commerce (ICA) jointly issued a notice to ban building, extending, or reconstructing equipment which produce or consume ODS. This notice has been efficiently implemented with no newly-built or re-built CFC-11 tobacco expansion equipment, thereby controlling CFC-11 consumption at the source.

On Dec. 3rd, 1999, the SEPA, the Ministry of Foreign Trade and Economic Cooperation (MFTEC), and the General Administration of Customs (GAC) jointly issued the *Management regulation on import and export of ozone depleting substances (ODS)*. The import and export of CFC-11 expanded cigarettes has been controlled through policies, investigation, and data analysis. The conclusion was there is ultimately no expanded tobacco being imported or exported; therefore the control objectives of import and export by the Sector Plan have been achieved.

On May 31st, 1999, the SEPA and the State Petroleum and Chemical Industry Administration (SPCIA) jointly issued the *Notice on the implementation of chlorofluorocarbons (CFCs) production quota license management strictly restricting CFC-11 production*. On Jun. 21st, 2007, the SEPA issued the *Notice on the prohibition of all chlorofluorocarbons (CFCs) production*, which banned CFCs production nationally, and ensured the completed phase-out of CFC-11 consumption within the tobacco sector.

Table 2.2 Policy inventory for CFC-11 consumption phase-out within tobacco sector

(National policies and measures related to CFC-11 phase-out)

Date	Titles	Publishing departments
-------------	---------------	-------------------------------

1997.11.11	<i>Notice to ban newly-built, extending or reconstructing ODS production or consumption equipments</i>	SEPA State Planning Commission, State Economic and Trade Commission, State Administration for Industry & Commerce
1999.5.31	<i>Notice on the implementation of CFCs production quota management</i>	SEPA State petroleum and Chemical Industry Bureau
1999.12.3	<i>Method on Import and export of ozone depleting substances (ODS) management</i>	SEPA, the Ministry of Foreign Trade and Economic Cooperation (MFTEC), the General Administration of Customs (GAC)
2007.5.28	<i>Bulletin: on the issuance of ozone depleting substances (ODS) directory of recommended alternatives (Amendment)</i>	SEPA
2007.6.21	<i>Ban on chlorofluorocarbons (CFCs) production</i>	SEPA

2.3 Quota system

The quota system is the most important method to phase out CFC-11 consumption within the tobacco sector. It is practical, controllable, and can guarantee the phase-out objectives are fulfilled.

The SEPA and STMA firstly identified annual CFC-11 consumption control targets and the total consumption quota for cigarette factories. The implementation of quotas includes the following steps: quota base establishment, application by factories, issue by STMA, consumption supervision, and actual consumption inspection. Cigarette factories are allowed to use CFC-11 tobacco expansion equipment only when they have a consumption licenses and have been issued a quota. Each quota was only in effect for its validity period of one year and its trade was forbidden.

During implementation, the total CFC-11 consumption was much lower than the issued quotas in both 2001 and 2002. During 2003-2006, the phase-out targets had been achieved and CFC-11 actual consumption amounts were all below the issued quotas (as shown in Table 2.3). In total, the summed reduction of CFC-11 consumption between 2001 and 2006 exceeded the stated targets by 774.9 tons.

Table 2.3 CFC-11 consumption by 58 factories during 2001-2006

(Unit: ton)

Factory	2001	2002	2003	2004	2005	2006
Zunyi Factory	0.00					
Zangyang Factory	0.00					
Chongqing Factory	0.00					
Tongren Factory	0.00					
Lichuan Factory	0.00					
Chengdu Factory	0.00					
Bengbu Factory	0.00					
Xiangfan Factory	0.00					
Wuhan Tobacco Co. Ltd.	0.00					
Bijie Factory	0.00					
Kaifeng Factory	4.81					
Huaiyin Factory	3.40					
Xuzhou Factory	12.75					
Hangzhou Factory	11.20					
Longyan Factory	58.80					
Guangshui Factory	6.24	0.67				
Lanzhou Factory	9.47	10.15				
Tianjing Factory	7.31	13.51				
Hong'an Factory	14.75	4.30				
Beijing Factory	32.76	21.03				
Dangyang Factory	9.82	9.24				
Hefei Factory	31.5	0.00				
Guiyang Factory	55.95	36.5				
Guiding Branch Factory	8.00	5.00	1			
Siping Factory	0.85	2.00	0.00			
Harbin Factory	0.50	0.00	0.00			
Shenyang Factory	7.75	10.75	6.75			
Chuzhou Factory	20.75	13.2	14.75			

Project Completion Report for Tobacco Sector Plan for CFC-11 Phase-out in China

Factory	2001	2002	2003	2004	2005	2006
Meizhou Factory	23.52	15.60	9.77			
Lianjiang Branch Factory	2.09	1.81	12.21			
Liuzhou Factory	28.87	28.98	13.5			
Fuyang Factory	15.24	21.83	11.04			
Nanxiong Factory	9.08	0.00	30.00			
Xiamen Factory	45.75	44.5	20.25			
Xianning Factory	11.36	12.62	7.82	0.00		
Yanji Factory	7.83	11.02	6.00	6.00		
Nanghai Factory	17.84	12.88	20.00	7.00		
Ruzhou Factory	8.54	5.55	8.00	8.00		
Zhangjiakou Factory	11.69	11.83	8.00	12.00		
Shaoguan Factory	50.12	59.64	65.00	15.00		
Nanchang Factory	14.96	14.69	0.00	15.00		
Tianshui Factory	4.55	6.35	8.00	16.00		
Mianyang Factory	20.04	15.36	0.00	16.00		
Hainan Factory	17.36	14.72	18.00	20.00		
Luohe Factory	23.6	27.00	28.00	20.00		
Shijiazhuang Factory	19.75	27.25	32.00	32.00		
Zhumadian Factory	28.50	26.25	35.00	35.00		
Zunyi Factory	27.07	30.50	30.00	40.00		
Zhengzhou Factory	36.17	39.38	40.00	45.00		
Huamei Cigarette Co. Ltd.	4.50	3.50	6.00	6.00	2.00	
Zhanjiang Factory	29.29	29.99	3.00	15.00	15.00	
Xinjiang Factory	10.39	11.89	11.00	18.00	18.00	
Shenzhen Factory	18.37	19.01	30.00	25.00	18.00	
Guiding Factory	20.41	21.02	25.00	35.00	55.00	
Wulanhaote Factory	4.35	4.59	4.00	4.00	4.00	10.00
Hohhot Factory	8.78	9.53	10.00	10.00	10.00	20.00
Luoyang Factory	16.67	17.52	22.00	22.00	50.00	0.00
Anyang Factory	53.82	39.41	50.00	55.00		70.00

Factory	2001	2002	2003	2004	2005	2006
No. of bid application	49	44	33	24	9	3
Total consumption	887.10	710.60	551.20	463.10	121.80	21.30
Quota	1,000	880	700	500	300	150
Permitted consumption	1,000	880	700	500	300	150

The STMA strictly supervised 58 factories to ensure they do not surpass their CFC-11 consumption quota. The advantages of the quota system are: First, clear objectives which not only ensure reaching the control objectives of CFC-11 consumption but also meet the demand of CFC-11 consumers, thereby safeguarding the demand of the cigarette consumption market; Second, the STMA and SEPA have implemented the Sector Plan with low administrative costs; Third, the quota system encourages factories to give up CFC-11 consumption and dismantle CFC-11 tobacco expansion equipment on schedule. This system guarantees the implementation of the Sector Plan and promotes CFC-11 phase-out in tobacco sector.

Chapter 3: Bidding system and equipment dismantlement

3.1 Bidding system

To encourage factories to dismantle CFC-11 tobacco expansion equipment on schedule, the quota system was alone insufficient: a bidding system was also established. Bidding can improve the efficiency of fund usage, ensure annual reduction of CFC-11 consumption, and realize the dismantling of expansion equipment.

Bidding time was scheduled at the beginning of each year. The STMA first issues a bidding notice and eligible factories then submit their application. After bidding, an evaluation committee assesses the applications and recommends eligible applicants. Finally, the bid-won factories sign contracts with the SEPA and STMA. The bidding process was supervised by the UNIDO. Bidding process information is shown in Table 3.1 and Table 3.2. During 2001-2004, 34 factories won the bid and dismantled 36 lines, meeting the goal set by the Sector Plan.

Many problems appeared in implementing a bidding system. Some factories were unwilling to bid considering their own economic benefits, and they couldn't accept the provided prices of CFC-11 phase-out, due to its insufficiency to cover the cost of alternatives. The compensation provided by the Multilateral Fund only accounted for 10% of the total, bidding system played its role hardly. In this situation, the STMA negotiated with the factories, and they reached agreements on conferred prices based on considerate persuasion and mobilizing efforts. And then the contracts were signed for dismantlement. During 2005-2007, without bidding, the contracts were signed by consultation between the bidding evaluation committee and the factories. At last, the remaining 20 lines of eligible CFC-11 tobacco expansion equipment were dismantled.

