WORKSHOP REPORT

Training Workshop on Safety Aspects of CFC Substitution

(Full version with presentation texts)

Hangzhou, China, 22-24 May 1996

OzonAction Information Clearinghouse
OzonAction Programme

UNEP
Industry and Environment
FINAL REPORT

TRAINING WORKSHOP
ON SAFETY ASPECTS OF CFC SUBSTITUTION

(Full version with presentation texts)

Hangzhou, China, 22-24 May 1996

Organized by: The National Environmental Protection Agency of China
in cooperation with
The United Nations Environment Programme
Industry and Environment (UNEP IE)
OzonAction Programme

Funded by: the Multilateral Fund
# TABLE OF CONTENTS

**EXECUTIVE SUMMARY**

1. OPENING OF THE WORKSHOP

2. BACKGROUND

3. OBJECTIVES

4. PARTICIPANTS

5. METHODOLOGY

6. OUTPUTS

7. CONTENT

  7.1 Introduction of existing codes and standards for flammable substances and Safety Guidelines for CFC substitution

  7.2 Safety Guidelines for Projects Using Hydrocarbon Substitutes

  7.3 In depth discussion of sector aspects of safety issues in CFC substitution

  7.4 Site visit and role-play practices

  7.5 Policy setting and safety guideline development planning

8. FOLLOW-UP ACTIVITIES OF THE WORKSHOP

9. EVALUATION OF THE WORKSHOP

10 CONCLUSION

11. ANNEXES

  11.1 ANNEX I: AGENDA

  11.2 ANNEX II: PARTICIPANTS LIST

  11.3 ANNEX III: A: RESUME & CONTACT INFORMATION OF INTERNATIONAL RESOURCE PERSONS

  B: LOCAL RESOURCE PERSONS

  11.4 ANNEX IV: INTRODUCTORY PRESENTATION

  11.5 ANNEX V: FULL TEXT OF MAIN WORKING DOCUMENTS USED DURING THE WORKSHOP

  11.6 ANNEX VI: FULL TEXT OF PRESENTATIONS MADE DURING THE WORKSHOP

  A: INTERNATIONAL RESOURCE PERSONS

  B: LOCAL RESOURCE PERSONS

  11.7 ANNEX VII: PRESS RELEASE

  11.8 ANNEX VIII: EVALUATION GRAPHS

  11.9 ANNEX IX: BACKGROUND ON THE OZONATION PROGRAMME

  11.10 ANNEX X: BACKGROUND OF THE UNEP IE
Training Workshop on Safety Aspects of CFC Substitution

Organized by
the National Environmental Protection Agency of China
and
the United Nations Environment Programme

Hangzhou, China, 22-24 May 1996

EXECUTIVE SUMMARY

The Training Workshop on Safety Aspects of CFC Substitution for China was approved at the 18th meeting of the Executive Committee of the Multilateral Fund, as a response to the urgent need for development and implementation of regulations and safety procedures, at a national and enterprise level, to ensure safe production after conversion to non-ozone depleting substance technologies.

The workshop was intended to initiate the activities to address these needs. It was consistent with China’s sectoral strategy on ODS phase-out which promotes the development of standards for the safe use of hydrocarbons and toxic alternatives.

The workshop aimed to build the capacity of local government and industry organizations to handle safety issues through training and information sharing and to set up safety standards and regulations.

The China National Environmental Protection Agency (NEPA) and the UNEP’s Industry and Environment OzonAction Programme jointly organized this Workshop in Hangzhou (China) from 22-24 May 1996.

119 Chinese participants from enterprises, line ministries and local government attended the workshop. National and international experts, including members of UNEP Technical Options Committees, from Canada, Denmark, Germany, France, United Kingdom and United States of America, contributed to the design and presentations of the workshop. The World Bank, UNIDO, UNDP and the Secretariat of the Multilateral Fund for the implementation of the Montreal Protocol, were also represented.

The workshop was designed to achieve its objectives through the interactions among local and international experts, enterprise managers and government decision makers. The key components of the training were:
introduction of existing codes and standards for flammable substances and Safety Guidelines for CFC substitution;
• in depth discussion of sector aspects of safety issues in CFC substitution;
• site visit and practical study;
• policy setting and safety guideline development planning.
(See Annex I Agenda)

The results of the workshop were:

• participant's awareness about safety issues in the ODS phaseout;
• participant's understanding of existing international and national regulations, standards for using the flammable substances;
• training of key personnel on safety guidelines for developing and implementing safety plans at local and enterprise level;
• a work plan for incorporation of safety aspects into the "Guidelines for the Implementation of Projects Under the Multilateral Fund for the Protection of Ozone Layer" being prepared by NEPA;
• a work plan for development of sector-specific safety guidelines being used by Chinese enterprises implementing ODS phaseout projects.

