METHYL BROMIDE CRITICAL USE RENOMINATION
NOMINATION FOR STRUCTURES, COMMODITIES OR OBJECTS

NOMINATING PARTY:
The United States of America

NAME
USA CUN09 **POST HARVEST STRUCTURES - FOOD PROCESSING PLANTS**

BRIEF DESCRIPTIVE TITLE OF NOMINATION:
Methyl Bromide Critical Use Nomination for Post Harvest Use on Structures -- Food Processing Plants (Submitted in 2007 for 2009 Use Season)

STRUCTURE, COMMODITY OR OBJECT TREATED:
This sector includes rice mills, flour mills, pet food manufacturing facilities, and a few bakeries. Primarily this sector is treating only the portions of the facilities that contain electronic components and have machinery with copper and copper alloy parts. These facilities are under intense pressure from many insect pests. The flour millers and the bakeries in this sector do not target any of their commodities to be fumigated with methyl bromide, although some may be present during fumigation. However, rice millers and pet food manufacturers may target some of their products during fumigations with methyl bromide.

QUANTITY OF METHYL BROMIDE REQUESTED IN EACH YEAR OF NOMINATION:

TABLE COVER SHEET: QUANTITY OF METHYL BROMIDE REQUESTED IN EACH YEAR OF NOMINATION

YEAR	NOMINATION AMOUNT (METRIC TONNES)*
2009	**291.418**

*This amount includes methyl bromide needed for research.

SUMMARY OF ANY SIGNIFICANT CHANGES SINCE SUBMISSION OF PREVIOUS NOMINATIONS:

There have been no significant changes since the previous nomination.

REASON OR REASONS WHY ALTERNATIVES TO METHYL BROMIDE ARE NOT TECHNICALLY AND ECONOMICALLY FEASIBLE:

The U. S. nomination is only for those facilities where the use of alternatives is not suitable. In U. S. food processing plants there are several factors that make the potential alternatives to methyl bromide unsuitable. These include:

- Pest control efficacy of alternatives: the efficacy of alternatives may not be comparable to methyl bromide, making these alternatives technically and/or economically infeasible.

- Geographic distribution of the facilities: some facilities are situated in areas where key pests usually occur at lower levels, such as those located in the northern part of the U. S. In such cases, the U. S. is only nominating a CUE for facilities where the key pest pressure is moderate to high.
- Age and type of facility: older food processing facilities, especially those constructed of wood, experience more frequent and severe pest infestations that must be controlled by fumigation.
- Constraints of the alternatives: some types of commodities (e.g., those containing high levels of fats and oils) prevent the use of heat as an alternative because of its effect on the final product (e.g., rancidity). Further, the corrosive nature of phosphine on certain metals prevents its use in mechanical and electrical areas of the facilities. Additionally, both phosphine and sulfuryl fluoride are temperature sensitive.
- Transition to newly available alternatives: Sulfuryl fluoride recently received a federal registration for portions of this sector. It will take some time for sulfuryl fluoride to be incorporated into a pest management program.
- Delay in plant operations: e.g., the use of some methyl bromide alternatives can add a delay to production by requiring additional time to complete the fumigation process. Production delays can result in significant economic impacts to the processors.

Over the last decade, food processing facilities in the United States have reduced the number of methyl bromide fumigations by incorporating many of the alternatives identified by MBTOC. The most critical alternative implemented is IPM strategies, especially sanitation, in all areas of a facility. Plants are now being monitored for pest populations, using visual inspections, pheromone traps, light traps and electrocution traps. When insect pests are found, plants will attempt to contain the infestation with treatments of low volatility pesticides applied to both surfaces and cracks and crevices. These techniques do not disinfest a facility but are critical in monitoring and managing pests. However, when all these methods fail to control a pest problem, facilities will resort to phosphine, heat, and if all else fails, to methyl bromide.

Many facilities in the United States also are using both phosphine and heat treatments to disinfest at least portions of their plants. Phosphine, alone and in combination with carbon dioxide, is often used to treat both incoming grains and finished products. Unfortunately, phosphine is corrosive to copper, silver, gold and their alloys. These metals are critical components of both the computers that run the machines as well as some of the machines themselves. Therefore, phosphine is not feasible in all areas of food processing facilities. Additionally, phosphine requires more time to kill insect pests than does methyl bromide, so plants need to be shut down longer to achieve mortality, resulting in economic losses. There are also reports of stored product pests becoming resistant to phosphine (Taylor, 1989; Bell, 2000; Mueller, 2002).

Heat treatments are being used in this industry. However, not all areas of a plant can be efficiently treated with heat, nor can it be used to treat most products. Some food substances, for instance oils and butters will become rancid with heat treatments. Not all finished food products can be heated for the length of time heat is required for efficient kill of pests. In addition, geography of the United States plays a crucial role in the use of heat treatments. Food processing plants in the northern United States will experience winters with several weeks of sustaining temperatures of -32° to -35° C (-30° to -25° F). In some of these areas facilities have heaters and the power plants have the capacity to supply excess power as needed. However, the southern and parts of the western zones of the United States are geographically quite different. Winter temperatures there seldom reach –1.2° C (30° F) and when temperatures should fall that low, it is typically for only a few hours one night. For many winters, these areas of the U. S. don't freeze at all. Subsequently, these facilities do not have heaters, nor do the power plants have enough power to allow them to heat such large areas and sustain the temperatures necessary for an effective kill of pest populations. Still, many southern and western facilities use heat treatments as a spot treatment whereas the northern facilities can use heat treatments more extensively.

Sulfuryl fluoride was registered by U.S. EPA in January 2004 for rice mills and flour mills, and for additional sites and commodities in July 2005. There are some constraints with this new fumigant: the initial uses were registered in California in May 2005; it is temperature dependent; its efficacy on eggs requires higher concentrations except at optimal temperatures; and it requires extensive training of the applicators to proficiently use the computerized fumigation guide. Many flour and rice mills have tried sulfuryl fluoride this year to fumigate their facilities. Many other facilities are waiting for state registrations and label clarifications to try this new fumigant. The industry is trying to incorporate this newly registered fumigant into their best management practices.

(Details on this page are requested under Decision Ex. I/4(7), for posting on the Ozone Secretariat website under Decision Ex. I/4(8))

This form is to be used by holders of single-year exemptions to reapply for a subsequent year's exemption (for example, a Party holding a single-year exemption for 2005 and/or 2006 seeking further exemptions for 2007). It does not replace the format for requesting a critical-use exemption for the first time.

In assessing nominations submitted in this format, TEAP and MBTOC will also refer to the original nomination on which the Party's first-year exemption was approved, as well as any supplementary information provided by the Party in relation to that original nomination. As this earlier information is retained by MBTOC, a Party need not re-submit that earlier information.

NOMINATING PARTY CONTACT DETAILS:

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Following the requirements of Decision IX/6 paragraph (a)(1) [*insert name of Party*] has determined that the specific use detailed in this Critical Use Nomination is critical because the lack of availability of methyl bromide for this use would result in a significant market disruption. ☐ Yes ☐ No

_______________________ _______________________ ____________

Signature Name Date

Title: ____

CONTACT OR EXPERT(S) FOR FURTHER TECHNICAL DETAILS:

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LIST OF DOCUMENTS SENT TO THE OZONE SECRETARIAT IN OFFICIAL NOMINATION PACKAGE:

1. PAPER DOCUMENTS: **Title of paper documents and appendices**	**No. of pages**	**Date sent to Ozone Secretariat**
USA CUN09 POST HARVEST STRUCTURES - FOOD PROCESSING PLANTS		
2. ELECTRONIC COPIES OF ALL PAPER DOCUMENTS: ***Title of each electronic file (for naming convention see notes above)**	**No. of kilobytes**	**Date sent to Ozone Secretariat**
USA CUN09 POST HARVEST STRUCTURES - FOOD PROCESSING PLANTS		

* Identical to paper documents

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Part A: INTRODUCTION
Renomination Part A: SUMMARY INFORMATION

1. (Renomination Form 1.) NOMINATING PARTY AND NAME:
The United States of America
USA CUN09 POST HARVEST STRUCTURES -- FOOD PROCESSING PLANTS

2. (Renomination Form 2.) DESCRIPTIVE TITLE OF NOMINATION:
Methyl Bromide Critical Use Nomination for Post Harvest Use on Structures -- Food Processing Plants (Submitted in 2007 for 2009 Use Season)

3. SITUATION OF NOMINATED METHYL BROMIDE USE (*e.g. food processing structure, commodity (specify)*):

This nomination includes rice mills, flour mills, pet food manufacturing facilities, and a few bakeries. Primarily this sector is treating only the portions of the facilities that contain electronic components and have machinery with copper and copper alloy parts. These facilities are under intense pressure from many insect pests. The flour millers and the bakeries in this sector do not target any of their commodities to be fumigated with methyl bromide, although some may be present during fumigation. However, rice millers and pet food manufacturers may target some of their products during fumigations with methyl bromide.

