Chemtura

Methyl Bromide Update

Heat Treatment Workshop

Kansas State University

May 13, 2009

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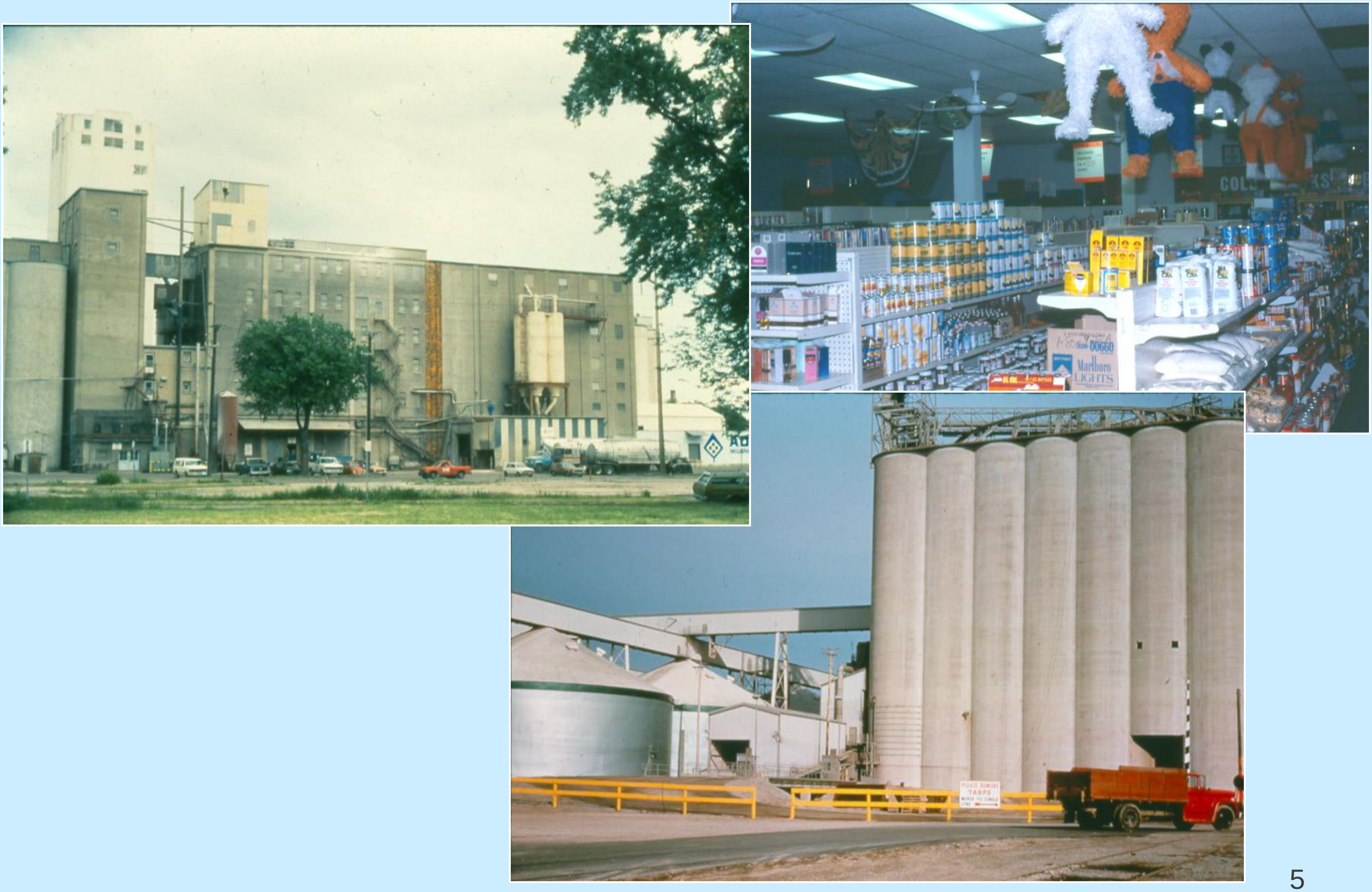
Methyl Bromide for Commodity Fumigation

- Raw agricultural commodities
- Processed foods
- Part of total sanitation procedures
- Meets USDA and FDA requirements

Why Use Methyl Bromide?

- Evaporates quickly
- Penetrates
- Toxic to all insect life stages
- Works quickly
- Leaves no residue