Table 3.1 Implementation of bidding system

Bidding date	Deadline for dismantlement	No. of eligible factories	No. of bidding factories	No. of bid-won	No. of being appointed	Dismantled line
Jan.2001	Dec.31,2001	56	10	7	-	8
Mar.2002	Dec.31,2002	48	15	10	-	11
Mar.2003	Dec.31,2003	37	8	8	-	8
Mar.2004	Dec.31,2004	29	10	9	-	9
Apr.2005	Dec.31,2005	20	-	11	11	12
Apr.2006	Dec.31,2006	8	-	-	4	6
Apr.2007	Dec.31,2007	2	-	-	2	2
Total		56				56

Table 3.2 Inventory for factories who dismantled their equipment

Year	Factory	Bid-won or not	Dismantled line	Installation date
2001	Tongren Factory	Y	1	Aug.1991
	Bijie Factory	Y	1	Oct.1993
	Wuhan Factory	N	1	Apr.1992
	Lichuan Factory	Y	1	Apr.1992
	Zaoyang Factory	Y	1	Mar.1992
	Xiangfan Factory	N	1	Mar.1992
	Bengbu Factory	N	1	Dec.1992
	Chongqing Factory	Y	1	Oct.1992
	Hangzhou Factory	Y	1	Oct.1987
Changchun Factory	Y	2	Jan.1985	
<i>Subtotal</i>	<i>10 factories participated in the bidding (7 in which got the bid, dismantled 8 lines in all)</i>			
2002	Zhangjiakou Factory	N	1	Jun.1991
	Wuhan Factory	Y	1	Apr.1992
	Xiangfan Factory	Y	1	Mar.1992
	Bengbu Factory	Y	1	Dec.1992
	Hangzhou Factory	Y	1	Aug.1990
	Huaiyin Factory	Y	1	Dec.1990

Project Completion Report for Tobacco Sector Plan for CFC-11 Phase-out in China

Year	Factory	Bid-won or not	Dismantled line	Installation date
	Guangshui Factory	Y	1	Jun.1992
	Xuzhou Factory	Y	1	Jan.1991
	Longyan Factory	Y	2	Mar.1995
	Kaifeng Factory	Y	1	Aug.1992
	Xiamen Factory	N	1	Apr.1992
	Zhengzhou Factory	Y	1	May1993
	Yanji Factory	N	1	Jan.1992
	Xianning Factory	N	1	Feb.1993
	Guiyang Factory	N	1	Jan.1992
<i>Subtotal</i>	<i>15 factories participated in the bidding (10 in which got the bid, dismantled 11 lines in all)</i>			
2003	Guiyang Factory	Y	1	Oct.1992
	Beijing Factory	Y	1	Apr.1990
	Hong'an Factory	Y	1	Mar.1992
	Tianjing Factory	Y	1	Jun.1992
	Guiding Branch Factory	Y	1	Sep.1992
	Dangyang Factory	Y	1	Sep.1992
	Luohe Factory	Y	1	Oct.1994
	Harbin Factory	Y	1	Jan.1992
<i>Subtotal</i>	<i>8 factories participated in the bidding (8 in which got the bid, dismantled 8 lines in all)</i>			
2004	Shenyang Factory	Y	1	Sep.1992
	Meizhou Factory	Y	1	Oct.1993
	Zhanjiang Factory	Y	1	Dec.1993
	Lianjiang Branch Factory	Y	1	Jun.1995
	Zhangjiakou Factory	Y	1	Jun.1991
	Xiamen Factory	Y	1	Apr.1992
	Siping Factory	Y	1	Feb.1992
	Liuzhou Factory	Y	1	Oct.1992
	Ruzhou Factory	Y	1	Sep.1994

Year	Factory	Bid-won or not	Dismantled line	Installation date
	Shaoguan Factory	N	2	Sep.1994
<i>Subtotal</i>	<i>10 factories participated in the bidding (9 in which got the bid, dismantled 9 lines in all)</i>			
2005	Shaoguan Factory	Appointed (A)	1	Dec. 1991
			1	Sep. 1994
	Nanxiong Factory	A	1	Jun. 1995
	Nanghai Factory	A	1	Mar. 1992
	Hainan Factory	A	1	Sep. 1992
	Yanji Factory	A	1	Jan. 1992
	Shijiazhuang Factory	A	1	Apr. 1992
	Zhumadian Factory	A	1	Dec. 1992
	Xiamen Huamei Factory	A	1	Mar. 1995
	Zhangjiakou Factory	A	1	Jun. 91
	Nanchang Factory	A	1	Oct. 1992
	Luohe Factory	A	1	Oct. 1994
<i>Subtotal</i>	<i>11 factories participated in the bidding (11 in which got the bid, dismantled 12 lines in all)</i>			
2006	Zhengzhou Factory	A	3	May1993
	Xinjiang Factory	A	1	Oct.1994
	Guiyang Factory	A	1	Oct.1992
	Shenzhen Factory	A	1	May1990
<i>Subtotal</i>	<i>4 factories participated in the bidding (4 in which got the bid, dismantled 6 lines in all)</i>			
2007	Hohhot Factory	A	1	Nov.1992
	Xianning Factory	A	1	Feb. 1993
<i>Subtotal</i>	<i>2 factories participate in the bidding (2 in which got the bid, dismantled 2 lines in all)</i>			
Total	46 factories participated (which have dismantled 56 lines of CFC-11 expansion equipment)			

3.2 Dismantlement of subsidized equipment

On Oct. 23rd and 24th, 2000, under the guidance of the STMA, the CFC-11 tobacco

expansion equipment of Chongqing Factory was dismantled ahead of bidding time, which indicated that the implementation of Tobacco Sector Plan for CFC-11 Phase-out in China was formally launched. This dismantlement provided the suitable approach, countermeasures, and dismantlement experience, becoming the reference for other factories. On Mar. 20th and 21st, 2001, equipment was dismantled at Changchun Factory, the winner of the first bid.

The SEPA and STMA signed contracts with CFC-11 consumption factories that obtained the bid or agreed to dismantle CFC-11 tobacco expansion equipment. The contracts included dismantlement responsibility and funding. By Sep. 2007, 46 factories dismantled 56 lines of CFC-11 tobacco expansion equipment that were eligible to be funded. The SWG keeps the documents including the phase-out contracts, fund agreements, and inventory of equipment disposal. Detailed information including factory names, their geographical distribution, installed and dismantled dates of CFC-11 tobacco expansion equipment, CFC-11 consumption, contract No. and funding provided are shown in Table 3.3.

Table 3.3 Inventory of factories assigned the contracts

(For subsidized ones)

No.	Factory	CFC-11 consumption (ton)	Equipment		Phase-out date	Contract No.	Fund (US dollars)
			Line	Installation date			
1	Zhengzhou Factory	11.8	1	May 1993	2006	F/III/S/06/241	444,000
		11.8	1	May 1993			
		11.8	1	May 1993			
2	Zhumadian Factory	41.0	1	Dec. 1992	2005	F/III/S/05/161	141,000
3	Luohe Factory	12.5	1	Oct. 1994	2003	F/III/S/05/164	154,000
		12.5	1	Oct. 1994	2005		
4	Ruzhou Factory	9.2	1	Sep. 1994	2004	F/III/S/04/318	162,000
5	Kaifeng Factory	6.0	1	Aug. 1992	2002	YC/QI/008	170,000
6	Shaoguan Factory	34.0	1	Dec. 1991	2005	F/III/S/05/155	619,000
		0.0	1	Sep. 1994	2005		
7	Nanxiong Factory	12.6	1	Jun. 1995	2005		
8	Nanghai Factory	12.2	1	Mar. 1992	2005		
9	Zhanjiang Factory	23.2	1	Dec. 1993	2004		

Project Completion Report for Tobacco Sector Plan for CFC-11 Phase-out in China

No.	Factory	CFC-11 consumption (ton)	Equipment		Phase-out date	Contract No.	Fund (US dollars)
			Line	Installation date			
10	Lianjiang Branch Factory	5.0	1	Jun. 1995	2004	F/III/S/04/319	154,000
11	Hainan Factory	4.6	1	Sep. 1992	2005	F/III/S/05/157	155,000
12	Meizhou Factory	25.5	1	Oct. 1993	2004	F/III/S/04/126	162,000
13	Guiyang Factory	172.5	1	Oct. 1992	2003		170,000
			1	Oct. 1992	2006		130,000
14	Guiding Branch Factory	14.4	1	Sep. 1992	2003	YC/QI/024	170,000
15	Tongren Factory	6.3	1	Aug. 1991	2001	YC/QI/005	185,000
16	Bijie Factory	0.0	1	Oct. 1993	2001	YC/QI/007	170,000
17	Wuhan Factory	43.0	1	Apr. 1992	2002	YC/QI/011	185,000
18	Lchuan Factory	25.0	1	Apr. 1992	2001	YC/QI/003	185,000
19	Zaoyang Factory	21.8	1	Mar. 1992	2001	YC/QI/006	185,000
20	Hongan Factory	12.0	1	Mar. 1992	2003	YC/QI/021	170,000
21	Guangshui Factory	2.6	1	Jun. 1992	2002	YC/QI/017	170,000
22	Dangyang Factory	16.9	1	Sep. 1992	2003	YC/QI/022	162,000
23	Xiangfan Factory	23.0	1	Mar. 1992	2002	YC/QI/010	185,000
24	Xianning Factory	6.4	1	Feb. 1993	2006	No contract	-
25	Bengbu Factory	20.5	1	Dec. 1992	2002	YC/QI/009	185,000
26	Xiamen Factory	24.0	1	Apr. 1992	2004	F/III/S/04/122	191,000
27	Longyan Factory	24.3	1	Sep. 1992	2002	YC/QI/016	354,000
		23.3	1	Mar. 1995	2002		170,000
28	Shijiazhuang Factory	6.5	1	Apr. 1992	2005	F/III/S/05/159	141,000