4. AMOUNT OF METHYL BROMIDE NOMINATED (*Give quantity requested and years of nomination*):
(Renomination Form 3.) YEAR FOR WHICH EXEMPTION SOUGHT:

TABLE A 1: QUANTITY OF METHYL BROMIDE REQUESTED IN EACH YEAR OF NOMINATION

YEAR	NOMINATION AMOUNT (METRIC TONNES)*
2009	**291.418**

*This amount includes methyl bromide needed for research.

(Renomination Form 4.) SUMMARY OF ANY SIGNIFICANT CHANGES SINCE SUBMISSION OF PREVIOUS NOMINATIONS (e.g. changes to requested exemption quantities, successful trialling or commercialisation of alternatives, etc.)

There have not been any significant changes since the previous nomination. Industries are testing alternatives (such as sulfuryl fluoride, heat, etc) and learning how to better incorporate these into their IPM strategies. Facilities are improving sealing during fumigations, and building improvements. Research is ongoing to solve pest problems in food processing facilities and mills. However, at the time of this nomination, there have not been any significant changes.

5. BRIEF SUMMARY OF THE NEED FOR METHYL BROMIDE AS A CRITICAL USE (Describe the particular aspects of the nominated use that make methyl bromide use critical, e.g. lack of economic alternatives, unacceptable corrosion risk, lack of efficacy of alternatives under the particular circumstances of the nomination):

TABLE A 2: EXECUTIVE SUMMARY*

Region		Rice Millers	Bakeries	Pet Food Institute	North American Millers	Sector Total
EPA Preliminary Value	kgs	117,480	11,669	46,638	268,526	444,314
EPA Amount of All Adjustments	kgs	(68,677)	(3,361)	(24,683)	(56,175)	(152,895)
Most Likely Impact Value (kgs)	kgs	48,804	8,308	21,955	212,352	291,418
	$1000m^3$	2,440	583	1,190	10,973	15,186
	Rate	20	14	18	19	19
Sector Research Amount (kgs)		-	2009 Total US Sector Nomination		291,418	

* *See Appendix A for a complete description of how the nominated amount was calculated.*

6. METHYL BROMIDE CONSUMPTION FOR PAST 5 YEARS AND AMOUNT REQUIRED IN THE YEAR(S) NOMINATED:

TABLE A 3: METHYL BROMIDE CONSUMPTION AND HISTORIC AMOUNTS

Historical Methyl Bromide Application Data — STRUCTURE / FOOD PROCESSOR

	MBR HISTORICAL USE (KILOGRAMS)						
Applicant Name	1999	2000	2001	2002	2003	2004	2005
Rice Millers	168,736	171,911	142,881	149,685	149,685	145,603	-
Bakeries	34,019	31,570	29,937	26,770	21,707	21,459	-
Pet Food Institute	43,001	45,200	48,264	30,287	31,301	31,427	26,978
North American Millers	442,252	419,573	408,233	385,553	362,874	340,194	327,493
SECTOR TOTALS	688008	668254	629315	592295	565567	538684	354471
	VOLUME TREATED (1,000 CUBIC METERS)						
Applicant Name	1999	2000	2001	2002	2003	2004	2005
Rice Millers	5,125	5,229	4,587	4,672	4,672	5,975	-
Bakeries	1,699	1,586	1,529	1,501	1,614	1,416	-
Pet Food Institute	1,974	2,075	2,215	1,390	1,695	1,706	1,464
North American Millers	18,406	18,689	19,539	19,255	18,123	16,990	16,367
SECTOR TOTALS	27204	27578	27871	26819	26104	26087	17832
	APPLICATION RATE (KGS/1,000 CUBIC METERS)						
Applicant Name	1999	2000	2001	2002	2003	2004	2005
Rice Millers	32.92	32.88	31.15	32.04	32.04	24.37	unknown
Bakeries	20.02	19.91	19.58	17.84	13.45	15.16	unknown
Pet Food Institute	21.79	21.79	21.79	21.79	18.46	18.42	18.42
North American Millers	24.03	22.45	20.89	20.02	20.02	20.02	20.01
SECTOR AVERAGE	25.29	24.23	22.58	22.09	21.67	20.65	19.88

7. LOCATION OF THE FACILITY OR FACILITIES WHERE THE PROPOSED CRITICAL USE OF METHYL BROMIDE WILL TAKE PLACE (*Give name and physical address. Continue on separate sheet(s) as annex to this form if necessary. Number each address from one onwards*):

This nomination package represents 275 food processing facilities across the United States. These facilities are distributed across the United States from subtropical environments of Florida to the cold northern areas of the Great Plains. The location of each facility where methyl bromide fumigations may take place was not requested by the U.S. Government in the forms filled out by the applicants. However, location information has previously been submitted to MBTOC, which is included in this document as Appendix D.

In addition, a full list of all processing plants that apply any registered pesticide in the U.S. is available from the U.S. Department of Labor, Occupational Safety and Health Administration website located at http://www.osha.gov/pls/imis/sicsearch.html. EPA's Facility Registry System is publicly available and is located at http://www.epa.gov/enviro/html/fii/ez.html.

RENOMINATION FORM PART G: CHANGES TO QUANTITY OF METHYL BROMIDE REQUESTED

This section seeks information on any changes to the Party's requested exemption quantity.

(Renomination Form 16) CHANGES IN USAGE REQUIREMENTS

Provide information on the nature of changes in usage requirements, including whether it is a change in dosage rates, the number of hectares or cubic metres to which the methyl bromide is to be applied, and/or any other relevant factors causing the changes.

There are no changes in the usage requirements for this sector

(Renomination Form 17.) RESULTANT CHANGES TO REQUESTED EXEMPTION QUANTITIES

TABLE RENOMINATION FORM G 1: RESULTANT CHANGES TO REQUESTED EXEMPTION QUANTITIES

QUANTITY REQUESTED FOR PREVIOUS NOMINATION YEAR:	**362.952 MT**
QUANTITY APPROVED BY PARTIES FOR PREVIOUS NOMINATION YEAR:	**248.237 MT**
QUANTITY REQUIRED FOR YEAR TO WHICH THIS REAPPLICATION REFERS:	**291.418 MT**