FANCY
BLUEBERRIES
BRADY FARMS, INC.
LENGT
EMPEROR
HYUNDAI


Marlboro LIGHTS
PLEASE REMOVE TARPS


IRVIN

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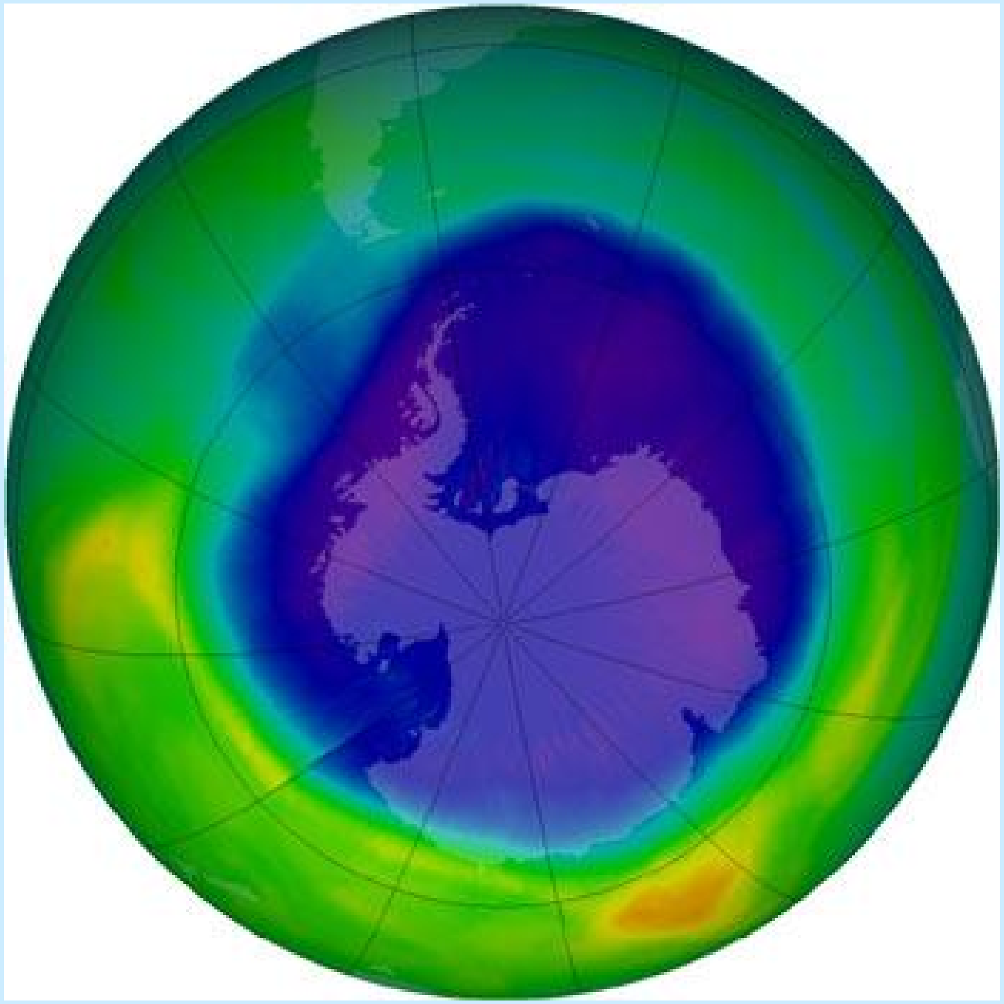
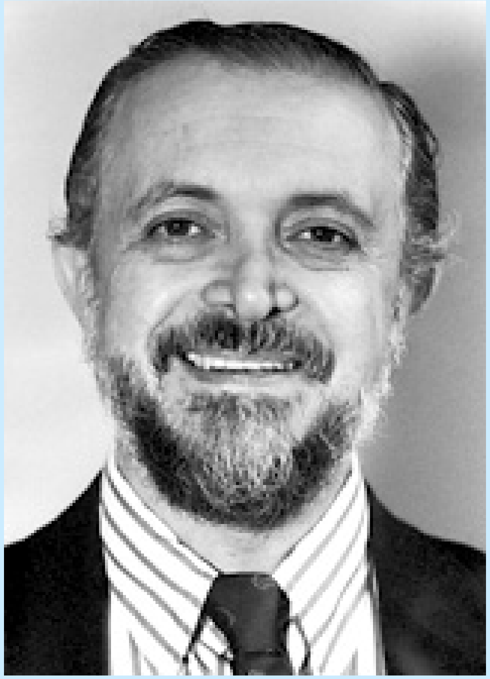


Montreal Protocol on Substances That Deplete the Ozone Layer

History of the Montreal Protocol

Prompted by the work of Sherwood Rowland and Mario Molina in 1974, showing that some halogenated chemicals can cause destruction of stratospheric ozone. In 1995 they were awarded the Nobel Prize in Chemistry for their work.