Project Completion Report for Tobacco Sector Plan for CFC-11 Phase-out in China

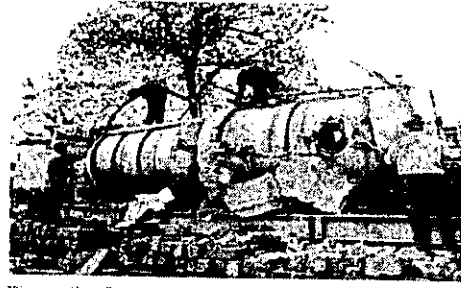
No.	Factory	CFC-11 consumption (ton)	Equipment		Phase-out date	Contract No.	Fund (US dollars)
			Line	Installation date			
29	Zhangjiakou Factory	67.3	3	Jun. 1991	2002		185,000
					2004		148,000
					2005		128,000
30	Beijing Factory	11.8	1	Apr. 1990	2003	YC/QI/008	177,000
31	Tianjing Factory	31.0	1	Jun. 1992	2003	YC/QI/019	170,000
32	Changchun Factory	5.8	2	Jun. 1985	2001	YC/QI/001	291,000
33	Yanji Factory	9.0	1	Jun. 1992	2005	F/III/S/05/162	148,000
34	Siping Factory	0.9	1	Feb. 1992	2004	F/III/S/04/317	155,000
35	Harbin Factory	14.1	1	Jun. 1992	2003	YC/QI/008	170,000
36	Shenyang Factory	0.0	1	Sep. 1992	2004	F/III/S/04/123	162,000
37	Huaiyin Factory	0.0	1	Dec. 1990	2002	YC/QI/014	177,000
38	Xuzhou Factory	25.0	1	Jan. 1991	2002	YC/QI/015	177,000
39	Chongqing Factory	8.5	1	Oct. 1992	2001	YC/QI/004	185,000
40	Hohhort Factory	26.0	1	Nov. 1992	2006	F/III/S/06/244	128,000
41	Xinjiang Factory	21.5	1	Oct. 1994	2006	F/III/S/06/242	147,000
42	Liuzhou Factory	16.2	1	Oct. 1992	2004	F/III/S/04/125	155,000
43	Nanchang Factory	20.0	1	Oct. 1992	2005	F/III/S/05/158	141,000
44	Hangzhou Factory	22.3	1	Oct. 1987	2001	YC/QI/002	190,000
		22.3	1	Aug. 1990	2002	YC/QI/013	177,000
45	Xiamen Huamei Factory	11.3	1	Mar. 1995	2005	F/III/S/05/160	154,000
46	Shenzhen Factory	15.1	1	May 1990	2006	F/III/S/06/245	116,000
Total		1,004.3	56				8,941,000

After the SEPA signed phase-out contracts with factories that won the bid, it accompanied the STMA to organize the dismantlement. For each dismantling, members of

the SWG, officials from FECO, SEPA, Provincial Tobacco Monopoly Administrations, and local Environmental Protection Agencies, as well as staff from local notary offices were present for supervision. Above-mentioned members all signed the Certificate for CFC-11 equipment dismantlement. The whole dismantlement process was videotaped, photographed, and cleared by the notary. They were documented by the SWG. Fig. 3.1 shows CFC-11 equipment dismantlement in Zhengzhou Factory.



The work group is in front of the CFC-11 equipment



Dismantling Scene (The CFC-11 equipment was dismantling)



The CFC-11 equipment locale for dismantling



Dismantling Scene (The CFC-11 equipment had been dismantled)

Fig. 3.1 CFC-11 dismantlement in Zhengzhou Factory

The dismantlement process documents of all factories are kept and managed by the SWG:

- a. Certification of CFC-11 equipment dismantlement: It shows the license code, dismantling date, signature by factory representatives, dismantlement staff, supervision department and administrative department, and signed date. Video tape and photographs recording equipment condition before and after dismantlement, and its processes were attached (as it is shown in Fig. 3.2.).

CFC-11 抽丝膨胀装置拆除现场证明书
Certificate of Dismantling CFC-11 Equipment

茲將新疆煙草製絲廠 CFC-11 抽絲膨脹裝置 (機組編號: 35001337002201) 在下 (廠址: 6500121301003001) 的 Xinjiang Cigarette Factory (茲將新疆煙草製絲廠) 於 2005 年 9 月 23 日在監督部門監督下, 已拆除。隨附的現場監督人員的現場監督照片和照片, 以及生產線拆除前的設備和照片 (包括設備拆除前的狀態和生產線拆除前的設備)。在拆除設備前, 監督部門已對設備進行了檢查和記錄。這些設備已不再使用。設備拆除後, 設備的殘餘部分將由回收公司回收。所有設備的殘餘部分將由回收公司回收。所有設備的殘餘部分將由回收公司回收。所有設備的殘餘部分將由回收公司回收。

設備拆除後, 設備的殘餘部分將由回收公司回收。所有設備的殘餘部分將由回收公司回收。所有設備的殘餘部分將由回收公司回收。所有設備的殘餘部分將由回收公司回收。

企業代表: (Representative of Xinjiang Cigarette Factory)
 [Signature]

監督方名稱及其代表 (Representative of Dismantling Operator)
 6500121301003001 (Tobacco Special Work Group)
 [Signature]

監督方名稱及其代表 (Representative of Supervision Department)
 [Signature] [Seal]

主管部門名稱及其代表 (Representative of Administrative Department)
 新疆煙草製絲廠 (Xinjiang Tobacco Monopoly Bureau)
 [Signature] [Seal]

簽字日期: 2005 年 9 月 23 日
 (Date)

Fig. 3.2 Dismantling certificate in Xinjiang Factory

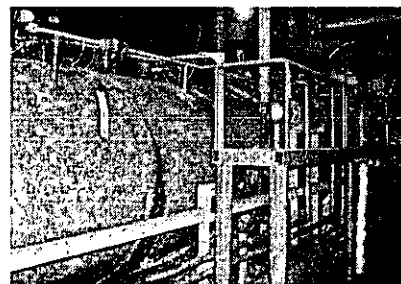
b. Reclaiming certification of dismantled equipment: It is to certify that the dismantled equipment has been properly disposed and reclaimed by Materials Recycling Sector. It includes the statement that the equipment has been dismantled and reclaimed, a copy of receipt, and the name and seal of the recycling company. Fig. 3.3 and Fig. 3.4 show the certification of dismantled equipment recovery in Shenzhen Factory, cold tank and working tank pictures of dismantled CFC-11 tobacco expansion equipment in Wulanhaote Factory.

回收證明
Certificate of Dismantled Equipment Recovery

茲將廣東煙草製絲廠 CFC-11 抽絲膨脹裝置 (機組編號: 35001337002201) 在下 (廠址: 6500121301003001) 的 Shenzhen Cigarette Factory (茲將廣東煙草製絲廠) 於 2005 年 9 月 23 日在監督部門監督下, 已拆除。隨附的現場監督人員的現場監督照片和照片, 以及生產線拆除前的設備和照片 (包括設備拆除前的狀態和生產線拆除前的設備)。在拆除設備前, 監督部門已對設備進行了檢查和記錄。這些設備已不再使用。設備拆除後, 設備的殘餘部分將由回收公司回收。所有設備的殘餘部分將由回收公司回收。所有設備的殘餘部分將由回收公司回收。所有設備的殘餘部分將由回收公司回收。

設備拆除後, 設備的殘餘部分將由回收公司回收。所有設備的殘餘部分將由回收公司回收。所有設備的殘餘部分將由回收公司回收。所有設備的殘餘部分將由回收公司回收。

回收公司名稱: [Name]
 回收日期: 2005 年 9 月 23 日



Cold tank recovery from 馬三浩特卷煙廠



Working tank recovery from 馬三浩特卷煙廠

Fig. 3.3 Reclaiming certificate for dismantled equipment in Shenzhen Factory (left)

Fig. 3.4 Recovery of cold tank and working tank in Wulanhaote Factory (right)

c. Notarial deed: The staff of the local notary offices supervised the dismantlement and issued the notarial deed. Fig. 3.5 shows the notarial deed of equipment dismantlement in Guizhou Huangguoshu Tobacco Group Co. Ltd.

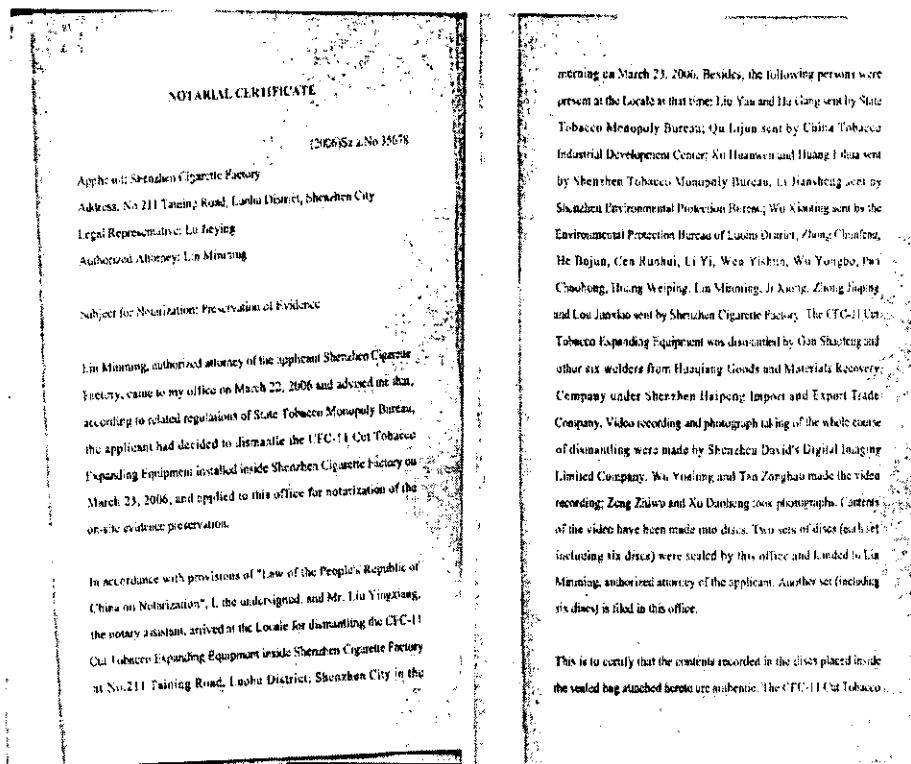


Fig. 3.5 Dismantling notarial deed in Guiyang Factory

Under the supervision and management of the SEPA and STMA, 56 subsidized lines of equipment have been dismantled.