The future action plan and follow-up activities of this workshop mainly includes plans to:

• formulate safety guidelines in accordance with Chinese laws/regulations, codes and standards;
• establish and improve working procedures involving safety issue when China implements Multilateral Fund projects;
• study further safety training plan; and
• make full use of OzonAction Information Exchange Clearinghouse of UNEP and strengthen Information Exchange Clearinghouse of NEPA.

The report concludes by summarizing the participants' evaluations of the workshop's effectiveness. A graphic presentation of participants ratings is attached in Annex III.
1. OPENING OF THE WORKSHOP

Representatives from NEPA, UNDP, the World Bank, UNIDO, UNEP IE and the Multilateral Fund Secretariat gave opening addresses.

2. BACKGROUND

China, now the largest producer and consumer of ODS in the world, is scheduled to phase-out ODS by the year 2010 under the Montreal Protocol. Out of 100 investment projects already approved under the Multilateral Fund, 64 of these in the refrigeration, aerosol and foam sectors will be using flammable and toxic alternatives.

Given that relevant enterprises do not have the experience of handling flammable or toxic chemicals in their conventional production, the Chinese Government and industries are very concerned with safety problems that may be introduced in the ODS phase-out process. With large number of small and medium sized enterprises, the only solution is to assist local government and industry organizations in increasing their capacity for handling safety problems through training and information sharing on experiences and safety standards.

Approved by the Multilateral Fund’s Executive Committee, this safety training workshop aims to make the government and industry managers dealing with ODS phase-out aware of the related safety issues, international standards, and available technologies so that regulations and safety procedures at national level (as well as at the enterprise level) can be developed and implemented to ensure the safe production after conversion to ODS-free technologies.

3. OBJECTIVES

The objectives of the workshop were to assist the Chinese Government, industry associations and enterprises in their safe conversion to ODS-free technologies by training the trainees on:

- the importance of measures, regulations and training for safe conversion;
- the key issues related to the safety of human health and the environment when implementing ODS-alternative technologies;
- international and national standards/regulations on safe use of relevant ODS substitutes;
- the methods and procedures for enterprises to develop internal safety measures and training programmes for the safe management of their production.
4. PARTICIPANTS

119 Chinese participants from enterprises, line ministries and local government attended this workshop.

National and international speakers, including members of UNEP Technical Options Committees, from Canada, Denmark, Germany, France, United Kingdom and United States of America, contributed to the design and presentations of the workshop.

The World Bank, UNIDO, UNDP and the Secretariat of the Multilateral Fund for the Implementation of the Montreal Protocol, were also represented.

A full list of participants is included as Annex II of this report.

5. METHODOLOGY

The workshop consisted of presentations, practical case studies, site visits and role-play practices together with expert group discussions and debates. An agenda and a list of the presentations is provided in annex I and IV of this report.

6. OUTPUTS

With this workshop, following outputs were achieved:

- increased awareness on safety related issues among managers of enterprises undertaking conversions projects;
- established the plans to set up safety standards and regulations within China;
- elaborated the list of essential elements to be included in safety procedures and training at an enterprise level when implementing ODS phase-out projects;
- elaborated the recommendations on main policy and technical measures for safe conversion.
7. CONTENT

The workshop agenda and the list of presentations are included as annexes I and IV of this report. A full copy of all or selected presentations can be obtained upon request from UNEP IE. Summary information about the main points covered during the workshop is presented in the following sections.

7.1 Introduction of existing codes and standards for flammable substances and Safety Guidelines for CFC substitution

International and local experts gave presentations at the plenary sessions to address the following issues:

- Risk and safety issues related to flammability and toxicity in context of alternative technologies;
- Role of education and awareness on safe conversions to non-ODS productions;
- International laws/regulations, codes and standards directed at flammable substances;
- International industry practices directed at flammable substances;
- Existing laws/regulations, codes and standards in China directed at flammable substances;
- China's consideration about safety problem when using flammable substances;
- Safety guidelines for projects using hydrocarbon substances;
- Safety problems of products that use flammable substances;
- How to compile safety plan for projects;

As it was the first training of its kind in China, both local and international experts performed the role of trainers. The combination of international and local expertise provided the trainees, who had no experiences in handling flammable and toxic chemicals in their conventional production, with a broad overview of the existing codes and practices in China and abroad.