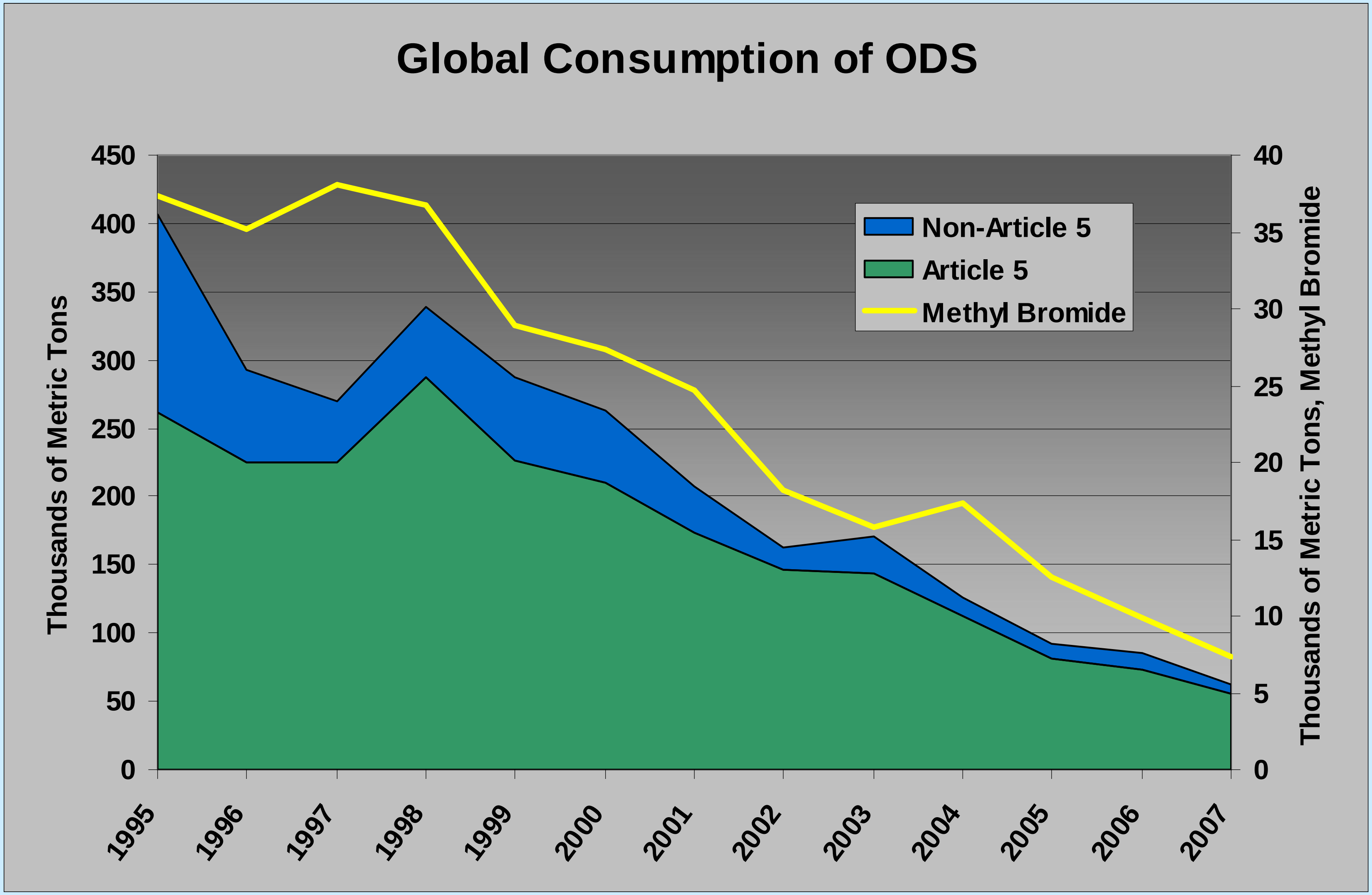
F. Sherwood Rowland



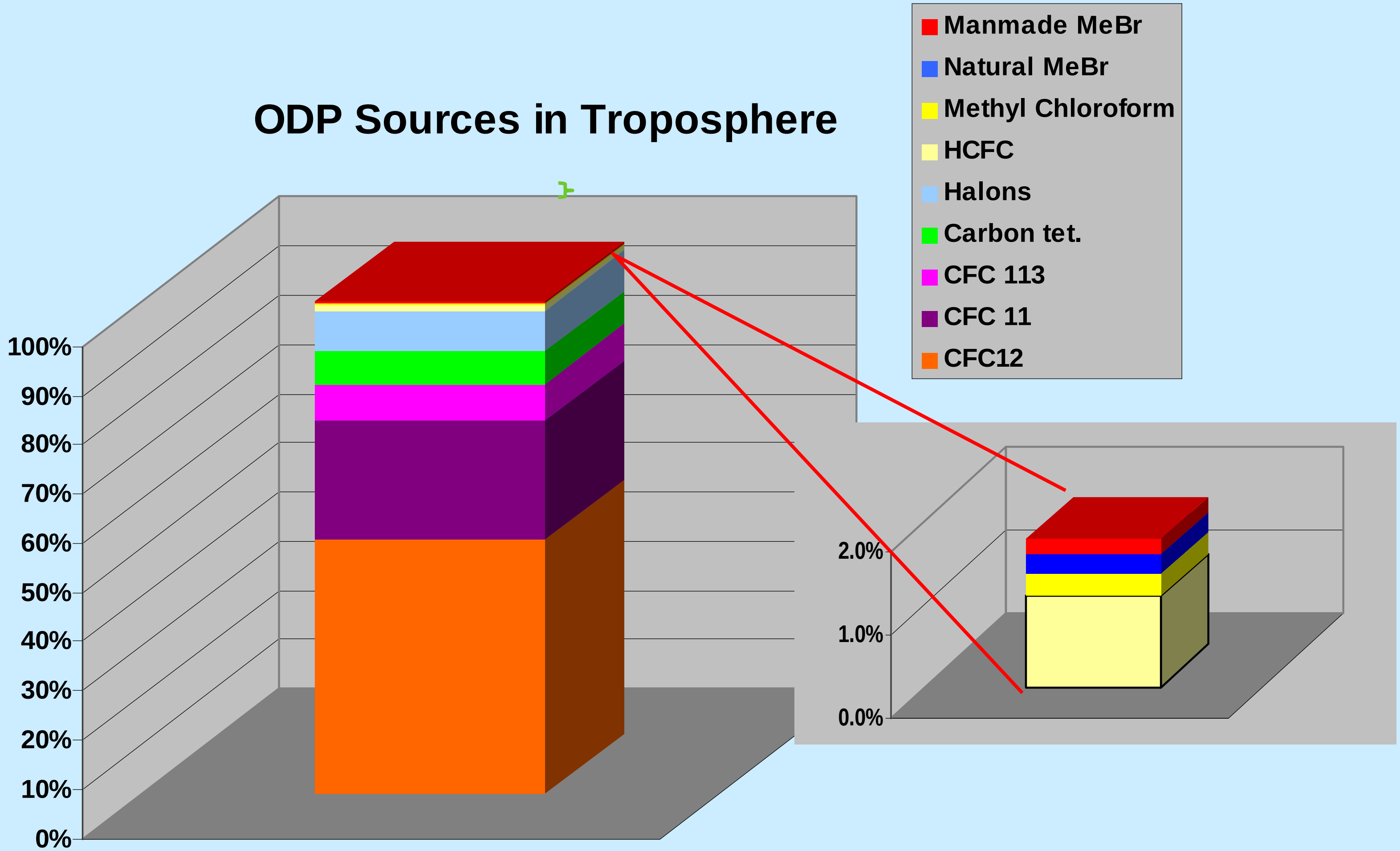
Mario Molina

History of the Montreal Protocol -2

- Montreal Protocol drafted in 1987
- Ratified by US in 1988
- 195 nations have ratified
- Methyl bromide was added as an Ozone Depleting Substance in 1992.
- In the U.S., methyl bromide production was frozen in 1994, and phase out began in 1998.
- Policies adopted by signatory nations have resulted in a 95% reduction in the production of Ozone Depleting Substances.
- Elimination of major ODS have led to increased emphasis on minor, insignificant chemicals

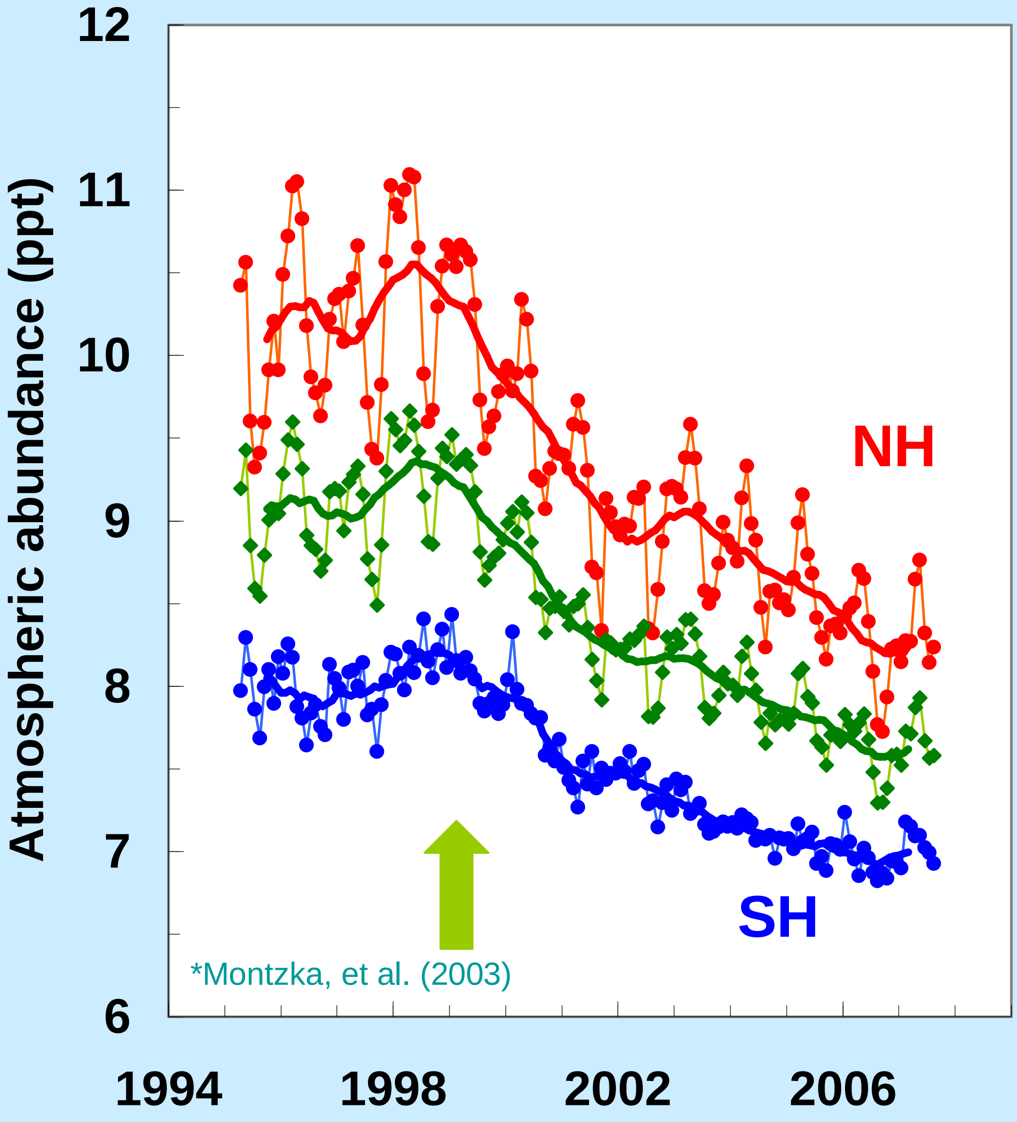

Global Consumption of ODS
Thousands of Metric Tons
Thousands of Metric Tons, Methyl Bromide
0
50
100
150
200
250
300
350
400
450
0
5
10
15
20
25
30
35
40
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
Non-Article 5
Article 5
Methyl Bromide

Contribution of Methyl Bromide



Methyl Bromide contributes only 0.2% of ODP in the atmosphere

Atmospheric Observations of CH_3Br*



*Montzka, et al. (2003)

The atmospheric abundance has declined each year since production decreases began (1999)

Northern Hemisphere declines are twice those in the SH

The decline is most likely from reduced industrial production—*but faster than expected*

How have other processes influenced the decline? *e.g.*, banking, tarping, biomass burning…?