3.3 Dismantlement of unsubsidized equipment

Out of 73 lines of CFC-11 tobacco expansion equipment, 56 were eligible for funding, the remaining 17 lines were installed after Jul. 25, 1995 and ineligible for the Montreal Protocol Multilateral Fund (MLF). Those factories should cover the phase-out cost by themselves. The STMA limited their CFC-11 consumption through a quota system, and used administrative measures for equipment dismantlement.

In 2001, the CFC-11 expansion equipment was dismantled in Hangzhou Factory without compensation of MLF, who was the first one to begin the phase-out without fund. The 17 unsubsidized lines of CFC-11 equipment installed after Jul. 25, 1995 have been dismantled. Detailed information is shown in Table 3.4.

Table 3.4 Information for equipment dismantlement (for unsubsidized)

Phase-out date	Factory	Equipment		CFC-11 Consumption (ton)
		Line	Installation date	

Phase-out date	Factory	Equipment		CFC-11 Consumption (ton)
		Line	Installation date	
2001	Hangzhou Factory (Wuhu)	1	Dec. 1996	5.0
2003	Chengdu Factory	1	May 1996	6.8
	Lanzhou Factory	1	Jan. 1997	0.8
	Hefei Factory	1	Dec. 1996	5.2
	Chuzhou Factory (Wuhu)	1	Dec. 1996	3.0
	Fuyang Factory	1	Oct. 1997	0.0
2004	Xiamen Factory	1	Jul. 1996	9.0
	Zunyi Factory	1	Aug. 1996	19.0
	Tianshui Factory	1	Oct. 1996	7.9
2005	Mianyang Factory	1	Nov. 1995	4.7
2006	Guiding Factory	1	Oct. 1996	3.6
	Zhanjiang Factory	1	Aug. 1998	0.0
2007	Anyang Factory	1	Sep. 1995	9.7
		1	Oct. 1997	0.0
	Luoyang Factory	1	Dec. 1996	7.6
		1	Dec. 1996	3.9
	Wulanhaote Factory	1	Oct. 1997	0.0
Total		17		86.2

By 2007, CFC-11 expansion equipment from 58 tobacco factories in China have been completely dismantled, consisting of 56 lines of equipment eligible for MLF and 17 lines of equipment uneligible for MLF. The dismantlement of CFC-11 expansion equipment within the tobacco sector has been completed and the CFC-11 phase-out work has achieved a decisive success.

Chapter 4: Technical assistance

4.1 Implementation of technical assistance

Technical assistance including training, capability construction, and spread of the alternative technologies were conducted, which promoted the effective and smooth implementation of the Sector Plan. Key actions are shown in Fig. 4.1.

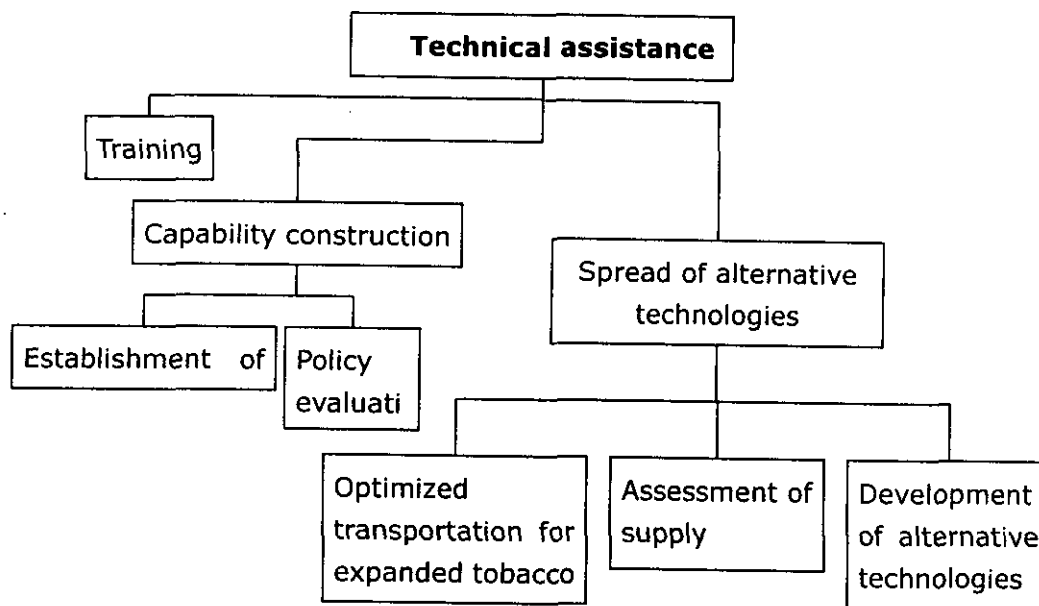


Fig. 4.1 General overview of technical assistances

(1) Training

3 technical training sessions on dismantlement of CFC-11 tobacco expansion equipment were conducted for the staff responsible for the phase-out in tobacco factories. Training included policies, regulations, dismantlement procedures, records, precautions in the process of dismantlement, knowledge about alternative technologies, and the optimized transportation of expanded tobacco. The video which recorded the dismantlement of CFC-11 tobacco expansion equipment was used for training.

(2) Capacity building

a. Establishment of Administrative Information System

The purpose of the Administrative Information System (AIS) is real-time supervision of CFC-11 consumption in factories and prevention of CFC-11 consumption from exceeding permitted quota. It also assists tobacco factories to identify residual productivity and available amount of expanded tobacco.

AIS is developed by Beijing Lianhe Software Tech. Co. Ltd. It passed inspection and was accepted at the project meeting held by the SEPA on Jun. 26th, 2002. The system basically meets the designed requirements: First, it has improved the management capabilities using the idea of project management for reference. Second, it performs data sharing and collaboration. Third, it possesses good reliability, safety, practicality and universality, which basically meets the sector's need and user's expectation.

b. Policy evaluation on import and export management of tobacco expanded by CFC-11

This project focuses on the following aim: Ban import and export of tobacco expanded by CFC-11 as set by the Sector Plan. The investigation on import and export management of expanded tobacco was conducted domestically and abroad, with the conclusion that the

import and export management of tobacco in China was already strictly regulated. All kinds of both import and export products are managed by administrative measures. In addition, there exists no import and export of expanded tobacco. Therefore, the current available administrative policies about import and export on tobacco can comprehensively meet the prohibition of import and export on tobacco expanded by CFC-11, therefore it is not necessary to specially draw up a policy for its import and export prohibition.

(3) Spread of alternative technologies

a. Optimized transportation of expanded tobacco

The tobacco expanded by CO₂ is the main alternative technology to CFC-11. More than 30 lines of CO₂ tobacco expansion equipment have been created. It required a large amount of investment and higher energy consumption. Some SMEs could not build lines themselves so they jointly built expanded tobacco production centres. These new centres created the problem of transportation for the produced tobacco. Because of the transportation distance and fragility of expanded tobacco, its transportation needed improvement.

After testing and analysis, the project for optimized transportation of expanded tobacco brought forward solutions for CO₂ expanded tobacco packaging, transport, and usage. A series of technical and economic problems, including tobacco packaging criterion, mode of transport, transport cost (by truck or train), reasonable transport radius, as well as the total cost of CO₂ expanded tobacco, were resolved. Based on data and field test results, reasonable suggestions have been proposed on the expanded tobacco packaging and transportation, which provide positive guidance to promote the application of CO₂ expanded tobacco.

b. Feasibility analysis of expanded tobacco supply

The project of feasibility analysis on expanded tobacco supply includes a comprehensive survey on 58 enterprises that used the CFC-11 expansion tobacco equipment, particularly focusing on 10 of them. Based on the analysis of financial and technological capabilities, required amounts of expanded tobacco by those factories, comparing the advantages and disadvantages between solutions, suggested programs to guarantee the supply of expanded tobacco have been proposed.

c. Technical criterion and quality control standards

To support the application of alternative technologies, an emphasis on product quality regulation has been adopted. The projects include technical criterion, quality control standards of expanded tobacco produced by alternative technologies, a study on the impact of tobacco leaf on the quality of expanded tobacco using alternative technologies, and the impact of chemical components of tobacco by different expansion technologies. This research has provided guidance for the selection of alternative technologies. All reports are kept in the archive by SWG.

Technical assistances are shown in Table 4.1.