Part B: SITUATION CHARACTERISTICS AND METHYL BROMIDE USE

8. KEY PESTS FOR WHICH METHYL BROMIDE IS REQUESTED:

TABLE B 1: KEY PESTS FOR WHICH METHYL BROMIDE IS REQUESTED

GENUS AND SPECIES OF MAJOR PESTS FOR WHICH THE USE OF METHYL BROMIDE IS CRITICAL	COMMON NAME	SPECIFIC REASON WHY METHYL BROMIDE IS NEEDED
Tribolium confusum	Confused flour beetle	Pest status is due to health hazard: allergens; plus body parts, exuviae, and excretia violate Food and Drug Administration (FDA) regulations[1]. Methyl bromide is needed because these insects can occur in areas with electronic equipment and materials that cannot tolerate high temperatures (i.e. cooking) so phosphine and heat are not completely adequate. Sulfuryl fluoride was registered for some of these uses, requires high concentration to kill all life stages, requires higher concentrations as temperature decreases; experience needed to incorporate into best management plan.
Tribolium castaneum	Red flour beetle	
Trogoderma variable	Warehouse beetle	Health hazard: choking and allergens; plus body parts, exuviae, and excretia violate FDA regulations[1]. Methyl bromide is needed because these insects can occur in areas with electronic equipment and materials that cannot tolerate high temperatures (i.e. cooking) so phosphine and heat are not completely adequate. Sulfuryl fluoride was registered for some of these uses, requires high concentration to kill all life stages, requires higher concentrations as temperature decreases; experience needed to incorporate into best management plan.
Lasioderma serricorne	Cigarette beetle	Food contamination violates FDA regulations[1]. Methyl bromide is needed because these insects can occur in areas with electronic equipment and materials that cannot tolerate high temperatures (i.e. cooking of some products; oils and butter go rancid with heat) so phosphine and heat are not completely adequate. Sulfuryl fluoride was registered for some of these uses, requires high concentration to kill all life stages, requires higher concentrations as temperature decreases; experience needed to incorporate into best management plan.
Sitophilus oryzae	Rice weevil	
Plodia interpunctella	Indianmeal moth	
Oryzaephilus mercator	Merchant grain beetle	
Cryptolestes pusillus	Flat grain beetle	

[1] FDA regulations can be found at: http://www.fda.gov/opacom/laws/fdcact/fdcact4.htm and http://www.cfsan.fda.gov/~dms/dalbook.html.

9. SUMMARY OF THE CIRCUMSTANCES IN WHICH THE METHYL BROMIDE IS CURRENTLY BEING USED (*Give ranges of dosage, exposure or temperatures, if appropriate*):

TABLE B 2(A) COMMODITIES

CUE	METHYL BROMIDEDOSAGE (Kg/m^3)	EXPOSURE TIME (*hours*)	TEMP. (℃)	NUMBER OF FUMIGATIONS PER YEAR	PROPORTION OF FACILITY TREATED AT THIS DOSE	FIXED (F) MOBILE (M) STACK (S)
Rice Miller's Association	24	24	variable	2	100% *	F
Bakeries North America	20	24	variable	2.5	100%	F
Pet Food Institute	22	24	variable	< 1 Avg. 1application/1-2 yrs**	80%	F
North American Millers' Association	19	24	variable	2.5	100 %	F

*Unspecified type of rice is also fumigated along with the facilities.
** Highly variable. Some facilities need fumigating 2/year, but other facilities fumigate once every 3-5 years.

TABLE B2 (B): FIXED FACILITIES

CUE	TYPE OF CONSTRUCTION AND APPROXIMATE AGE IN YEARS	% FACILITIES AT VOLUMES (1,000m^3)	NUMBER OF FACILITIES	GASTIGHTNESS ESTIMATE*
Rice Miller's Association	Combination of wood, stone, brick, metal, and concrete	5% 1,416-28,317 90+% 28,317+	22	Poor to very poor
Bakeries North America	Combination of wood, stone, brick, metal, and concrete	28,317+	11	55% good, 27% fair, 18% poor
Pet Food Institute[1]	Combination of wood, stone, brick, metal, and concrete	25% 1,416-28,317 75% 28,317+	75	Good to poor areas
North American Millers' Association	Wood, stone, brick, concrete, metal; some about 100 yrs old, only a few less than 10 years old	50% <28 50% >28-142	167	10% good, 10% medium, 75% poor, 5% very poor

* Give gastightness estimates where possible according to the following scale: **good** – less than 25% gas loss within 24 hours or half loss time of pressure difference (e.g. 20 to 10 Pa ($t_{1/2}$)) greater than 1 minute; **medium** – 25-50% gas loss within 24 hours or half loss time of pressure difference greater than 10 seconds; **poor** – 50-90% gas loss within 24 hours or half loss time of pressure difference 1-10 second; **very poor** – more than 90% gas loss within 24 hours or a pressure half loss time of less than 1 second.
[1] See Appendix B for more information.

10. LIST ALTERNATIVE TECHNIQUES THAT ARE BEING USED TO CONTROL KEY TARGET PEST SPECIES IN THIS SECTOR (*Include main alternative techniques for situations similar to the nomination such as given in MBTOC and TEAP reports indexed at http://www.unep.org/ozone/teap/MBTOC*):

Many of the MBTOC 'not in kind' alternatives to methyl bromide are critical to monitoring pest populations and managing those populations, but they do not disinfest food processing. The most crucial of these alternatives are sanitation and IPM strategies. Sanitation is important and constantly addressed in management programs (Arthur and Phillips 2003). Cleaning and hygiene practices alone do not reduce pest populations, but reportedly improve the efficacy of insecticides or diatomaceous earth (Arthur and Phillips 2003). The principles of IPM are to utilize all available chemical, cultural, biological, and mechanical pest control practices. These include pheromone traps, electrocution traps, and light traps to monitor pest populations. If pests are found in traps, then contact insecticides and low volatility pesticides are applied in spot treatments for surfaces, cracks and crevices, or anywhere the pests may be hiding. These applications are intended to restrict pests from spreading throughout the facility to try to avoid a plant fumigation (Arthur and Phillips 2003). However, IPM is not designed to completely eliminate pests from any given facility or to ensure that a facility remains free from infestation. Although FDA allows minimal contamination of food products, U.S. consumers have a zero tolerance for visible insect contamination in their food products. While sanitation and IPM strategies are used to manage pest populations and extend the time between methyl bromide fumigations, neither is an acceptable alternative to methyl bromide under high pest pressure.

Phosphine, alone and in combination with carbon dioxide, is used to fumigate portions of food processing facilities. Many facilities treat incoming raw ingredients and their storage facilities with phosphine, but the corrosive nature of phosphine limits its use throughout the entire plant, especially in areas with electronic components. In the United States it is specifically against the label (illegal) to fumigate in areas with susceptible metals (at: http://oaspub.epa.gov/pestlabl/ppls). Phosphine is also problematic in that some stored product pests are developing resistance to this chemical (Taylor, 1989, Bell, 2000, Mueller, 2002).

Many food processing facilities in the United States use heat treatments to reduce insect populations. Heat does kill insects, typically temperatures of 50-60° C sustained for 8 hours kills the more heat tolerant life stages of post-harvest pests. Unfortunately, some areas (electronics and electrical portions) of facilities are sensitive to heat. In addition heat is not a good alternative if ingredients or products will be a part of a fumigation because it causes rancidity in butters and oils, denatures proteins that may be used in the ingredients, and not all manufactured products can be heated to the high temperature or for the time required in order to get an effective kill of insect pests.

Heat stratifies (hot air raises) resulting in hot spots and cold areas during fumigations. Also, since various materials have different expansion coefficients (expand and contract at different rates) some facilities have reported structural damage resulting from heat treatments. Also, some facilities have glass atria and glass is a poor insulator, creating cold down drafts . A company that has a patented process of an air handling system can improve the air distribution to reduce the effects of heat stratification. They have reported multiple successes with their system. However, facilities in the southern and western parts of the United States do not have heat sources on the premises thereby making heat fumigations impractical without costly investments that are not economically feasible.

Sulfuryl fluoride was federally registered for flour and rice mills, tree nuts and dried fruits in January 2004. California registered this product for these uses in May 2005. It has been used in many mills. The industry is learning how to incorporate this product into its pest management strategy. It integrates temperature (requires less product as temperature increases) and dosages (choice of only post-embryonic stages or all life stages) into the mills' plans. More sites were added to the federal label in July 2005, including bakeries and pet food facilities. However, some of the manufactured products are not allowed to be directly fumigated and will need to be removed prior to fumigation of the facility. Many facilities will be unable to accomplish this since they do not have a way to separate ingredients and products within their facility. In addition, a fumigation to kill pest eggs within manufactured products will still require methyl bromide if a sulfuryl fluoride tolerance for the commodity has not been established.