7.2 Safety Guidelines for Projects Using Hydrocarbon Substitutes

Safety Guidelines for Projects Using Hydrocarbon Substitutes were developed by UNEP experts with the contribution of Chinese expertise. This document functioned as the key training material and each trainee was provided with a Chinese-language version.
7.3 In depth discussion of sector aspects of safety issues in CFC substitution

In the discussion sections, groups were formulated based on features of different sectors, including:

- PU foam;
- PE/PS foam;
- Refrigeration;
- Aerosol;

Under the safety experts' guidance, the participants from different industries studied the draft Safety Guidelines for Projects Using Hydrocarbon Substitutes during the group discussion and discussed the following questions in the context of industry's characteristics:

- the main safety problems that will be faced when the sector employs hydrocarbon substances;
- introduction of finished projects within the sector and safety measure analysis;
- safety problems of products involved in hydrocarbon projects;
- safety plan establishment for conversion projects.

7.4 Site visit and role-play practices

The workshop studied a case study which is one of the first completed Multilateral Fund projects -- conversion project of Huajiang Plastics Factory.

Participants conducted a site visit, simulated tests and developed a case study with strong support of Huajiang Plastics Factory.

Led by experts, members of the four sessions played two roles -- "Safety Consultant" and "Safety inspector" -- visited the factory and inspected the site safety according to the draft safety guideline.

Based on the full discussion, the "safety inspector" inspected aspects of the factory and gave comments on the safety status, including whether:

- all appropriate and necessary safety measures had been taken by the factory in accordance with the draft safety guideline;
- all safety measures were operational;
• safety operation procedures were understood and used by workers on site;
• a safety organization in the factory was in place and efficient training had been given to the workers.

The "Safety consultant" provided suggestions to the factory based on the following problems:

• general safety requirements when converting to a hydrocarbon project;
• fire source separation measures in the factory;
• installation of storage tank;
• other safety measures;
• safety operation process, safety training planning and emergency measures.

Through site practice, workshop participants gained deep understanding of the specific implication of safety, and put to use what they just learned at the workshop. They also exchanged views, and further realized the specific applications of safety knowledge in different sectors.

### 7.5 Policy setting and safety guidelines development planning

During the last session of the workshop, the national and international experts presented summaries of the training provided to each group. Each group submitted a safety inspection checklist with regard to Huajiang Plastics Factory. The Chinese fire prevention experts provided a technical summary and introduced systematic overall considerations on fire prevention issue to be taken into consideration in the projects.

After the discussions, Chinese experts proposed working procedures of safety evaluation for Multilateral Fund projects which will be incorporated into the "Guidelines for the Implementation for Projects Using the Multilateral Fund for the Protection of Ozone Layer" being prepared by NEPA.

A future action plan was presented by the National Environmental Protection Agency. One of the main follow-up actions is to develop sector specific safety guidelines for China’s ODS phase-out projects.
8. FOLLOW-UP ACTIVITIES OF THE WORKSHOP

The future action plan includes:

- formulation of sector specific safety guidelines in accordance with Chinese laws/regulations, codes and standards;
- establishment and improvement of working procedures involving safety issues when implementing Multilateral Fund projects in China;
- development of further safety training plan;
- making full use of the OzonAction Information Exchange Clearinghouse of UNEP and strengthening the Information Exchange Clearinghouse of NEPA;
- organization of a series of safety workshop in every sector in the coming years.

9. EVALUATION OF THE WORKSHOP

In order to evaluate the Workshop’s success and obtain experience for future workshop, the workshop organizers designed a special evaluation questionnaire to obtain participants views on the workshop.

From the feedback of the completed questionnaires (which does not include experts and workshop organizers) returned by over 50% of the participants, the evaluation is summarized as follows:

- general rating of the workshop: 52% responded that it was very useful, 33% think it was useful, 15% thought it was average.
- rating on information provided by the workshop: 24% regard it as very useful, 48% as useful, 28% as average.
- regarding the exchange between the participants: 30% consider it very useful, 50% found it useful, 15% found it average, 4% thought it was not sufficient.
- regarding the interaction between the experts and participants: 26% rated it very high, 56% rated it high, 18% rated it average.
- rating for the selection of the participants: 26% rated it very good, 46% good, 28% average.
- on the delivery of the presentations: 24% thought they were very easy to
understand, 39% easy, 37% average.

From the evaluation by the workshop participants, the results of the workshop were positive, and were acknowledged by the majority of participants, who considered that the workshop contents were substantial and valuable.