Table 4.1 Summary of technical assistance

Classification	Approved year	Project	Cost (US dollars)	Completion date	Contractor	Output
Technical training	2001	Training for the dismantlement of CFC-11 expansion equipment	48,000	Dec. 2001	Special Working Group for CFC-11 phase-out in tobacco sector	Technical support to CFC-11 expansion lines dismantlement
	2002	Training	53,000	Dec. 2002		
	2003	Training	80,000	Jun. 2004		
Capacity construction	2001	AIS	80,000	Dec. 2001	Beijing Co-software Tech. Co., Ltd.	The establishment of administrative information system for CFC-11 phase-out in tobacco sector
	2001	Policy evaluation on the management of import and export of tobacco expanded by CFC	45,000	Dec. 2002	Center for Environmental Sciences, Peking University	Feasibility study on <i>Ban import and export of tobacco expanded by CFC-11</i>
Alternative technologies and project assessment	2001	Reduction of CFC-11 consumption by existed tobacco equipments	35,000	Dec. 2001	Beijing Huatongren Marketing Research Co., Ltd.	CFC-11 consumption by existed CFC-11 expansion equipment has been reduced
	2001	Study on the optimized transportation of expanded tobacco (Period 1)	137,000	Dec. 2001	Zhengzhou Tobacco Research Institute of China National Tobacco Corp.	Technical problems in the transportation of CO ₂ expanded tobacco have been solved and the transportation efficiency has been improved
	2002	Reduction of CFC-11 consumption by existed tobacco equipments	65,000	Dec. 2002	Beijing Changzheng High Tech. Co., Ltd.	CFC-11 consumption of existed CFC-11 expansion equipment has been reduced

Project Completion Report for Tobacco Sector Plan for CFC-11 Phase-out in China

Classification	Approved year	Project	Cost (US dollars)	Completion date	Contractor	Output
	2002	Feasibility study on expanded tobacco supply	74,000	Dec. 2002	Beijing Huatongren Marketing Research Co., Ltd.	The programs to guarantee the supply of expanded tobacco have proposed.
	2002	Study on the optimized transportation of expanded tobacco (Period 2)	63,000	Dec. 2002	Zhengzhou Tobacco Research Institute of China National Tobacco Corp.	Technical problems in the transportation of CO ₂ expansion tobacco have been solved and the transportation efficiency has been improved
	2003-2004	Study on technical criterion and quality control for expanded tobacco produced by non CFC-11 alternative technologies	80,000	Dec. 2004		Technical criterion and quality control for alternative technologies have been proposed, which promotes application.
	2003-2004	Evaluation of steam drying expansion technology	70,000	Dec. 2004	Zhengzhou Tobacco Research Institute of China National Tobacco Corp.	Evaluation on steam drying expansion technology
	2003-2004	Feasibility assessment of establishing CO ₂ tobacco expansion line in Xuzhou to supply expanded tobacco to several neighbouring cigarette factories	70,000	Dec. 2004		Feasibility of establishing CO ₂ tobacco expansion line in Xuzhou to supply expanded tobacco to several neighbouring cigarette factories has been assessed.
	2005	Study on the impact of different tobacco leaf to the quality of non CFC-11 expanded tobacco	100,000	Dec. 2006	Zhengzhou Tobacco Research Institute of China National Tobacco	Variable tobacco leaf results variable chemical components of expanded tobacco,

Project Completion Report for Tobacco Sector Plan for CFC-11 Phase-out in China

Classification	Approved year	Project	Cost (US dollars)	Completion date	Contractor	Output
					Corp.	with different expansion methods, and the qualities of expanded tobacco has been evaluated
	2005	Study on the impact of CO ₂ expansion technology to volatile chemical components of the tobacco	100,000	Dec. 2006	China National Tobacco Quality Supervision and Test Centre	The volatile chemical components of tobacco have been determined and conducted the impact assessment of this technology to tobacco quality
Total			1,100,000			

4.2 Development of alternative technologies

In the process of the Sector Plan implementation, the development of alternative technologies was funded by the STMA, which has played an important role in the CFC-11 phase-out.

Online expansion technology is a full expansion technology. It is easy to link up with subsequent cigarette processing and has a lower build cost compared to CO₂ tobacco expansion equipment. Online expansion equipment can reduce the financial and manpower requirements, and is very suitable for small and median enterprises (SMEs).

SH9 style tobacco fast-expanded online system has been successfully developed by the DSE, STMA, Hefei Factory and Changzhou Zhisi Machinery Manufacture Co., Ltd. It provides a technical alternative to CFC-11 expansion equipment.

SH9 system consists of the flow control unit, the super moisture regainer, fast-expanding drier, cooling system, related auxiliary equipment, moisture meter, and temperature detector, etc. It has visible technological advantages such as compact construction and lower price. It can expand and dry tobacco efficiently.

SH9 system has been used by some factories, including Hefei Factory, Xuzhou Factory, Lichuan Factory, Tongren Factory, Liuzhou Factory, Guiding Factory, Fuyang Factory, Hainanhongta Factory, Luoyang Factory, and Yanji Factory.

Chapter 5: Application of alternative technologies

The supply of expanded tobacco has been guaranteed by the application of alternative technologies, which is of great significance to steadily push CFC-11 phase-out within the tobacco sector.

5.1 Faced challenges

Since expanded tobacco can reduce tar and other hazardous components of smoke gas, China planned to increase use of expanded tobacco from about 4% of the 1997 total to 15% in 2007, which results in the increasing demand of expanded tobacco substantially and enormous challenge against the phase-out of CFC-11 tobacco expansion technology.

Along with the phase-out of CFC-11 consumption and the dismantlement of CFC-11 tobacco expansion equipment, there is a great necessity to introduce, develop, and spread new tobacco expansion technologies and industrialized production equipment. To guarantee the supply of expanded tobacco and to avoid negative influence on the tobacco sector development by the phase-out, it was critical to implement the Sector Plan.

5.2 Investment in alternative technologies

CO₂ tobacco expansion technology has been chosen to gradually replace CFC-11 according to the Tobacco Sector Plan for CFC-11 Phase-out in China based on its technological efficiency and acceptability both domestically and abroad. Since the early 1990s, CO₂ tobacco expansion equipment has been installed and utilized in some tobacco factories in China. Until to Aug. 1999, there had been 21 lines of CO₂ tobacco expansion equipment in tobacco sector (seen in Table 5.1).

Table 5.1 Inventory of CO₂ tobacco expansion equipment in tobacco sector

Factory	Production capacity (kg/h)	Manufacturer	Commissioning date
Shanghai Factory	570	AIRCO (US)	Feb. 1991
Qingdao Factory	570	BAT (UK)	Mar. 1992
Guangzhou Factory	570	BAT (UK)	Apr. 1992
Ningbo Factory	570	AIRCO (US)	Apr. 1992
Changde Factory	500	COMAS(Italy)	1993
Changsha Factory	500	COMAS(Italy)	1993
Guangzhou 1 st Factory	570	AIRCO (US)	May 1995
Guiyang Factory	570	Qinhuangdao Tobacco Machinery Plant (China)	Jan. 1996
Jinan Factory	570	BAT (UK)	Mar. 1996
Zhangjiakou Factory	570	AIRCO (US)	Mar. 1996
Bengbu Factory	570	AIRCO (US)	Apr. 1997
Wuhan Factory	570	AIRCO (US)	Jul. 1997
Yuxi Factory	2,270	BAT (UK)	Aug. 1997
Wuhu Factory	570	Qinhuangdao Tobacco Machinery Plant (China)	Oct. 1997
Xinzheng Factory	570	AIRCO (US)	Feb. 1997
Kunming Factory	2,270	AIRCO (US)	Oct. 1998
Shanghai Factory	1,140	AIRCO (US)	Apr. 1999
Qujing Factory	1,140	AIRCO (US)	Jul. 1999
Honghe Factory	1,140	AIRCO (US)	Jul. 1999
Zhaotong Factory	1,140	AIRCO (US)	Jul. 1999
Chuxiong Factory	1,140	AIRCO (US)	Aug. 1999
<i>Subtotal</i>	<i>18,080</i>	<i>21</i>	<i>Installed before Aug. 1999</i>
Qingzhou Factory	570	Qinhuangdao Tobacco Machinery Plant (China)	Jan. 2001
Hangzhou Factory	570	AIRCO (US)	Jan. 2001
Xuchang Factory	400	Zhengzhou Tobacco Research Institute of China National Tobacco Corp. (China)	Jul. 2001
Baoji Factory	570	Qinhuangdao Tobacco Machinery Plant (China)	Oct. 2001
Bijie Factory	570	AIRCO (US)	Jan. 2002

Factory	Production capacity (kg/h)	Manufacturer	Commissioning date
Chengdu Factory	1,140	AIRCO (US)	Jan. 2002
Beijing Factory	570	Qinhuangdao Tobacco Machinery Plant (China)	Feb. 2002
Longyan Factory	570	AIRCO (US)	Mar. 2002
Yingkou Factory	570	Qinhuangdao Tobacco Machinery Plant (China)	Dec. 2002
Xiamen Factory	570	Qinhuangdao Tobacco Machinery Plant (China)	Dec. 2002
Jiangsu Provincial Co. Ltd.	1,140	AIRCO (US)	Dec. 2002
Zunyi Factory	570	Qinhuangdao Tobacco Machinery Plant (China)	Jul. 2003
Nanchang Factory	570	Qinhuangdao Tobacco Machinery Plant (China)	Apr. 2004
Jinsi Tobacco Co. Ltd.	570	Qinhuangdao Tobacco Machinery Plant (China)	May 2004
Shaoguan Factory	570	Qinhuangdao Tobacco Machinery Plant (China)	Jan. 2005
Lanzhou Factory	570	Qinhuangdao Tobacco Machinery Plant (China)	Dec. 2005
Hangzhou Factory	570	Qinhuangdao Tobacco Machinery Plant (China)	Dec. 2005
<i>Subtotal</i>	<i>10,660</i>	<i>17</i>	<i>Installed after Aug. 1999</i>
Total	28,740	38	

CO₂ expansion technology is a mature technology with a product quality advantage. Using it, however, would burden factories with huge financial pressures. The gap between equipment costs and fund provided by the Montreal protocol fund is considerable. In 2007, compare to 1999, there were additional 17 new CO₂ tobacco expansion equipment lines, because of the phase-out of CFC-11 tobacco expansion equipment. (As it is shown in Table 5.1) Presently, there are 38 lines of CO₂ tobacco expansion equipment with variable types, as it is shown in Table 5.2.