Food processing facilities in the United States have incorporated sanitation, IPM strategies, heat and phosphine and yet, on occasion, insect pest populations will still become too high and a facility will need to fumigate with methyl bromide. However, by employing these alternatives, this sector has been able to lengthen times between methyl bromide applications, thereby reducing the total amount of methyl bromide. However, in some areas of the country, information suggests that some processors may employ a marginal strategy without major economic dislocation if given a reasonable time frame for the transition. The assessment of need was adjusted to account for this.

Part C: TECHNICAL VALIDATION
Renomination Form Part D: REGISTRATION OF ALTERNATIVES

11. SUMMARISE THE ALTERNATIVE(S) TESTED, STARTING WITH THE MOST PROMISING:

If necessary, any additional comments:

TABLE C 1: TESTS OF ALTERNATIVES - SUMMARY

PEST	STUDY TYPE	RESULTS	CITATION
T. castaneum	Pilot feed and flour mills;	Insects contained in plastic boxes. Non-uniform heat. Number of hours to reach 50° C varied between the mills and within mills. 100% mortality at most locations of 50-60°C for 52 hrs. Old instars and pupae more heat tolerant	Mahroof, et al. 2003
T. castaneum	Lab	Mortality of each life stage increased with increase in temperature and exposure time. Young larvae most heat- tolerant and required 7.2 hr at >50°C.	Mahroof, et al. 2003
T. castaneum & T. confusum	Lab	Mortality increased as temperature increased and decreased as humidity increased. Mortality at one week was greater than initial mortality probably due to delayed effects of DE. *T. confusum* mortality lower than *T. castaneum.*	Arthur 2000
Rhyzopertha dominica; P. interpunctella; & T. castaneum	Lab	Initial investigation of volatiles from mountain sagebrush demonstrated some activity in against these insects in bioassays. No indication of whether this is really a potential alternative	Dunkel & Sears 1998
T. confusum	2nd & 3rd floors of a Pilot flour mill	Adult insects in open rings placed in mill. 100% mortality of beetles in 25 hr on the north end of the 3rd floor, but south end of 2nd floor had only 75% mortality with full DE and 50% mortality with partial DE after 64 hr.	Dowdy & Fields 2002
Ephestia kuehniella	Lab	Efficacy was influenced by age of the medium with DE when investigated under driest conditions (58% rh). But this is not a pest of concern in the U. S.	Nielsen 1998
T. castaneum & T. confusum	Lab	Field collected flour beetles demonstrated varying degrees of resistance to several pesticides: malathion, chlorpyrifos, dichlorvos, phosphine, but not to resmethrin. *T. castaneum* more resistant than *confusum*.	Zettler 1991
T. castaneum & T. confusum	Lab	Malathion-resistant flour beetles were susceptible to cyfluthrin treated steel panels. Longer residuals on unpainted panels than on painted panels	Arthur 1992

Also see **Part F, Renomination Form Part C** in this document, for additional relevant discussion.

12. SUMMARISE TECHNICAL REASONS, IF ANY, FOR EACH ALTERNATIVE NOT BEING FEASIBLE OR AVAILABLE FOR YOUR CIRCUMSTANCES (*For economic constraints, see Question 14*):

TABLE C 2: TECHNICAL SUMMARY OF INFEASIBILITY OF ALTERNATIVES

IN KIND ALTERNATIVES	TECHNICAL FEASIBILITY	COMMENTS
Carbon Dioxide (high pressure)	No	Facilities in the United States are not airtight enough for modified atmospheres or carbon dioxide to be effective primarily because most are more than 25 years old. To implement these alternatives would require new construction of all facilities.
Controlled & Modified Atmospheres	No	
Ethyl/Methyl Formate	No	Not registered in United States (last product cancelled in Oct. 1989)
Hydrogen Cyanide	No	Not registered in United States (last product cancelled in Feb. 1988)
Phosphine, alone	No	Although does kill insects, it is corrosive to metals, especially copper and its alloys, bronze and brass. These metals are important components of the electronics that run the manufacturing equipment and some of the equipment itself (for example: motors, mixers, etc.). In addition, phosphine requires longer application time. This alternative is already being used in the areas without electronics and where temperatures are not a factor. Resistance to this fumigant has also been reported for several stored product pests. This alternative has already been implemented in areas without sensitive metals.
Phosphine, in combination	No	
Sulfuryl fluoride	Yes	Recently registered in United States for some uses in this sector on January 23, 2004 and July 14, 2005. Efficacy of this chemical remains to be demonstrated in the field, but appears to be promising. Requires higher concentrations at lower temperatures to kill eggs.
NOT IN KIND ALTERNATIVE	**TECHNICAL FEASIBILITY**	**COMMENTS**
Heat Treatment	Yes	Sufficiently high temperature will kill insects given enough time; but heat sources are not readily available in all areas of United States (such as those in the south where hot weather is the norm and no heaters are available); and heat requires longer time of exposure. In areas that can use heat, it is being used. It is not feasible in remaining plants or areas of a plant. In order to completely replace methyl bromide, some facilities would need to be relocated and others would need major reconstruction.
Cold Treatment	No	Does not disinfest facilities. Most of these IPM strategies are currently practiced and widely implemented with the beneficial result of lengthening time between fumigations. Facilities use sanitation and cleaning to maintain their plants. They monitor populations with pheromone traps. They try to limit incoming pests with electrocution traps by entrances/exits. When populations are discovered, they use physical removal and contact insecticides and low volatility pesticides. Facilities maintain rodenticide bait stations around their perimeter. These IPM strategies are not a replacement for methyl bromide, but do lengthen time between fumigations.
Contact Insecticides	No	
Cultural Practices	No	
Electrocution	No	
Inert Dust	No	
Pest Exclusion/Physical Removal	No	
Pesticides of Low Volatility	No	
Pheromones	No	

Physical Removal/Cleaning /Sanitation	No	
Rodenticide	No	

Progress in registration of a product will often be beyond the control of an individual exemption holder as the registration process may be undertaken by the manufacturer or supplier of the product. The speed with which registration applications are processed also can falls outside the exemption holder's control, resting with the nominating Party. Consequently, this section requests the nominating Party to report on any efforts it has taken to assist the registration process, but noting that the scope for expediting registration will vary from Party to Party.

(Renomination Form 11.) PROGRESS IN REGISTRATION

Where the original nomination identified that an alternative's registration was pending, but it was anticipated that one would be subsequently registered, provide information on progress with its registration. Where applicable, include any efforts by the Party to "fast track" or otherwise assist the registration of the alternative.

The registration status of the alternatives to methyl bromide has not changed since the previous nomination.

Methyl bromide alternatives do have a fast track for registration in the U.S. EPA. However, before registering a new pesticide or *new use* for a registered pesticide, EPA must first ensure that the pesticide, when used according to label directions, can be used with a reasonable certainty of no harm to human health and without posing unreasonable risks to the environment. To make such determinations, EPA requires more than 100 different scientific studies and tests from applicants. Where pesticides may be used on food or feed crops, EPA also sets tolerances (maximum pesticide residue levels) for the amount of the pesticide that can legally remain in or on foods.

There is a registration decision expected soon on applying an insect growth regulator, methoprene, onto a plastic film used for coating food boxes to control pests after food has been processed. It is undergoing review within the EPA Office of Pesticide Programs.

USG has no legal authority to compel registrations; it can only act on registrations requested by private entities. The timely submission of data to support a registration decision is at the sole discretion of the registrant. Please see table above for additional detail.

(Renomination Form 12.) DELAYS IN REGISTRATION

Where significant delays or obstacles have been encountered to the anticipated registration of an alternative, the exemption holder should identify the scope for any new/alternative efforts that could be undertaken to maintain the momentum of transition efforts, and identify a time frame for undertaking such efforts.

Methyl bromide alternatives have a fast track for registration in the U.S. EPA. However, before registering a new pesticide or *new use* for a registered pesticide, EPA must first ensure that the pesticide, when used according to label directions, can be used with a reasonable certainty of no harm to human health and without posing unreasonable risks to the environment. To make such determinations, EPA requires more than 100 different scientific studies and tests from applicants. Where pesticides may be used on food or feed crops, EPA also sets tolerances (maximum pesticide residue levels) for the amount of the pesticide that can legally remain in or on foods.