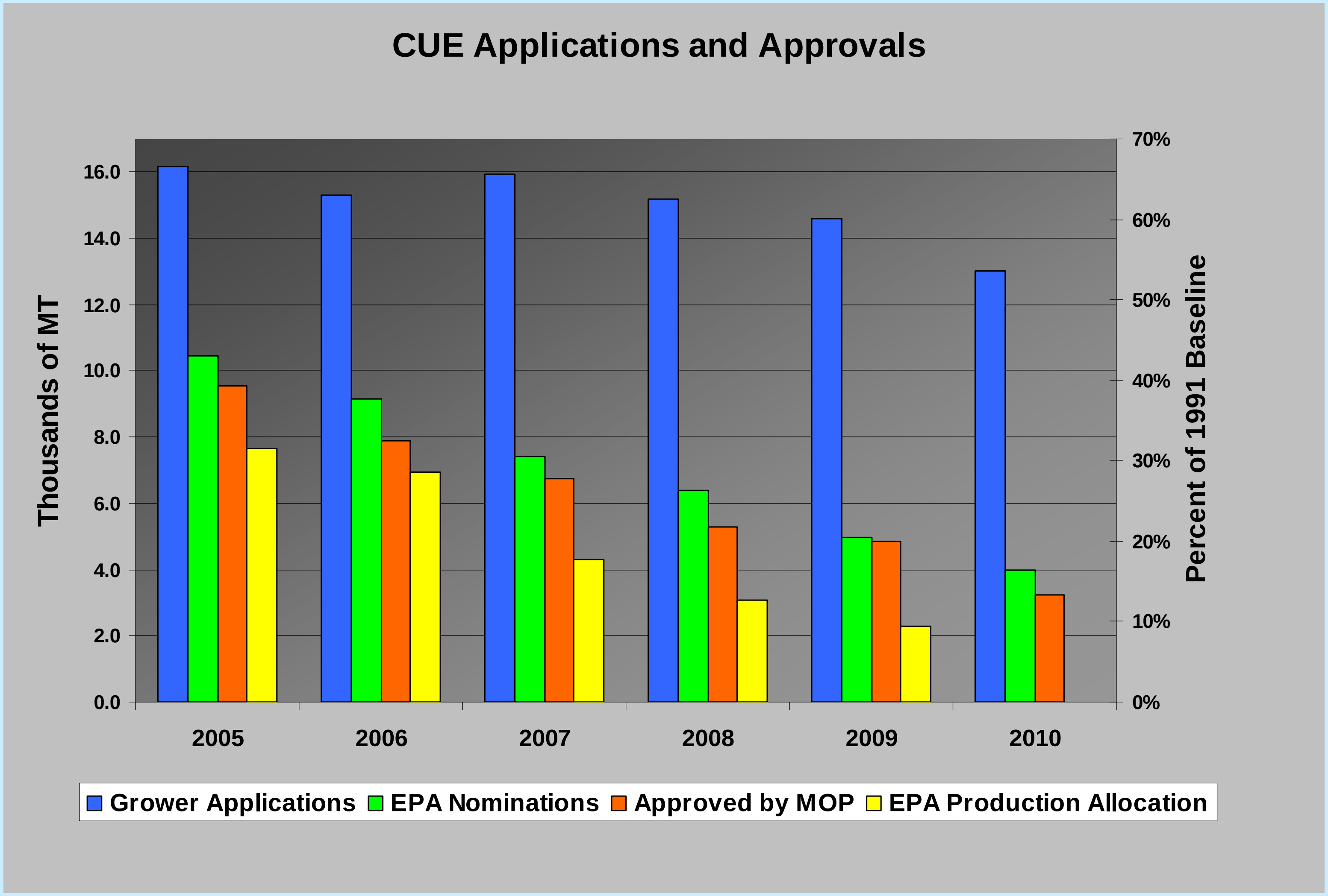
Atmospheric Burden Revision

Source or Sink Type	Source or Sink Best Estimate (Gg yr^{-1})	
Sources		
Ocean	54	(From net flux of –14 Gg/y and uptake)
Fumigation-(soils, durables, perishables, structures)	41.8	(*Kurylo et al.*, 1999)
Gasoline	5	(*Kurylo et al.*, 1999)
Biomass Burning	20	(*Mano and Andreae*, 1994)
Wetlands	4.6	(*Varner et al.*, 1999)
Salt Marshes	14	(*Rhew et al.*, 2000)
Shrublands	1	(*Rhew et al.*, 2001)
Rapeseed	6.6	(*Gan et al.*, 1998)
Rice Fields	1.5	(*Redeckeret al.*, 2000)
Fungus	1.7	(*Lee-Taylor and Holland*, 2000)
Peatlands	0.9	(*Dimmer et al.*, 2001)
Subtotal (Sources)	*150*	
Sinks		
Ocean	-68	(*Yvon-Lewis and Butler*, 1997; 2002)
OH and hν	-71	(*De More et al.*, 1997)
Soils	-42	(*Shorter et al.*, 1995; *Varner et al.*, 1999)
Plants	(not quantified)	
Subtotal (Sinks)	*-181*	
Total (Sources + Sinks)	***-31***	