Table 5.2 Sum of CO₂ tobacco expansion equipment in tobacco sector

Producer	Equipment type	Production capacity kg/h	Line	Subtotal (kg/h)
Qinhuangdao Tobacco Machinery Plant	SP25/SP26	570	13	7,410
BAT (UK)	DIET PLANT	570	3	1,710
		2,270	1	2,270
AIRCO (US)	DIET PLANT	570	10	5,700
		1,140	7	7,980
		2,270	1	2,270
COMAS (Italy)	DIET PLANT	500	2	1,000
Zhengzhou Tobacco Research Institute of China National Tobacco Corp.		400	1	400
Total			38	28,740

Online expansion technology is another alternative technology. Its process is as follows: after being humidified, tobacco is rapidly dried by hot air during which inter-cellular water rapidly evaporates, which makes the cells fully expand. This technology is conducive to link up with the subsequent cigarette processing. Its cost is cheaper than building CO₂ tobacco expansion equipment, and is suitable for SMEs.

Considering factors such as funding and technology, some factories choose online tobacco expansion technology, such as Hefei Factory and Xuzhou Factory. The tobacco sector currently counts 56 lines of online expansion equipment (see Table 5.3), including both 17 lines (seen Table 5.4) were built by those factories who phased out CFC-11 tobacco expansion equipments and 39 lines by other factories out of the 58 ones.

Table 5.3 Sum of online tobacco expansion equipment in tobacco sector

Producer	Equipment type	Production capacity (kg/h)	Lines		Subtotal (kg/h)
Dickson-Legg (UK)	HXD	5,400	9	1	5,400
		6,400		7	44,800
		9,000		1	9,000
Hauni Co. Ltd. (German)	HDT	6,400	3	2	12,800
		9,000		1	9,000
Changzhou Zhisi (China)	SH9	500	29	1	500
		4,000		6	24,000
		4,800		18	86,400
		6,400		4	25,600
Qinhuangdao Machinery Manufacturing Co.	SH963	4,800	15	7	33,600
	SH945	4,800		8	38,400
Total			56		289,500

Table 5.4 Inventory of online tobacco expansion equipment to alternative CFC-11 equipment (17 lines)

No.	Factory	Installed date	Line	Production capacity (kg/h)
1	Tongren Factory	2001	1	5,400
2	Xuzhou Factory	2002	1	9,000
3	Yanji Factory	2002	1	4,000
4	Guiyang Factory	2002	1	6,400
5	Zhengzhou Factory	2002	1	6,400
6	Kaifeng Factory	2003	1	6,400
7	Tianjing Factory	2003	1	9,000
8	Heinan Ruzhou Factory	2003	1	6,400
9	Luohe Factory	2003	1	4,800
10	Liuzhou Factory	2004	1	4,800
11	Meizhou Factory	2004	1	4,000
12	Zhanjiang Factory	2004	1	4,000
13	Hainan Factory	2004	1	4,800
14	Luoyang Factory	2005	1	4,800
15	Hefei Factory	2005	1	6,400
16	Guiding Factory	2006	1	6,400
17	Fuyang Factory	2006	1	4,000
Total			17	97,000

5.3 Demand satisfaction of expanded tobacco supported by alternatives

With the implementation of the Sector Plan, the 58 tobacco factories who originally used CFC-11 expansion technology, adopted alternative technologies including CO₂ expansion equipment, online expansion equipment. Some of the 58 factories independently purchased CO₂ tobacco expansion equipment. Part of them lacked the financial resources to build their own tobacco expansion lines and therefore joint neighbouring factories to establish joint CO₂ expanded tobacco production centres and online expanded tobacco equipment. Other small factories outsourced tobacco production. See Table 5.5.

Table 5.5 Alternative technology and corresponding factories

Alternative technology	Number (line)	Number (factory)	Factory
CO ₂ expanded tobacco production equipment	15	15	Zhangjiakou Factory, Bengbu Factory, Chengdu Factory, Shaoguan Factory, Xiamen Factory, Longyan Factory, Bijie Factory, Nanchang Factory, Zhumadian Factory, Beijing Factory, Anyang Factory, Shenzhen Factory, Zunyi Factory, Chuzhou Factory (Wuhu line), Lanzhou Factory
CO ₂ expanded tobacco production centres	2	9	Hangzhou Factory, Wuhan Factory, Zaoyang Factory, Xiangfan Factory, Huaiyin Factory, Hongan Factory, Guangshui Factory, Lichuan Factory, Dangyang Factory);
Online tobacco expansion equipment	17	17	Yanji Factory, Tongren Factory, Xuzhou Factory, Guiyang Factory, Zhengzhou Factory, Kaifeng Factory, Tianjin Factory, Ruzhou Factory, Luohe Factory, Liuzhou Factory, Meizhou Factory, Zhanjiang Factory, Hainan Factory, Luoyang Factory, Hefei Factory, Guiding Factory and Fuyang Factory
Outside processes	3	3	Siping Factory, Shenyang Factory and Mianyang Factory
Outsourcing*	12	12	Changchun Factory, Chongqing Factory, Harbin Factory, Shijiazhuang Factory, Guiding Branch Factory, Nanhai Factory, Xiamen Huamei Co. Ltd, Lianjiang Branch Factory, Hohhot Factory, Xinjiang Factory, Tianshui Factory and Wulanhaote Factory
Total		56*	
*Nanxiong Factory merged into Shaoguan Factory, and Xianning Factory went bankrupt. Therefore, the total of factories is 58.			

So far, for the whole Chinese tobacco sector, the total production capacity of expanded tobacco is 289,500 Kg/h for online expansion equipment and 28,740 kg/h for CO₂

expansion equipment. The expanded tobacco produced by online expansion equipment can be directly used in cigarette production--its expansion rate is low and there's no need to mix with ordinary tobacco. The expanded tobacco produced by CO₂ tobacco expansion equipment needs to be mix with ordinary tobacco at the ratio of 15:75 (by weight) for cigarette production. Assuming each line runs 24 h per day and 250 days a year (according to the national regulation), operating rate is 70%. Online expansion equipment can produce a total of 1,215,900 tonnes of expanded tobacco (which can be directly used for cigarette production). CO₂ tobacco expansion equipment can produce 120,708 tonnes of expanded tobacco, after mixing with ordinary tobacco for an equivalent of 724,248 tonnes of tobacco used to produce cigarettes. This totals to approximately 1,940,148 tonnes. China's current demand of cigarette tobacco is about 1,500,000 tonnes. The production capacity of alternative technologies can meet demand of domestic cigarette production; Chinese factories are completely autonomy and the alternatives equipment installed guarantee their regular production.

The SWG puts emphasis on training in the spread of alternative technologies. All technical and operational workers, from factories who operated alternative equipment, attended the training. They ensured technical and operational workers understand the technical specification of every dismantlement procedure, to get familiar with its function and operation. Communicating with experts helped to understand technical principle, equipment structure and operating precaution, etc. The successful application of alternative technologies met the demand of expanded tobacco, which ensured CFC-11 phase-out basically.

The 73 lines of CFC-11 equipment in the 58 factories have been dismantled. The alternatives adopted along with the implementation of the Sector Plan. The tobacco sector has achieved its scope of CFC-11 phase-out while also ensuring its own development. Table 5.4 has summarized the information related to the dismantlement of the 73 lines and alternatives. Related information about online tobacco expansion equipments and comprehensive dismantling and alternative information are shown in Table 5.6, respectively.)

Table 5.6 Dismantling schedule and alternatives, 73 lines in 58 factories

No.	Factory	CFC-11 equipment				Eligibility	Fund	Alternative measure
		Line	Production capacity (kg/h)	Installed date	Dismantled date			
1	Wuhan Factory	1	180	Apr. 1992	2001	Y	185,000	CO ₂ expanded tobacco production centre
2	Lichuan Factory	1	180	Apr. 1992	2001	Y	185,000	
3	Zaoyang Factory	1	180	Mar. 1992	2002	Y	185,000	
4	Hong'an Factory	1	180	Mar. 1992	2003	Y	170,000	
5	Guangshui Factory	1	180	Jun. 1992	2003	Y	170,000	
6	Dangyang Factory	1	180	Sep. 1992	2004	Y	162,000	
7	Xiangfan Factory	1	180	Mar. 1992	2001	Y	185,000	
8	Hangzhou Factory	1	180	Oct. 1987	2001	Y	190,000	CO ₂ expanded tobacco production center
		1	180	Aug. 1990	2002	Y	177,000	
		1	180	Dec. 1996	2002	N	-	
9	Huaiyin Factory	1	180	Dec. 1990	2002	Y	177,000	
10	Shaoguan Factory	1	180	Feb. 1991	2002	Y	148,000	
		1	180	Sep. 1994	2004	Y	162,000	
11	Xiamen Factory	1	180	Apr. 1992	2002	Y	191,000	CO ₂ expanded tobacco equipment
		1	180	Jul. 1996	2004	N	-	CO ₂ expanded tobacco equipment
12	Beijing Factory	1	180	Apr. 1990	2004	Y	177,000	CO ₂ expanded tobacco equipment
		1	180	Sep. 1995	2004	N	-	CO ₂ expanded tobacco equipment
13	Anyang Factory	1	180	Sep. 1995	2004	N	-	CO ₂ expanded tobacco equipment
		1	180	Oct. 1997	2005	N	-	CO ₂ expanded tobacco equipment
14	Shenzhen Factory	1	180	May 1990	2005	Y	116,000	CO ₂ expanded tobacco equipment
15	Zunyi Factory	1	180	Aug. 1996	2005	N	-	CO ₂ expanded tobacco equipment