The participants also considered that the amount of information was abundant. Within the three short days, participants obtained systematic understanding of the information on safety, laws, regulations, codes and standards, and industry practices in developed countries as well as in China. The objective of information transfer was well achieved at the workshop.

The workshop participants actively participated in all activities of the workshop, and provided active responses. At session discussions, participants spoke enthusiastically. From the safety summary of each session, excellent training effects were obtained.

As the first training of its kind in China, the workshop has established a organizational and ideological framework for the safe implementation of Montreal Protocol projects, and generated important impact in relevant sectors.

10. CONCLUSION

The workshop may be considered very successful in achieving its objectives and expected results. As main outcome of the workshop, we can mention

- participant's awareness about safety issues in the ODS phaseout;
- participant’s understanding of existing international and national regulations, standards for using the flammable substances;
- training of key personnel on safety guidelines for developing and implementing safety plans at local and enterprise level;
- a work plan for incorporation of safety aspects into the "Guidelines for the Implementation of Projects Under the Multilateral Fund for the Protection of Ozone Layer" being prepared by NEPA;
- a work plan for development of sector-specific safety guidelines being used by Chinese enterprises implementing ODS phaseout projects.
The results of the workshop will be enforced and extended by an appropriate implementation of the follow-up action plan.
ANNEX I

AGENDA

Wednesday 22 May:

08:00-08:30 - Registration

08:30-09:30 - Official Opening

* Welcome address by Mr Wang Yangzu, Deputy Administrator of NEPA
* Opening statement by Mr Sheng Shou Lang, Deputy Chief Officer of the Multilateral Fund Secretariat
* Opening statement by Mr Frank Pinto, Principal Technical Adviser and Chief, Montreal Protocol Unit/SEED/UNDP

09:30-09:45 - Objectives of the Workshop: Mr R. Shende, OzonAction Programme Coordinator - UNEP IE

SESSION 1: Session Chairman: Mr Wu Baozhong, Director, Department of Pollution Control, NEPA

09:45-10:15 - Overview of safety issues related to ODS phase-out
- Dr S. O. Andersen, Co-chair of UNEP Technology & Economic Assessment Panel, to be presented by Ms S. Rand, Member of UNEP Technology Options Committee - Foam

Risk and Safety issues related to flammability and toxicity in context of alternative technologies will be reviewed

10:15-10:30 - Discussions

10:30-10:45 - Coffee Break

10:45-11:15 - Role of education and awareness on safety issues
- Mr Sun Lun, Senior Engineer, Director of Fire Bureau, Ministry of Public Security
Importance of education and awareness on safety in production facilities in the context of China's phase-out plans will be discussed

11:15-11:45 - A field proven safety management system
- Mr B. Young, Former Corporate Director Safety, Security and Loss Prevention - DOW Chemicals Canada Inc

Introduction to safety management and role of awareness and training

11:45-12:00 - Discussions

12:00-13:00 - Lunch

SESSION 2: SAFETY STANDARDS AND REGULATIONS

Session Chairman: Mr J. Buswell - Safety Executive Calor Gas

The aim of this session is to give an overview of existing Chinese and international safety standards and regulations related to ODS phase-out projects

13:00-14:00 - Status and development of China's safety standards and regulations related to CFC substitution
- Mr Li Yicheng, Senior Engineer, Fire Bureau, Ministry of Public Security (30 mn)
- Mr Cui Mayao, Chief of Safety Production Division, Ministry of Chemical Industry (30 mn)

14:00-15:00 - Status and trend of international safety standards and regulations related to ODS substitutes
- Mr E. Pedersen, Former Deputy Director, Danish Fire Institute and Member of UNEP Halon Technical Options Committee (30 mn)
- Mr K.J. Richardt, Head of Department of Plant Safety and Environment TUV Sudwest (30 mn)

15:00-15:20 - Coffee Break
SESSION 3: SAFETY MANAGEMENT

Session Chairman: Mr B. Veenendaal, Member UNEP Technical Options Committee - Foam

15:20-15:50 - Further consideration for safety management system. Role of safety management system in identifying and evaluating hazards, minimizing accidents and providing for active awareness preparedness emergency back up plans at the local level
- Mr B. Young,

15:50-16:10 Discussions

16:10-16:40 - Safety management: control and maintenance of safety measures
- Mr J. Buswell,

The presentation shall give an overview of necessary procedures for control and maintenance of safety provisions; inspection, monitoring, and reporting of installations, i.e. gas storages, gas detection system, fire fighting equipment, ventilation and electrical installations