(Renomination Form 13.) DEREGISTRATION OF ALTERNATIVES

Describe new regulatory constraints that limit the availability of alternatives. For example, changes in buffer zones, new township caps, new safety requirements (affecting costs and feasibility), and new environmental restrictions such as to protect ground water or other natural resources. Where a potential alternative identified in the original nomination's transition plan has subsequently been deregistered, the nominating Party would report the deregistration, including reasons for it. The nominating Party would also report on the deregistration's impact (if any) on the exemption holder's transition plan and on the proposed new or alternative efforts that will be undertaken by the exemption holder to maintain the momentum of transition efforts.

Methyl bromide use on structures, commodities, and post harvest treatments is undergoing reregistration in the US. The proposed mitigations for that reregistration include a fumigation management plan, treatment buffers to enhance worker safety and ventilation buffers to enhance bystander safety. The proposed buffers are based primarily on use rate, total amount of methyl bromide used, and the type and duration of aeration.

An additional complication in forecasting changes in the registration of alternatives is that under the US federal system individual states may impose restrictions above those imposed at the Federal level. Examples of these additional restrictions may include increasing buffer zones around facilities and chambers and requiring capture and destruction technology.

PART D: EMISSION CONTROL
RENOMINATION FORM PART E: IMPLEMENTATION OF MBTOC/TEAP RECOMMENDATIONS

13. HOW HAS THIS SECTOR REDUCED THE USE AND EMISSIONS OF METHYL BROMIDE IN THE SITUATION OF THE NOMINATION? (*Describe procedures used to determine optimum methyl bromide dosages and exposures, improved sealing processes, (refer to gastightness standards given in Question 9(b) above) monitoring systems and other activities that are in place to minimise dosage and emissions***).**

By using sanitation and IPM the industry has been able to reduce methyl bromide use by extending the time between fumigations. According to the applicants, 10-12 years ago, plants in the United States used to fumigate with methyl bromide as much as 4-6 times a year. Currently, most southern facilities have reduced the number of methyl bromide fumigations to twice a year. These fumigations are typically at the beginning of the summer when pest pressure is significantly increasing and at the end of the summer.

In the northern regions of the United States, IPM strategies and sanitation methods have enabled some of these facilities to fumigate with methyl bromide once every 3 years, and a few facilities have gone without a methyl bromide fumigation for almost 5 years. The facilities in the northern United States have been able to exploit heat treatments more extensively than their southern counterparts, as well as opening up facilities during extremely cold weather for extensive cleaning coupled with low volatility pesticides (organophosphates, pyrethroids, insect growth regulators, botanicals) at the perimeters.

The industry is committed to studying how to improve insect control with IPM strategies and sanitation and to further reduce the number of methyl bromide fumigations. They are also continuing to pursue research of heat treatments, sulfuryl fluoride, and other potential alternatives to maximize efficiency.

The Methyl Bromide Technical Options Committee and the Technology and Economic Assessment Panel may recommended that a Party explore and, where appropriate, implement alternative systems for deployment of alternatives or reduction of methyl bromide emissions.

Where the exemptions granted by a previous Meeting of the Parties included conditions (for example, where the Parties approved a reduced quantity for a nomination), the exemption holder should report on progress in exploring or implementing recommendations.

Information on any trialling or other exploration of particular alternatives identified in TEAP recommendations should be addressed in Part C.

(Renomination Form 14.) USE/EMISSION MINIMISATION MEASURES

Where a condition requested the testing of an alternative or adoption of an emission or use minimisation measure, information is needed on the status of efforts to implement the *recommendation. Information should also be provided on any resultant decrease in the exemption quantity arising if the recommendations have been successfully implemented. Information is required on what actions are being, or will be, undertaken to address any delays or obstacles that have prevented implementation.*

During the preparation of this nomination the USG has accounted for all identifiable means to reduce the request. Specifically, approximately 15 million kilograms of methyl bromide were requested by methyl bromide users across all sectors. USG carefully scrutinized requests and made subtractions to ensure that no growth, double counting, inappropriate use rates on a volume basis was incorporated into the final request. Use when the requestor qualified under some other provision (QPS, for example) was also removed, and appropriate transition - given yields obtained by alternatives and the associated cost differentials - was factored in. As a result of all these changes, the USG is requesting roughly 1/3 of that amount.

The USG feels that no additional reduction in methyl bromide quantities is necessary, given the significant adjustments described above.

PART E: ECONOMIC ASSESSMENT
RENOMINATION FORM PART F: ECONOMIC ASSESSMENT

14. (Renomination Form 15.) ECONOMIC INFEASIBILITY OF ALTERNATIVES – Methodology *(MBTOC will assess economic infeasibility based on the methodology submitted by the nominating Party. Partial budget analysis showing the operations' gross and net returns for methyl bromide and next best alternatives is a widely accepted approach. Analyses should be supported by discussions identifying which costs and revenues change and why. The following measures may be useful descriptors of the economic outcome using methyl bromide or alternatives. Parties may identify additional measures. Regardless of the methodology used, this section should explain why the calculated measures with the alternative are levels that indicate the alternative is not economically feasible. In the case of culturally significant artifacts economic assessment may not be practical.):*

The following measures or indicators may be used as a guide for providing such a description:

- (a) The purchase cost per kilogram of methyl bromide and of the alternative;
- (b) Gross and net revenue with and without methyl bromide, and with the next best alternative;
- (c) Percentage change in gross revenues if alternatives are used;
- (d) Losses per cubic meter relative to methyl bromide if alternatives are used;
- (e) Losses per kilogram of methyl bromide requested if alternatives are used;
- (f) Losses as a percentage of net cash revenue if alternatives are used;
- (g) Percentage change in profit margin if alternatives are used.

TABLE E 1. SUMMARY OF ECONOMIC REASONS FOR EACH ALTERNATIVE NOT BEING FEASIBLE OR AVAILABLE

METHYL BROMIDE ALTERNATIVE	ECONOMIC REASON (IF ANY) FOR THE ALTERNATIVE NOT BEING AVAILABLE	ESTIMATED MONTH/YEAR WHEN THE ECONOMIC CONSTRAINT COULD BE SOLVED
Heat Treatment	For food processing facilities which are able to convert to heat treatment, economic losses are from additional production downtimes due to longer fumigation time and from capital expenditures required to adopt an alternative. There are other food processing facilities in areas of United States where heat treatment is not feasible.	Economic losses due to downtime with heat treatment are persistent.
Sulfuryl Fluoride	A small portion of the food processing facilities can economically convert to sulfuryl fluoride. Other facilities cannot due to economic losses that would result from inefficacious control of pests and higher treatment costs which arise at higher temperatures. See "Summary Of Technical Reason For Each Alternative Not Being Feasible Or Available."	Limitations of sulfuryl fluoride are persistent

MEASURES OF ECONOMIC IMPACTS OF METHYL BROMIDE ALTERNATIVES

The four economic measures in Table E 2 through E 5 were used to quantify the economic impacts to post-harvest uses for food-processing. The measures are not independent of each other since they can be calculated from the same financial data. The economic measures do, however, complement each other in evaluating the CUE applicant's economic viability. These measures represent different ways to assess the economic feasibility of methyl bromide alternatives for methyl bromide users.

Net revenue is calculated as gross revenue minus operating costs. This is a good measure as to the direct losses of income that may be suffered by the users. It should be noted that net revenue does not represent net income to the users. Net income, which indicates profitability of an operation of an enterprise, is gross revenue minus the sum of operating and fixed costs. Net income should be smaller than the net revenue measured in this analysis. We did not include fixed costs because it is often difficult to measure and verify.

Sulfuryl Fluoride

Results of the assessment of using sulfuryl fluoride as an alternative to methyl bromide are provided in Tables 14.1, and E.1 through E.4. For purposes of this analysis, current prices of sulfuryl fluoride, the number of applications, and efficacy with methyl bromide were assumed equal and plant temperatures are assumed to be 24 degrees centigrade (75 degrees Fahrenheit). This analysis only covers cases where sulfuryl fluoride is a technically feasible alternative to methyl bromide and can be used and its use is not restricted. Fumigation with sulfuryl fluoride at lower temperatures controlling all pest life stages is infeasible due to prohibitively high application rates and minimal efficacy.