$\tau = 0.7y$

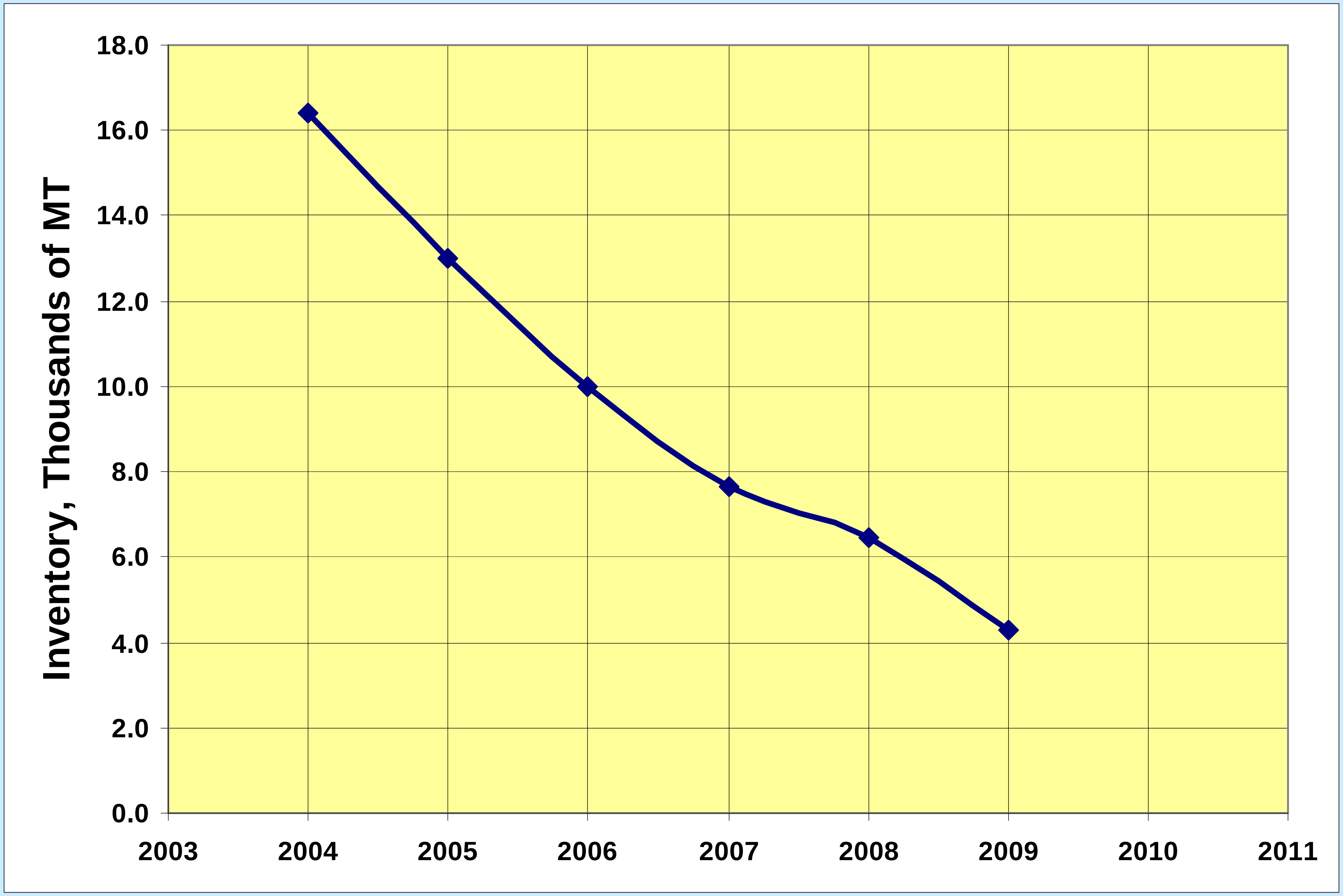
Revised from WMO 2002 Report

US Methyl Bromide Phase Out



Despite demonstrated need and small contribution to Ozone depletion, US EPA continues to aggressively phase out methyl bromide

Methyl Bromide US Field Inventory



Exempt Uses

- Non-emissive use
- Export to developing nations
- Quarantine and pre-shipment
- Critical Use

> *There are no technically and economically feasible alternatives or substitutes available to the user that are acceptable from the standpoint of environment and health and are suitable to the crops and circumstances of the nomination;*