Project Completion Report for Tobacco Sector Plan for CFC-11 Phase-out in China

No.	Factory	CFC-11 equipment				Eligibility	Fund	Alternative measure
		Line	Production capacity (kg/h)	Installed date	Dismantled date			
16	Chuzhou Cigarette Factory (Wuhu line)	1	180	Dec. 1996	2005	N	-	CO ₂ expanded tobacco equipment
17	Lanzhou Factory	1	180	Jan. 1997	2006	N	-	CO ₂ expanded tobacco equipment
18	Zhangjiakou Factory	1	180	Jun. 1991	2001	Y	185,000	CO ₂ expanded tobacco equipment
		1	180	Jun. 1991	2004	Y	148,000	
		1	180	Jun. 1991	2006	Y	128,000	
19	Bengbu Factory	1	180	Dec. 1992	2001	Y	185,000	CO ₂ expanded tobacco equipment
20	Chengdu Factory	1	180	May 1996	2001	N	-	CO ₂ expanded tobacco equipment
21	Bijie Factory	1	180	Oct. 1993	2003	Y	170,000	CO ₂ expanded tobacco equipment
22	Nanchang Factory	1	180	Oct. 1992	2003	Y	141,000	CO ₂ expanded tobacco equipment
23	Zhumadian Factory	1	180	Dec. 1992	2003	Y	141,000	CO ₂ expanded tobacco equipment
24	Longyan Factory	1	180	Dec. 1992	2002	Y	354,000	CO ₂ expanded tobacco equipment
		1	180	Mar. 1995	2002	Y		
25	Xuzhou Factory	1	180	Jan. 1991	2002	Y	177,000	Online tobacco expanded equipment
26	Guiyang Factory	1	180	Oct. 1992	2002	Y	170,000	Online tobacco expanded equipment
		1	180	Oct. 1992	2004	Y	130,000	
27	Zhengzhou Factory	1	180	May 1993	2002	Y	148,000	Online tobacco expanded equipment
		1	180	May 1993	2003	Y	148,000	
		1	180	May 1993	2005	Y	148,000	
28	Luohe Factory	1	180	Oct. 1994	2003	Y	170,000	Online tobacco expanded equipment
		1	180	Oct. 1994	2004	Y	154,000	

Project Completion Report for Tobacco Sector Plan for CFC-11 Phase-out in China

No.	Factory	CFC-11 equipment				Eligibility	Fund	Alternative measure
		Line	Production capacity (kg/h)	Installed date	Dismantled date			
39	Luoyang Factory	1	180	Dec. 1996	2005	N	-	Online tobacco expanded equipment
		1	180	Dec. 1996	2005	N	-	
30	Hefei Factory	1	180	Dec. 1996	2005	N	-	Online tobacco expanded equipment
31	Liuzhou Factory	1	180	Oct. 1992	2004	Y	155,000	Online tobacco expanded equipment
32	Meizhou Factory	1	180	Oct. 1993	2004	Y	162,000	Online tobacco expanded equipment
33	Zhanjiang Factory	1	180	Dec. 1993	2004	Y	191,000	Online tobacco expanded equipment
		1	180	Aug. 1998	2006	N	-	
34	Hainan Factory	1	180	Sep. 1992	2004	Y	155,000	Online tobacco expanded equipment
35	Heinan Ruzhou Factory	1	180	Sep. 1994	2003	Y	162,000	Online tobacco expanded equipment
36	Kaifeng Factory	1	180	Aug. 1992	2003	Y	170,000	Online tobacco expanded equipment
37	Tianjing Factory	1	180	Jun. 1992	2003	Y	170,000	Online tobacco expanded equipment
38	Tongren Factory	1	180	Aug. 1991	2001	Y	185,000	Online tobacco expanded equipment
39	Yanji Factory	1	180	Jan. 1992	2002	Y	148,000	Online tobacco expanded equipment
40	Guiding Factory	1	180	Oct. 1996	2006	N	-	Online tobacco expanded equipment
41	Fuyang Factory	1	180	Oct. 1997	2006	N	-	Online tobacco expanded equipment
42	Mianyang Factory	1	180	Nov. 1995	2005	N	-	Online tobacco expanded equipment
43	Siping Factory	1	180	Feb. 1992	2004	Y	155,000	Outside processing tobacco with CO ₂ equipment
44	Shenyang Factory	1	180	Sep. 1992	2002	Y	162,000	Outside processing tobacco with CO ₂ equipment
45	Nanxiong Factory	1	180	Jun. 1995	2005	Y	154,000	It merged into Shaoguan Factory
46	Xianning Factory	1	180	Feb. 1993	2002	Y	154,000	Bankrupt

Project Completion Report for Tobacco Sector Plan for CFC-11 Phase-out in China

No.	Factory	CFC-11 equipment				Eligibility	Fund	Alternative measure
		Line	Production capacity (kg/h)	Installed date	Dismantled date			
47	Nanghai Factory	1	180	Mar. 1992	2004	Y	155,000	Outsourcing
48	Guiding Branch Factory	1	180	Sep. 1992	2003	Y	170,000	Outsourcing
49	Shijiazhuang Factory	1	180	Apr. 1992	2003	Y	141,000	Outsourcing
50	Harbin Factory	1	180	Jan. 1992	2003	Y	170,000	Outsourcing
51	Chongqing Factory	1	180	Oct. 1992	2000	Y	185,000	Outsourcing
52	Lianjiang Branch Factory	1	180	Jun. 1995	2005	Y	154,000	Outsourcing
53	Xiamen Huamei Factory	1	180	Mar. 1995	2005	Y	154,000	Outsourcing
54	Hohhot Factory	1	180	Nov. 1992	2006	Y	128,000	Outsourcing
55	Xinjiang Factory	1	180	Oct. 1994	2006	Y	147,000	Outsourcing
56	Tianshui Factory	1	180	Oct. 1996	2006	N	-	Outsourcing
57	Wulanhaote Factory	1	180	Oct. 1997	2006	N	-	Outsourcing
58	Changchun Factory	1	180	Jan. 1985	2001	Y	291,000	Outsourcing
		1	180	Jan. 1985	2001	Y		
Total		73					9,095,00	

The total funds disbursed to tobacco company for the dismantlement of the 56 eligible CFC-11 expansion equipment amounts to 9,095,000 US\$. Additional 1,905,000 US\$ has been invested in training and awareness program, etc. The 73 CFC-11 expansion lines have been replaced with 17 lines of CO₂ tobacco expansion equipment and 17 lines of online tobacco expansion equipment. The average cost for CO₂ expansion equipment is 7,750,000 US\$. While the average cost for online expansion equipment is 1,847,000 US\$. It results on an investment of 163,150,000 US\$, comparing to the total project fund of 11,000,000.

Chapter 6: Contributions by Chinese tobacco sector in CFC-11 phase-out

6.1 Reduction of CFC-11 emission through phase-out

The implementation of the Sector Plan has sharply reduced CFC-11 consumption and emission. In 1999, consumption was 1,090 tonnes for tobacco expansion. According to trends within the tobacco sector, 3,800 tonnes of CFC-11 would have been consumed in 2006 if no controls were enforced.

The reduction of CFC-11 emission through phase-out activities has successful. Assuming no control and an increase of demand for CFC-11, actual consumption and its reduction can be calculated. Results are shown in Table 6.1.

Table 6.1 Reduction of CFC-11 consumption after using alternative technologies

(Unit: ton)

Year	2001	2002	2003	2004	2005	2006	Sum
CFC-11 consumption (estimated)	2,300	2,600	2,900	3,200	3,500	3,800	18,300
CFC-11 consumption (actual)	887	710	551	463	121	21	2,753
CFC-11 reduction *	1,413	1,890	2,349	2,737	3,379	3,779	15,574

* Based on assumed annual consumption

The reduction of CFC-11 emissions is shown in Fig. 6.1. An estimated 15,574 tonnes of CFC-11 emission have been reduced within the 6 years phase-out. The implementation of the Sector Plan contributed greatly to the reduction of CFC-11 emissions in China.

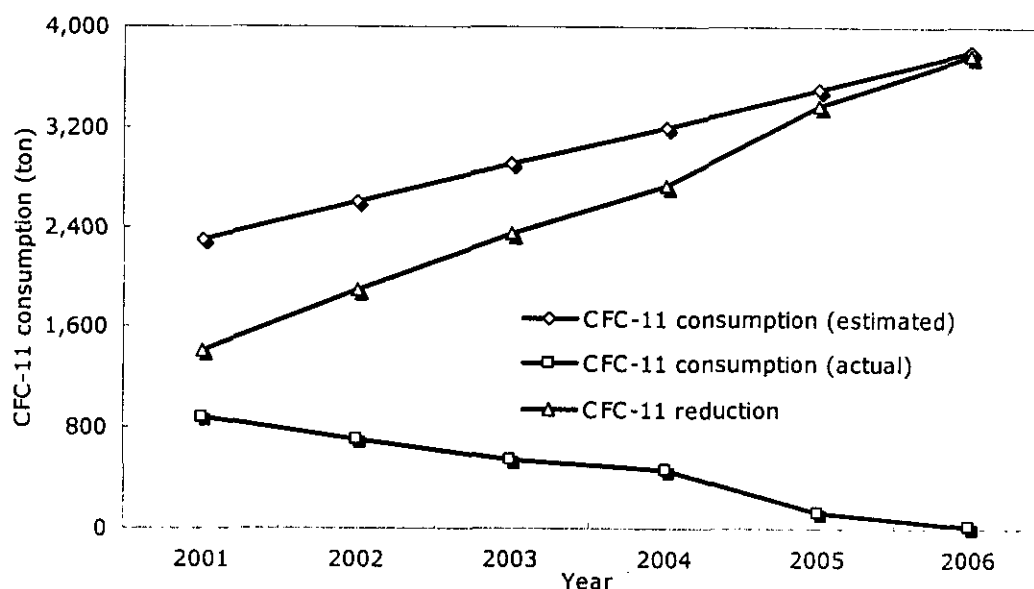


Fig. 6.1 Comparison on CFC-11 consumption (predicted and actual) and its reduction

6.2 Contribution to CFC-11 phase-out by China in global tobacco sector

China is one of the largest tobacco production and consumption countries. Yearly production of cigarettes accounts for approximately 35% of the world's total. Cigarette sales account for approximately 32% of the total. In the mid-1980s, the world's total yearly

production of expanded tobacco was about 150,000 tonnes, consuming 6,000 tonnes of CFC-11. In the 1990s, the Chinese tobacco sector consumed 1,090 tonnes of CFC-11 yearly. After developed countries phased out CFC-11 consumption, the Chinese tobacco sector's proportion in global consumption increased. Therefore, China's phase-out activities were extremely important to the CFC-11 phase-out in the global tobacco sector. Fig. 6.2 shows the tobacco production in China and other major tobacco producing countries in recent years.