16:40-17:00 Discussions

SESSION 4: SAFETY GUIDELINES: ODS PHASE-OUT

Session Chairman: Dr K.J. Richardt

The aim of this session is to introduce a draft safety guidelines based on experience from completed phase-out ODS projects. The draft guidelines will be utilized factory level exercise in Hangzhou Huajing foam factory

17:00-18:00 - Introduction of draft safety guidelines for ODS phase-out projects and discussions
- Mr E. Pedersen and Mr Shaw Z. Leng., Project Engineer, ICF Kaiser

18:10-19:00 - Welcome Reception

Thursday 23 May:
SESSION 5: SAFETY PROBLEMS AND MEASURES: SECTORAL CONSIDERATION

Group discussion in four parallel break out session

Session Chairman: Mr. E. Pedersen

The aim of this session is to give a general overview of technology and safety aspects for each of the sectors. Each of the following sector specific presentation will be done by a UNEP Consultant (30 mn) and a Chinese expert (30 mn), and discussion will be led by one Chinese expert (30 mn) on overview of technology used in conversion projects, safety problems related to alternatives, production and storage for each sector

08:30-10:00 - Safety problems and safety measures related to ODS phase-out in foams, refrigeration and aerosol sectors

PU foam: Presentations:
- Mr. JI. Gardner and Mr. Guan Jianwei, Shanghai Fire Bureau
Discussions: led by Mr. Cui Muyao

Group I

PE/PS foam: Presentations:
- Mr. B. Veenendaal and Mr. Pan Zuoyang, Senior Engineer, Zhejiang Fire Research Institute
Discussions: led by Mr. Zhou Jiaming, Vice-Factory Director, Senior Engineer, Foam Plastic Factory

Group II

Refrigeration: Presentations:
- Mr. KJ. Richardt and Mr. Huang Xiangxi, Senior Engineer, Beijing Dongfang Chemical Industrial Company
Discussions: led by Mr. Shaw Z.Leng

Group III

Aerosol: Presentations:
- Mr. J. Buswell, Mr. Fermé, Director of Aerotam and Mr. Hua Zhangxi, Senior Engineer, National Council of Light Industry
Discussions: led by Mr. Li Yicheng

Group IV

10:00-10:15 - Coffee break

14
10:15-11:45 - Safe conversion projects: Case studies

- Mr Wen Heping, Senior Engineer, Tianjin Polyurethane Plastics Factory

- Mr Zhou Jiaming, Senior Engineer, Zhejiang Huajing Foam Plastic Factory

- Mr Qu Guangmig, Engineer, Qingdao Head Refrigerator Co., Ltd.

- Mr Wan Baogeng, Senior Engineer, Shanghai Jiale Aerosol Factory

Review of four case studies based on existing project proposals

12:15-13:15 - Lunch

13:30-17:30 - Site Visit to Hangzhou Huajing Foam Factory

* Introduction by the Manager of the plant

* Explanation on 'mock exercise' for preparing safety management plan consisting of identification of sources of risk, checklist for safety measures, and ways to handle emergency situation

-Mr E. Federsen and Mr J. Buswell

* Site visit

* Exercise to prepare safety management plan by select group

18:00 - Supper

Friday 24 May

08:30-12:00 - Group discussion on safety management plans for each sector using the draft guidelines

Foam: led by Mr B. Veenendaal, Mr J.J. Gardner, Mr Zhou Jiaming and Mr Pan Zuoyang (1 Hr)

Refrigeration: led by Mr K.J. Richardt and Mr Shaw Z. Leng (1 Hr)

Coffee Break (30 mn)
Aerosol: led by Mr J. Buswell, Mr Fermé and Mr Hua Zhangxi (1 Hr)

12:00-13:00 - Lunch

13:00-15:00 - Presentation of safety management plan prepared by select group based on site-visit on 23rd May
- Mr Pan Zuoyang and Mr Zhou Jiamei

Discussions

15:00-15:15 - Coffee break

SESSION 6 WRAP-UP MEETINGS AND FOLLOW-UP STRATEGY

Session Chairman: Mr R. Shende

- Next steps and time schedule for completion of Safety Guideline and setting up standards in China

15:15-16:15 - Work plan for standards setting in China
- Mr Hua Zhangxi

16:15-16:45 Support from OzoneAction Programme and Follow-up Action -- Mr R. Shende, UNEP IE

16:45-17:00 Discussions

17:00-17:15 - Concluding Statement by Mr Sheng Shou Lang, the Multilateral Fund Secretariat

17:15-17:30 - Conclusion by NEPA

18:00 Supper