Heat Treatment

Potential economic losses were estimated for the food-processing facilities that have not been converted to heat treatment. This analysis only covers cases where heat treatment may potentially be technically feasible, and does not cover situations where heat would degrade the commodity being processed (those with fats and edible oils). Economic costs in the post-harvest uses of the food-processing sector can be characterized as arising from three contributing factors. First, the direct pest control costs are increased in most cases because heat treatment is more expensive, and labor is increased because of longer treatment time and increased number of treatments. For food-processing facilities that are not already using heat, capital expenditure is required to retrofit them to be suitable for heat treatment. Moreover, additional production downtimes for the use of alternatives are unavoidable. Many facilities operate at or near full production capacity and alternatives that take longer than methyl bromide or require more frequent application can result in manufacturing slowdowns, shutdowns, and shipping delays. Slowing down production would result in additional costs to the methyl bromide users. Economic cost per 1000 m^3 was calculated as the additional costs of methyl bromide if methyl bromide users had to replace methyl bromide with heat treatment. Implementation of heat treatment is likely to have substantial cost implications to the facilities that have not been converted to heat in the food-processing sector.

Production downtime is estimated at almost two additional days per heat treatment. Potential economic losses associated with the use of heat treatment also include the cost of capital investment. The estimated economic losses are shown in Tables E 2 through E 5. The estimated economic loss as a percentage of net revenue is over 50% for all the CUE applicants in the food-processing sector and over 100% for the rice millers resulting in negative net revenues.

TABLE E 2. ANNUAL ECONOMIC IMPACTS OF METHYL BROMIDE ALTERNATIVES FOR RICE MILLER'S ASSOCIATION

LOSS MEASURE	METHYL BROMIDE	SULFURYL FLUORIDE	HEAT TREATMENT
GROSS REVENUE (US$/1000 M³)	$29,385	$29,385	$27,720
- OPERATING COSTS (A+B) PER 1000 M³	$27,916	$28,758	$29,429
A) COST OF METHYL BROMIDEOR ALTERNATIVE	$2,596	$3,438	$3,894
B) OTHER OPERATING COSTS	$25,320	$25,320	$25,535
NET REVENUE (US$/1000 M³) (NET OF OPERATING COSTS)	$1,469	$627	($1,709)
LOSS MEASURES			
TIME LOST (DAYS)	0 DAYS	0 days	17 days
LOSS PER 1000 M³ (US$/1000 M³)	$0	$843	$3,178
LOSS PER KILOGRAM METHYL BROMIDE(US$/KG)	$0	$8.43	$32
LOSS AS A % OF GROSS REVENUE (%)	0%	3%	11%
LOSS AS A % OF NET REVENUE (%)	0%	57%	216%
PROFIT MARGIN (NET REVENUE/GROSS REVENUE)	5%	2%	-6%

TABLE E 3: ANNUAL ECONOMIC IMPACTS OF METHYL BROMIDE ALTERNATIVES FOR BAKERIES

LOSS MEASURE	METHYL BROMIDE	SULFURYL FLUORIDE	HEAT TREATMENT
GROSS REVENUE (US$/1000 M³)	$258,334	$258,334	$250,584
- OPERATING COSTS (A+B) PER 1000 M³	$245,685	$245,859	$246,271
A) COST OF METHYL BROMIDEOR ALTERNATIVE	$1,545	$1,719	$1,916
B) OTHER OPERATING COSTS	$244,140	$244,140	$244,355
NET REVENUE (US$/1000 M³) (NET OF OPERATING COSTS)	$12,649	$12,475	$4,313
LOSS MEASURES			
TIME LOST (DAYS)	0 DAYS	0 days	9 days
LOSS PER 1000 M³ (US$/1000 M³)	$0	$442	$8,604
LOSS PER KILOGRAM METHYL BROMIDE(US$/KG)	$0	$9.02	$181
LOSS AS A % OF GROSS REVENUE (%)	0%	<1%	3%
LOSS AS A % OF NET REVENUE (%)	0%	4%	67%
PROFIT MARGIN (NET REVENUE/GROSS REVENUE)	5%	5%	2%

TABLE E 4: ANNUAL ECONOMIC IMPACTS OF METHYL BROMIDE ALTERNATIVES FOR PET FOOD INSTITUTE

LOSS MEASURE	METHYL BROMIDE	SULFURYL FLUORIDE	HEAT TREATMENT
GROSS REVENUE (US$/1000 M³)	$175,452	$175,452	$170,773
- OPERATING COSTS (A+B) PER 1000 M³	$166,679	$166,848	$167,154
A) COST OF METHYL BROMIDEOR ALTERNATIVE	$519	$688	$779
B) OTHER OPERATING COSTS	$166,160	$166,160	$166,375
NET REVENUE (US$/1000 M³) (NET OF OPERATING COSTS)	$8,773	$8,604	$3,619
LOSS MEASURES			
TIME LOST (DAYS)	0 DAYS	O days	8 days
LOSS PER 1000 M³ (US$/1000 M³)	$0	$169	$5,153
LOSS PER KILOGRAM METHYL BROMIDE(US$/KG)	$0	$3.45	$258
LOSS AS A % OF GROSS REVENUE (%)	0%	<1%	3%
LOSS AS A % OF NET REVENUE (%)	0%	2%	59%
PROFIT MARGIN (NET REVENUE/GROSS REVENUE)	5%	5%	2%

TABLE E 5. ANNUAL ECONOMIC IMPACTS OF METHYL BROMIDE ALTERNATIVES FOR NORTH AMERICAN MILLER'S ASSOCIATION

LOSS MEASURE	METHYL BROMIDE	SULFURYL FLUORIDE	HEAT TREATMENT
GROSS REVENUE (US$/1000 M³)	$437,472	$437,472	$424,348
- OPERATING COSTS (A+B) PER 1000 M³	$415,598	$416,040	$416,452
A) COST OF METHYL BROMIDEOR ALTERNATIVE	$1,277	$1,719	$1,916
B) OTHER OPERATING COSTS	$414,321	$414,321	$414,536
NET REVENUE (US$/1000 M³) (NET OF OPERATING COSTS)	$21,874	$21,432	$7,896
LOSS MEASURES			
TIME LOST (DAYS)	0 DAYS	0 days	9 days
LOSS PER 1000 M³ (US$/1000 M³)	$0	$442	$13,978
LOSS PER KILOGRAM METHYL BROMIDE(US$/KG)	$0	$9.30	$294
LOSS AS A % OF GROSS REVENUE (%)	0%	0.1%	3%
LOSS AS A % OF NET REVENUE (%)	0%	2%	64%
PROFIT MARGIN (NET REVENUE/GROSS REVENUE)	5%	5%	2%

Part F: NATIONAL MANAGEMENT STRATEGY FOR PHASE-OUT OF THIS NOMINATED CRITICAL USE
Renomination Form Part B: TRANSITION PLANS

Provision of a National Management Strategy for Phase-out of Methyl Bromide is a requirement under Decision Ex. I/4(3) for nominations after 2005. The time schedule for this Plan is different than for CUNs. Parties may wish to submit Section 21 separately to the nomination.

15. DESCRIBE MANAGEMENT STRATEGIES THAT ARE IN PLACE OR PROPOSED TO ELIMINATE THE USE OF METHYL BROMIDE FOR THE NOMINATED CRITICAL USE, INCLUDING:

1. Measures to avoid any increase in methyl bromide consumption except for unforeseen circumstances;
2. Measures to encourage the use of alternatives through the use of expedited procedures, where possible, to develop, register and deploy technically and economically feasible alternatives;
3. Provision of information on the potential market penetration of newly deployed alternatives and alternatives which may be used in the near future, to bring forward the time when it is estimated that methyl bromide consumption for the nominated use can be reduced and/or ultimately eliminated;
4. Promotion of the implementation of measures which ensure that any emissions of methyl bromide are minimised;
5. Actions to show how the management strategy will be implemented to promote the phase-out of uses of methyl bromide as soon as technically and economically feasible alternatives are available, in particular describing the steps which the Party is taking in regard to subparagraph (b) (iii) of paragraph 1 of Decision IX/6 in respect of research programmes in non-Article 5 Parties and the adoption of alternatives by Article 5 Parties.