Table 6.2 Tobacco production in the world during 1999-2004

(Unit: 1 billion cigarettes)

Country	Year						Growth rate (%)
	1999	2000	2001	2002	2003	2004	
China	164,410	166,812	169,915	172,215	178,911	187,316	4.1723
United States	61,012	59,413	56,218	53,210	49,914	49,216	-1.1362
Russia	28,311	34,114	37,410	39,010	38,510	38,210	-0.1779
Japan	26,910	26,010	25,819	25,110	24,010	23,416	-2.1250
Indonesia	23,312	23,711	23,616	21,313	21,417	21,117	-1.1397
Germany	20,416	20,618	21,318	21,215	20,512	20,813	1.1511
Brazil	12,216	11,817	11,817	12,210	13,411	13,117	-1.1790
World total	550,019	558,210	564,318	565,917	573,116	582,419	1.1628

In 1997, 73 lines of CFC-11 expansion equipment were in use in China. Most factories hadn't yet profited from them, nor recovered costs. More investments were needed to cover the cost of alternatives. To solve this financial deficiency, the STMA held conferences to discuss counter-measures. In 2002, a relatively clear consensus was formed at the sum-up conference for phase-out activities & experience exchanges in tobacco sector held by the STMA. They concluded installation of CO₂ expansion equipment should be planned and positioned rationally, tobacco factories should be encouraged through joint venture in order to avoid repeated construction and to improve equipment efficiency.

Cigarette factories also provided extensive labour and resources to support phase-out and guarantee tobacco supply. For instance, in 2002, 3 cigarette factories jointly ventured and established Jiangsu Green Industrial Co., Ltd. In 2003, 7 cigarette factories founded Jinsi Tobacco Co., Ltd. in Yichang, Hubei Province. These factories specialize in producing expanded tobacco, without the need large of capital investment for separate CO₂ expansion lines. These factories not only provide expanded tobacco for themselves, but also sell it out to factories without expansion lines in other provinces. In addition, the STMA has studied the transportation method for expanded tobacco in order to solve transportation problems such as breakage and loss water loss.

With environmental protection and the development of an environment-friendly society in mind, under the leadership of the STMA, with efforts from multiple parties, the tobacco

sector has not only dismantled all 73 lines of CFC-11 tobacco expansion equipment, but also constructed new replacement equipment for production. This guaranteed the phase-out ahead of schedule and safeguarded the regular development of the sector. Through the use of expanded tobacco, tar and nicotine content was reduced by 20% (according to the objectives of the medium-term tobacco sector development) in cigarette products. The tobacco sector has undertaken huge financial investments and committed itself to the protection the ozone layer.

6.3 Achievements and experiences

Investigation

Under the leadership of the STMA and the organization of the SWG, basic data for CFC-11 consumption has been collected within the tobacco sector. Each survey team was dispatched to separate factories; once they arrived, information was collected about CFC-11 consumption, expanded tobacco production, and cost both with data references and field surveys. The integrated and detailed data provides a good basis for the phase-out plan preparation.

Communication and publication

A lot of work has been done with variable forms to publicize the importance and requirements of the phase-out; newsletters have been regularly issued. The main forms of communication include: news media, the Internet, conferences, material issues, case presentations. The communication is variable by target groups, with multiple levels and forms. These activities have improved people's awareness of its importance, reduced resistance, accelerated phase-out advancement, and increased enthusiasm.

Training

The trainees include government officials, principals in charge of environmental protection within factories, and dismantling workers. Training forms include courses, conferences, forums, and online study. Contents cover knowledge about ozone layer protection, related laws and regulations, and management and implementation of international conventions. Through this training, participants have obtained a higher understanding about the plan, and their related working capabilities have been improved. It helps relevant government officials and missionaries master information and technology about the phase-out.

Phase-out policies and regulations

On Jun. 6th, 2000, *Notice of launching ODS phase-out activities in tobacco sector* was proposed by the SEPA and STMA. It required that implementation of the plan for CFC-11 phase-out in tobacco sector follow a quota system and dismantlement measures.

Scientific and rational working mechanism

The quota system, one of the implemented mechanisms, is both scientific and effective. It manages CFC-11 consumption and pushes the dismantlement of CFC-11 tobacco expansion equipment. These mechanisms have guaranteed the strict annual control of CFC-11 consumption below the permitted quota and the lines were dismantled on schedule.

Effective supervision and inspection

The STMA actively promotes CFC-11 phase-out activities. It practices supervision and inspection about the phase-out with the UNIDO. The SWG for CFC-11 phase-out in tobacco sector, officials of the UNIDO, and experts closely supervised the implementation of CFC-11 quota system to monitor consumption by tobacco factories. At each dismantlement, they were on site to offer guidance. This inspection strengthened the implementation of the Sector Plan.

Technical assistance

Technical assistance, such as AIS in tobacco sector has been explored to manage CFC-11 phase-out in each factory online; optimized transportation has increased the feasibility of tobacco supply after the phase-out; and alternatives have been developed and received good feedback and economic benefits.

During the implementation of the Sector Plan, the tobacco sector has summarized the phase-out experiences, important to sustain the phase-out achievement and to promote development of the sector.

The completion of the phase-out shows the Chinese tobacco sector is credible and responsible. It always insists on the supreme interests of the nation and consumers. With a high responsibility to the country and human-beings, the sector has been making great efforts to construct a harmonious society, to protect the global environment, and to strive for forward new development.

Appendix: 58 factories and their abbreviations

No.	Factory	Abbreviation
1	Yuxi Hongta Group	Changchun Factory
2	Hangzhou Cigarette Factory	Hangzhou Factory
3	Zhangjiakou Cigarette Factory	Zhangjiakou Factory
4	Wuhan Cigarette Factory	Wuhan Factory
5	Lichuan Cigarette Factory	Lichuan Factory
6	Chongqing Cigarette Factory	Chongqing Factory
7	Bengbu Cigarette Factory	Bengbu Factory
8	Tongren Cigarette Factory	Tongren Factory
9	Zangyang Cigarette Factory	Zangyang Factory
10	Xiangfan Cigarette Factory	Xiangfan Factory
11	Chengdu Cigarette Factory	Chengdu Factory
12	Huaiyin Cigarette Factory	Huaiyin Factory
13	Xuzhou Cigarette Factory	Xuzhou Factory
14	Shaoguan Cigarette Factory	Shaoguan Factory
15	Jilin Yanji Cigarette Factory	Jilin Yanji Factory
16	Xiamen Cigarette Factory	Xiamen Factory
17	Longyan Cigarette Factory	Longyan Factory
18	Shenyang Cigarette Factory	Shenyang Factory
19	Guiyang Huangguoshu Group Co. Ltd.	Guiyang Factory
20	Xianning Cigarette Factory	Xianning Factory
21	Zhengzhou Cigarette Factory	Zhengzhou Factory
22	Harbin Cigarette Factory	Harbin Factory
23	Bijie Cigarette Factory	Bijie Factory
24	Kaifeng Cigarette Factory	Kaifeng Factory
25	Hongan Cigarette Factory	Hongan Factory
26	Shijiazhuang Cigarette Factory	Shijiazhuang Factory
27	Tianjing Cigarette Factory	Tianjing Factory
28	Guangshui Cigarette Factory	Guangshui Factory
29	Guiding Branch Cigarette Factory	Guiding Branch Factory

No.	Factory	Abbreviation
30	Nanchang Cigarette Factory	Nanchang Factory
31	Zhumadian Cigarette Factory	Zhumadian Factory
32	Henan Ruzhou Cigarette Factory	Henan Ruzhou Factory
33	Luohe Cigarette Factory	Luohe Factory
34	Beijing Cigarette Factory	Beijing Factory
35	Siping Cigarette Factory	Siping Factory
36	Nanhai Cigarette Factory	Nanhai Factory
37	Dangyang Cigarette Factory	Dangyang Factory
38	Liuzhou Cigarette Factory	Liuzhou Factory
39	Meizhou Cigarette Factory	Meizhou Factory
40	Zhanjiang Cigarette Factory	Zhanjiang Factory
41	Hainan Cigarette Factory	Hainan Factory
42	Anyang Cigarette Factory	Anyang Factory
43	Shenzhen Cigarette Factory	Shenzhen Factory
44	Xiamen Huamei Cigarette Co. Ltd	Xiamen Huamei Factory
45	Nanxiong Cigarette Factory	Nanxiong Factory
46	Lianjiang Branch Cigarette Factory	Lianjiang Branch Factory
47	Mianyang Cigarette Factory	Mianyang Factory
48	Zunyi Cigarette Factory	Zunyi Factory
49	Chuzhou Cigarette Factory (Wuhu line)	Chuzhou Factory
50	Luoyang Cigarette Factory	Luoyang Factory
51	Hefei Cigarette Factory	Hefei Factory
52	Hohhot Cigarette Factory	Hohhot Factory
53	Xinjiang Cigarette Factory	Xinjiang Factory
54	Tianshui Cigarette Factory	Tianshui Factory
55	Guiding Cigarette Factory	Guiding Factory
56	Lanzhou Cigarette Factory	Lanzhou Factory
57	Fuyang Cigarette Factory	Fuyang Factory
58	Wulanhaote Cigarette Factory	Wulanhaote Factory