Montreal Protocol, Decision IX/6, September 1997

Timeline for U.S. CUE Process

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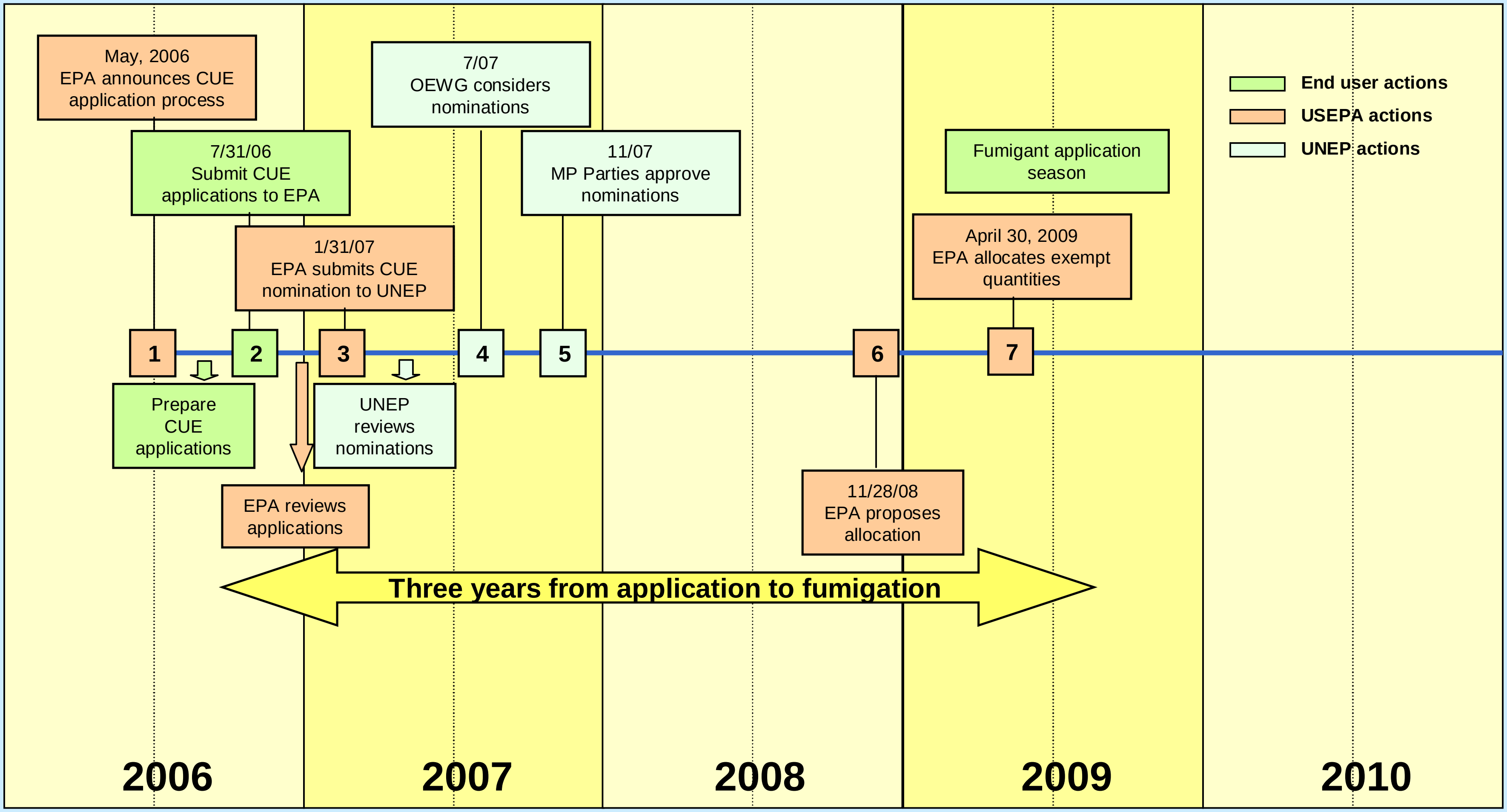


🟩 **End user actions**

🟧 **USEPA actions**

⬜ **UNEP actions**

May, 2006
EPA announces CUE application process

7/31/06
Submit CUE applications to EPA

1/31/07
EPA submits CUE nomination to UNEP

7/07
OEWG considers nominations

11/07
MP Parties approve nominations

Fumigant application season

April 30, 2009
EPA allocates exempt quantities

1 **2** **3** **4** **5** **6** **7**

Prepare CUE applications

EPA reviews applications

UNEP reviews nominations

11/28/08
EPA proposes allocation

Three years from application to fumigation

2006 **2007** **2008** **2009** **2010**

Despite the phase out…

- Methyl bromide remains available for the most critical uses.
- Unlimited volumes are available for Quarantine and Preshipment (QPS) uses.
- Registrants are supporting methyl bromide with additional studies and data during re-registration.
- Trade organizations such as NAMA and NPMA provide support by submitting Critical Use applications on behalf of users.
- Methyl bromide remains the fumigant of choice for many critical applications.

Re-registration

- Required of all pesticides
- For methyl bromide, began in early 1990’s with submission of several new studies to EPA
- Based on a review of these studies, EPA conducted risk assessments and released them for comment in 2003.
- After several rounds of comments, EPA released a draft “Reregistration Eligibility Decision” (RED) in August of 2006.

Draft RED

- Recommended continued registration of methyl bromide
- Label changes will be required
  - Respiratory protection will be required at levels above 1 ppm (1-5 ppm, cartridge type; >5 ppm SCBA)
  - Minimum aeration times of 4 hours (active) and 12 hours (passive) will be required
  - Fumigation Management Plans
  - Applicator Education
  - Buffer zones
  - Notification of neighbors within or adjacent to buffer zones.

Timing of Label Changes

- Additional comments on draft RED were submitted in 2008
- Final RED expected in the summer of 2009.
- Label changes, especially buffer zones, will be phased in.
- Some label changes will take effect in 2011, others may be delayed until 2013.

Buffer Zones

- Buffer zone = *area surrounding the fumigation site from which everyone must be evacuated.*
- EPA's initial risk assessments for methyl bromide predicted buffer zones of >4,000 feet in some cases.
- Such large buffer zones would be prohibitive for many facilities.
- Buffer zones were based on model calculations and a limit of exposure of 1 ppm over an 8-hour period.
- Despite objections from applicators that such levels had never been observed in actual practice, EPA refused to change.