The U.S. submitted the National Management Strategy in accordance with the Decision Ex. IX/6.

RENOMINATION FORM PART C: TRANSITION ACTIONS

Responses should be consistent with information set out in the applicant's previously-approved nominations regarding their transition plans, and provide an update of progress in the implementation of those plans.

In developing recommendations on exemption nominations submitted in 2003 and 2004, the Technology and Economic Assessment Panel in some cases recommended that a Party should explore the use of particular alternatives not identified in a nomination' transition plans. Where the Party has subsequently taken steps to explore use of those alternatives, information should also be provided in this section on those steps taken.

Questions 5 - 9 should be completed where applicable to the nomination. Where a question is not applicable to the nomination, write "N/A".

(Renomination Form 6.) TRIALS OF ALTERNATIVES
Where available, attach copies of trial reports. Where possible, trials should be comparative, showing performance of alternative(s) against a methyl bromide-based standard

None of the trials reported in the literature which follows reported results of a methyl bromide control.

(i) DESCRIPTION AND IMPLEMENTATION STATUS:

<u>IPM</u>

Research is continuing in the area of contour mapping to support pest management /IPM (Arbogast, et al. 2005; Nansen, et al., 2006). Spatial studies are important in monitoring pest populations.

Efficient insect detection of cereal grains is being studied (Neethirajan, et al., 2007).

Numerous articles on essential oils have been published recently (Lee 2002; Nansen and Phillips, 2003) and on other spot-treatments (Lee, et al., 2003; Leelaja, et al. In Press; Wang, et al., 2006). Hydroprene is receiving attention as well (Mohandass, et al. 2006a, 2006b).

<u>Alternative Fumigants</u>

Phosphine investigations continue. Collins, et al. (2005) conducted laboratory studies examining resistant and susceptible strains of the *Rhyzopertha dominica* to a range of phosphine concentrations and exposure periods.

Germinara, et al. (In Press) have begun preliminary investigations into the biological activity of proprionic acid on adults of *Sitophilus granarius* and *S. oryzae*.

Ozone as a fumigant in grain bins is being investigated (Kells, et al., 2001).

The registrant of sulfuryl fluoride is conducting more experiments through-out the U.S., but the experiments are not available at the time of this nomination.

Heat Treatments

Boina and Subramanyam (2004) studied confused flour beetle life stages in the laboratory to a range of elevated temperatures.

Mahroof, et al., (2005) continue investigations of heat treatments and the red flour beetle.

New Grants

Kansas State University has received $369,181 in a USDA/CSREES grant to investigate aerosols as an alternative to methyl bromide in commercial flour mills, processing plants and food storage facilities (to be completed in 2009). Kansas State University had received a grant for optimizing heat treatments in these same facilities. Researchers at Purdue University have gotten funding from USDA/CSREES to develop a structural fumigation and analysis tool for sulfuryl fluoride and the combination of phosphine+heat+carbon dioxide. These and other CSREES Funded Projects can be found at: http://www.csrees.usda.gov/fo/fundview.cfm?fonum=1107.

(ii) OUTCOMES OF TRIALS: (*Include any available data on outcomes from trials that are still underway. Where applicable, complete the table included at Appendix I identifying comparative disease ratings and yields with the use of methyl bromide formulations and alternatives.*)

IPM

Contour mapping in Indian meal moth illustrate that higher trap catches are nearer the source of infestations (Arbogast, et al., 2005).

Researchers are trying to develop efficient and fast insect detection techniques for grain. The potential of acoustic detection, carbon dioxide measurement, near-infrared spectroscopy, and soft X-ray methods have been discussed. Most were found to be cost prohibitive, and also the complexities of caibrating & operating the instruments presented problems to implementation (Neethirajan, et al., 2006).

The literature regarding essential oils consists of studies in small areas and laboratory experiments. In addition, none have included economic analyses. Thus these data do not shed light on commercial feasibility as yet.

A review of hydroprene, an insect growth regulator, demonstrates that it works well on the immature stages of many of the stored product insects, but the efficacy depends upon the surface texture, temperature, and sanitation (Mohandass, et al. 2006a). In addition, mortality of Indian meal moth larvae is increased at higher temperatures Mohandass, et al., 2006b).

Alternative Fumigants

Collins, et al. (2005) in studies on *R. dominica*, indicate that complete control can be expected in 5, 10, and 14 days depending on phosphine concentration. However, phosphine is corrosive to metal fixtures (as has been previously discussed).

Germinara, et al. (In Press) have begun preliminary investigations into the biological activity of proprionic acid on adults of *Sitophilus granarius* and *S. oryzae*. These laboratory studies demonstrated that proprionic acid was effective in killing adult weevils, and dose-dependent repellent effects.

Kells, et al. (2001) determined that ozone can be used as a fumigant in grain bins. In 8.9 tonnes of maize, with 50 ppm ozone for 3 days resulted in 92-100% mortality of adult red flour beetle, adult maize weevil and Indian meal moth larvae.

The sulfuryl fluoride registrant is conducting studies in different geographical locations with different stored products pests, but the results are not yet available.

Heat Treatments

Boina and Subramanyam (2004) found that old larvae of confused flour beetles most resistant to elevated temperatures. In pupae & adults of red flour beetles, sublethal heat exposure resulted in impaired reproductive performance (Mahroof, et al. 2005).

(iii) IMPACT ON CRITICAL USE NOMINATION/REQUIRED QUANTITIES: *(For example, provide advice on any reductions to the required quantity resulting from successful results of trials.)*

The available literature does not compare potential replacements for methyl bromide with methyl bromide. In addition, few studies have information regarding costs. However, the industry is learning how to implement sulfuryl fluoride as well as heat. There have been a few instances of building damage from heat fumigations, as many heat companies are trying to match the down times of methyl bromide fumigations. In August, 2006 EPA used its authority under Section 114 of the Clean Air Act to collected information about sulfuryl fluoride from a sample of millers and fumigators.

During the preparation of this nomination the USG has accounted for all identifiable means to reduce the request. Specifically, approximately 15 million kilograms of methyl bromide were requested by methyl bromide users across all sectors. USG carefully scrutinized requests and made subtractions to ensure that no growth, double counting, inappropriate use rates on a treated hectare basis was incorporated into the final request. Use when the requestor qualified under some other provision (QPS, for example) was also removed and appropriate transition given yields obtained by alternatives and the associated cost differentials~~,~~ was factored in. As a result of all these changes, the USG is requesting roughly 1/3 of that amount.

The USG feels that no additional reduction in methyl bromide quantities is necessary, given the significant adjustments described above.

(iv) ACTIONS TO ADDRESS ANY DELAYS/OBSTACLES IN CONDUCTING OR FINALISING TRIALS:

Research takes both time and money. In the U.S. much research is accomplished by university faculty members competing for grant money. In addition, the U.S. Department of Agriculture has an Agriculture Research Service that conducts research. The 5-year accomplishments of this program are available at:
http://www.ars.usda.gov/SP2UserFiles/Program/308/NP308AccomplishmentReport.pdf

The USG has the ability to authorize Experimental Use Permits (EUPs) for large scale field trials for methyl bromide alternatives. As with other activities connected with registration of a pesticide, the USG has no legal authority either to compel a registrant to seek an EUP or to require growers to participate.