New Emission Data for EPA

- In December, 2006, Chemtura, IFC and others met with EPA to discuss data that could be developed to improve buffer zone estimates
- The methyl bromide industry, led by Chemtura and IFC, agreed to provide
  - Comparison of actual and modeling results for several historical studies from the mid-1990's
  - Comprehensive emission monitoring studies at several representative fumigations of food processing facilities
  - Comparison of actual and modeling results for using the newly collected data.
  - An analysis of how the model should be modified to work for fumigant emissions

Conclusions from Emission Studies

- Emission studies completed during 2007 and reported to EPA early in 2008
- Total fumigant losses during Treatment phase are much **greater** than EPA assumed; they also occur over a longer time
- Emission rate profile shows <u>Aeration</u> Phase emissions much **lower** than assumed
- Downwind concentrations are **lower** than the 'EPA Level of Concern' at all points monitored
- Downwind concentrations show that no buffer zone would be required at these sites

EPA Modeling Assumptions vs. Lessons Learned from Analysis

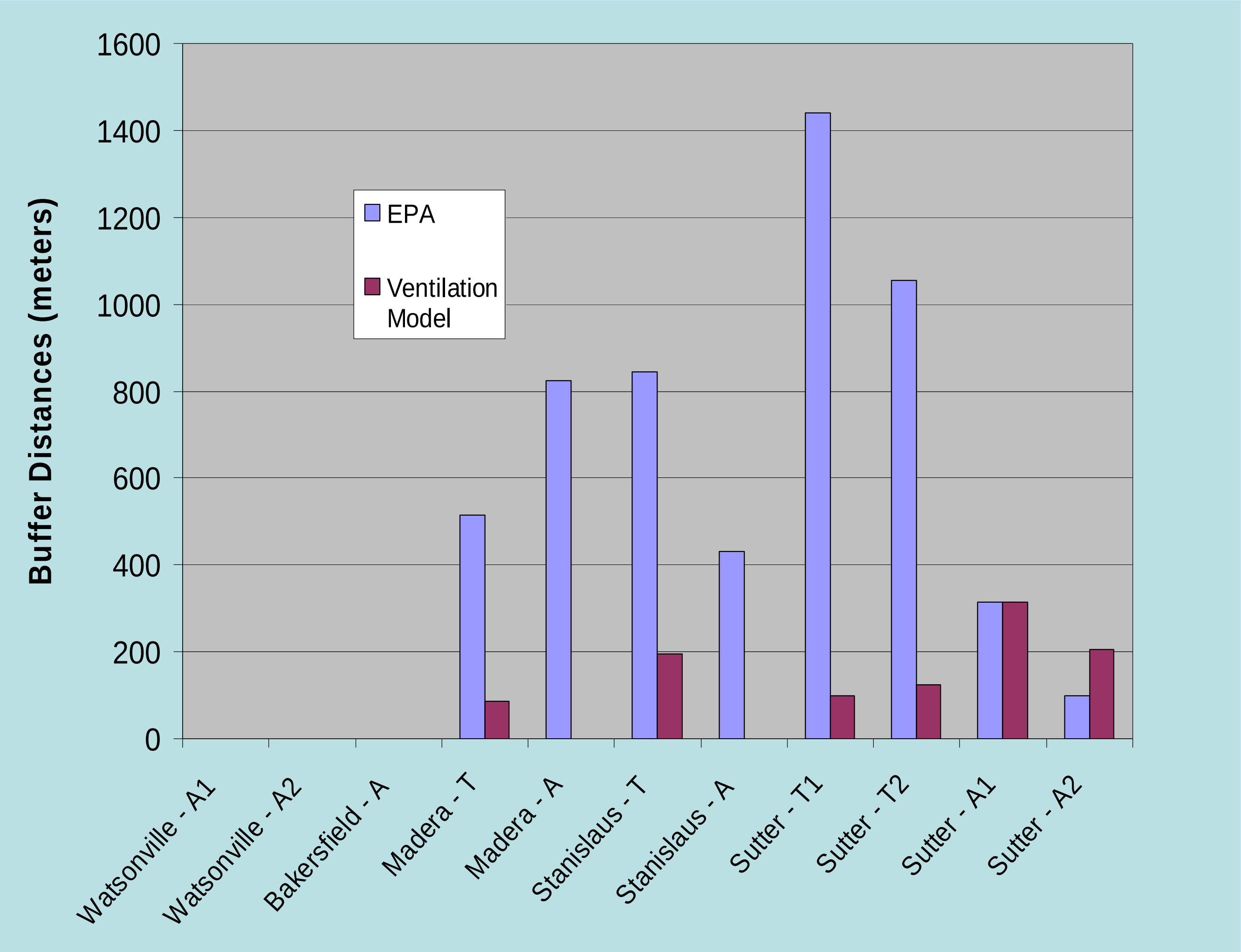
Treatment

- EPA: Between 1-50% of material is lost and the loss, in most scenarios, occurs in the first hour after application
- Measurement Studies: Loss can exceed 50%, but the emissions are released over the whole treatment period, leading to much lower peak emissions

Aeration

- EPA: 50-100% released, all in first hour
- Measurement Studies: Often, less than 50% is left after treatment, release can occur over 1-3 hours.

Buffer Zones – EPA Method vs. Ventilation Model



Regardless of the challenges of the last several years, methyl bromide remains the fumigant of choice for many critical applications

To the extent allowed by regulations, Chemtura intends to continue to work with our customers to supply product to fill their needs.