As noted in our previous nomination, the USG provides a great deal of funding and other support for agricultural research, and in particular, for research into alternatives for methyl bromide. This support takes the form of direct research conducted by the Agricultural Research Service (ARS) of USDA, through grants by ARS and CSREES, by IR-4, the national USDA-funded project that facilitates research needed to support registration of pesticides for specialty crop vegetables, fruits and ornamentals, through funding of conferences such as MBAO, and through the land grant university system

(Renomination Form 7.) TECHNOLOGY TRANSFER, SCALE-UP, REGULATORY APPROVAL FOR ALTERNATIVES

The USDA maintains an extensive technology transfer system, the Agricultural Extension Service. This Service is comprised of researchers at land grant universities, county extension agents, and private pest management consultants. In addition to these sources of assistance for technology transfer, there are trade organizations and grower groups, some of which are purely voluntary but most with some element of institutional compulsion, that exist to conduct research, provide marketing assistance, and to disseminate "best practices."

(i) DESCRIPTION AND IMPLEMENTATION STATUS:

Many of the USDA grants include technology transfer. Most of the recipients of grants typically accomplish this by extension education (publications, websites) and industry engagement via trade-shows and conferences. Several awardees will hold hands-on training and demonstrations.

(ii) OUTCOMES ACHIEVED TO DATE FROM TECHNOLOGY TRANSFER, SCALE-UP, REGULATORY APPROVAL:

See above.

(iii) IMPACT ON CRITICAL USE NOMINATION/REQUIRED QUANTITIES: (*For example, provide advice on any reductions to the required quantity resulting from successful progress in technology transfer, scale-up, and/or regulatory approval*.)

During the preparation of this nomination the USG has accounted for all identifiable means to reduce the request. Specifically, approximately 15 million kilograms of methyl bromide were requested by methyl bromide users across all sectors. The USG carefully scrutinized requests and made subtractions to ensure that no growth, double counting, inappropriate use rates on a volume basis was incorporated into the final request. Use when the requestor qualified under some other provision (QPS, for example) was also removed and appropriate transition given yields obtained by alternatives and the associated cost differentials~~,~~ was factored in. As a result of all these changes, the USG is requesting roughly 1/3 of that amount.

Therefore, the USG feels that no additional change in methyl bromide quantity requested is necessary.

(iv) ACTIONS TO ADDRESS ANY DELAYS/OBSTACLES:

Research takes both time and money. The above experiments are continuing and require more time in order to complete. After the data are analyzed, the results will dictate what further actions will be needed. Any further investigations will need appropriate funding, most likely through competitive grants. In addition, extension education (publications, websites) and industry engagement via trade-shows and conferences, and other venues (like the Methyl Bromide Alternatives Outreach Annual Meetings) will be pursued. Some groups will hold hands-on training and demonstrations.

Furthermore, the USG has no legal authority to compel registrations; it can only act on registrations requested by private entities. The timely submission of data to support a registration decision is at the sole discretion of the registrant.

(Renomination Form 8.) COMMERCIAL SCALE-UP/DEPLOYMENT, MARKET PENETRATION OF ALTERNATIVES

(i) DESCRIPTION AND IMPLEMENTATION STATUS:

(ii) IMPACT ON CRITICAL USE NOMINATION/REQUIRED QUANTITIES: (*For example, provide advice on any reductions to the required quantity resulting from successful commercial scale-up/deployment and/or market penetration*.)

The USG feels that no additional change in methyl bromide quantity requested is necessary. The U.S. nomination for this sector reflects the commitment by this sector and the U.S. to reduce methyl bromide use to only the most critical needs. See Appendix A.

(iii) ACTIONS TO ADDRESS ANY DELAYS/OBSTACLES:

USG has no legal authority to compel registrations; it can only act on registrations requested by private entities. The timely submission of data to support a registration decision is at the sole discretion of the registrant.

The USDA maintains an extensive technology transfer system, the Agricultural Extension Service. This Service is comprised of researchers at land grant universities and county extension agents in addition to private pest management consultants. In addition to these sources of assistance for technology transfer, there are trade organizations and grower groups, some of which are purely voluntary but most with some element of institutional compulsion, that exist to conduct research, provide marketing assistance, and to disseminate “best practices”.

(Renomination Form 9.) CHANGES TO TRANSITION PROGRAM

If the transition program outlined in the Party’s original nomination has been changed, provide information on the nature of those changes and the reasons for them. Where the changes are significant, attach a full description of the revised transition program.

See Appendix A.

(Renomination Form 10.) OTHER BROADER TRANSITION ACTIVITIES

Provide information in this section on any other transitional activities that are not addressed elsewhere. This section provides a nominating Party with the opportunity to report, where applicable, on any additional activities which it may have undertaken to encourage a transition, but need not be restricted to the circumstances and activities of the individual nomination. Without prescribing specific activities that a nominating Party should address, and noting that individual Parties are best placed to identify the most appropriate approach to achieve a swift transition in their own circumstances, such activities could include market incentives, financial support to exemption holders, labelling, product prohibitions, public awareness and information campaigns, etc.

These issues are discussed in the US Management Plan for Methyl Bromide, submitted previously.

Part G: CITATIONS

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APPENDIX A 2009 METHYL BROMIDE USAGE NEWER NUMERICAL INDEX EXTRACTED (BUNNI)

2009 Methyl Bromide Usage Newer Numerical Index - BUNNIE							Structures - Food Facilities	
December 18, 2006	Region		Rice Millers	Bakeries	Pet Food Institute	North American Millers	Sector Total	Notes
Dichotomous Variables	Currently Use Alternatives?		Yes	Yes	Yes	Yes		
	Pest-free Requirements?		Yes	Yes	Yes	Yes		
Other Issues	Frequency of Treatment of Product		2x per year	3x per year	1x per 3 years	2.5x per year		
	Quarantine & Pre-Shipment Removed?		Yes	Yes	Yes	Yes		
Most Likely Combined Impacts (%)	Regulatory Issues (%)		0%	0%	0%	0%		
	Key Pest Distribution (%)		100%	100%	100%	100%		
	Total Combined Impacts (%)		**100%**	**100%**	**100%**	**100%**		
Most Likely Baseline Transition	(%) Able to Transition		90%	72%	75%	58%		
	Minimum # of Years Required		5	5	5	5		
	(%) Able to Transition per Year		**18%**	**14%**	**15%**	**12%**		
EPA Adjusted Use Rate (kg/1000m3)			**20**	**14**	**18**	**19**		
2009 Applicant Requested Usage	*Amount - Pounds*	*Pounds*	*259,000*	*25,725*	*102,820*	*592,000*	*979,545*	
	Volume - 1000ft^3	*Pounds*	*172,348*	*20,580*	*75,660*	*490,000*	*758,588*	
	Rate (lb/1000ft^3)	*Pounds*	*1.50*	*1.25*	*1.36*	*1.21*	*1*	
	Amount - Kilograms	Metric	**117,480**	**11,669**	**46,638**	**268,526**	**444,314**	
	Volume - 1000m^3	Metric	4,880	583	2,142	13,875	21,481	
	Rate (kg/1000m^3)	Metric	24	20	22	19	21	
EPA Preliminary Value		**kgs**	**117,480**	**11,669**	**46,638**	**268,526**	**444,314**	
EPA Baseline Adjusted Value has been adjusted for:		MBTOC Adjustments, QPS, Double Counting, Growth, Use Rate, Miscellaneous Adjustments, and Combined Impacts						
EPA Baseline Adjusted Value		kgs	97,607	11,669	31,364	268,526	409,166	
EPA Transition Amount		kgs	(48,804)	(3,361)	(9,409)	(56,175)	(117,748)	
EPA Amount of All Adjustments		**kgs**	**(68,677)**	**(3,361)**	**(24,683)**	**(56,175)**	**(152,895)**	
Most Likely Impact Value (kgs)		kgs	**48,804**	**8,308**	**21,955**	**212,352**	**291,418**	
		1000m^3	**2,440**	**583**	**1,190**	**10,973**	**15,186**	
		Rate	**20**	**14**	**18**	**19**	**19**	
Sector Research Amount (kgs)		**-**		**2009 Total US Sector Nomination**		**291,418**		

1 Pound = 0.453592 kgs | 1000 cubic feet= 0.028316847 1000 cubic meters

1 lb/1000 ft^3 = 0.0624 kg/1000 m^3 | (ounces/1000 ft^3 ~ kg/1000 m^3)