METHYL BROMIDE CRITICAL USE RENOMINATION FOR POST-HARVEST USE TREATMENT OF STRUCTURES – FOOD PROCESSING PLANTS

NOMINATING PARTY: The United States of America

FILE NAME: USA CUN11 **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 2009 for 2011 Use Season)

QUANTITY OF METHYL BROMIDE REQUESTED IN EACH YEAR OF NOMINATION:

TABLE 1. QUANTITY OF METHYL BROMIDE REQUESTED IN EACH YEAR OF NOMINATION

YEAR	NOMINATION AMOUNT (KILOGRAMS)
2011	**135,299**

(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).)

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.

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Following the requirements of Decision IX/6 paragraph (a)(1) United States of America 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: ______________________________________

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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 CUN11 POST HARVEST STRUCTURES - FOOD PROCESSING PLANTS	10	
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 CUN11 POST HARVEST STRUCTURES - FOOD PROCESSING PLANTS		

* Identical to paper documents

METHYL BROMIDE CRITICAL USE RENOMINATION FOR PREPLANT SOIL USE (OPEN FIELD OR PROTECTED ENVIRONMENT)

STRUCTURES

1. SUMMARY OF NEED FOR METHYL BROMIDE AS A CRITICAL USE

Food processing facilities in the United States have reduced the number of methyl bromide fumigations by incorporating a variety of different techniques to control pests. The most critical strategy implemented is IPM, especially sanitation, and equipment design modifications to enable cleaning and inspection in all areas of a facility. Facilities are now being monitored for pest populations, using visual inspections, pheromone traps, light traps, and electrocution traps. When insect pests are found, facilities will attempt to contain the infestation with treatments of low volatility pesticides applied to both surfaces and cracks and crevices; spot treatments with heat or phosphine will be used in areas that are suitable. Incoming ingredients are inspected for insect pests and may be treated with phosphine if temperature and time are sufficient, or contaminated ingredients may be rejected. These techniques do not disinfest a facility but are critical in monitoring and managing pests, and hopefully preventing outbreaks. However, when all these methods fail to control a pest problem, facilities must rely on fumigation, to kill insects within the processing equipment, bins, storage spaces and even the walls of the structure. There are two primary fumigants available to this industry that may accomplish these tasks: methyl bromide and sulfuryl fluoride.

The USG has applied an aggressive transition rate which is reflected in the nomination amount and detailed in Table 2.

TABLE 2: NOMINATION AMOUNT

2011 Methyl Bromide Usage Newer Numerical Index (BUNNI)
Transition Use Reduction Description Spreadsheet

SECTOR		STRUCTURES			
		Rice Millers	Pet Food Institute	North American Millers	Sector Total / Average
Quantity Requested for 2010:	Amount (kgs)	14,511	13,722	163,760	191,993
Quantity Recommended by MBTOC/TEAP for 2010 :	Amount (kgs)	14,511	13,722	144,790	173,023
Quantity Approved by Parties for 2010:	Amount (kgs)	14,511	13,722	144,790	173,023
	Volume (1000 m^3)	726	745	8,459	9,930
	Rate	20	18	17	17
Transition from 2010 Baseline Adjusted Value	Percentage (%)	-82%	-56%	-58%	-63%
Quantity Required for 2011 Nomination:	Amount (kgs)	**14,511**	**13,722**	**107,066**	**135,299**
	Volume (1000 m^3)	**726**	**745**	**5530**	**7001**
	Rate	**20**	**18**	**19**	**19**

2. SUMMARIZE WHY KEY ALTERNATIVES ARE NOT FEASIBLE

This nomination is for facilities, or portions of facilities, that are unsuitable for the alternatives, and where the alternatives are not economically feasible. Sulfuryl fluoride is highly dependent upon temperature, so should a facility need fumigation during cold temperatures, this chemical may not be a cost-effective solution. Also, sulfuryl fluoride requires higher dosages for egg kill, a paramount concern in certain facilities. Phosphine can be explosive and is corrosive to many metals that are present in facilities, especially in the computers and other electronic process control instrumentation. Heat is dependent on several parameters: the structural composition, as different components expand and contract at different rates; the building design/layout factors, which affect the ability to evenly distribute heated air; and the availability of convenient and economical sources of heat. In addition, heat may not be a viable option for treatment of food products or commodities.

In addition, there is some confusion as to the materials that may be directly fumigated with sulfuryl fluoride. According to the Profume™ label pet food is not listed as a material approved for direct treatment. Therefore, the interpretation is that all pet food products would need to be removed from treatment areas or sufficiently protected to prevent the formation of sulfuryl fluoride residues within the pet food products. This is also a factor for mills that produce mixes (e.g. cake mixes, muffin mixes, etc.). This may sufficiently increase the costs and timing considerations for sulfuryl fluoride use on a host of processed foods and ingredients.

3. RESEARCH RESULTS SHOWING EFFICACY OF ALTERNATIVES

Jim Campbell (2008) evaluated efficacy of structural fumigations. He investigated trap catches of *Tribolium castaneum*, red flour beetle (RFB), in two flour mills. Mill 1 had 8 methyl bromide fumigations and 2 sulfuryl fluoride fumigations. Mill 2 had 11 methyl bromide fumigations. The average trap capture was higher in Mill 1 than in Mill 2, with a reduction of 93% and 67%, respectively, after fumigation. In addition, the average proportion of traps with RFB was reduced after fumigation (62% and 66%, respectively). Campbell (2008) also examined the seasonal impact of fumigation efficacy. In Mill 1 he reports that the mean trap captures in summer are higher than in either spring or fall, although there is no significant difference between spring and summer. There is a major reduction of in mean trap captures after fumigation, regardless of time of year. Mill 2 has higher mean trap captures in the fall, but again reduction after fumigation. Spring fumigations at Mill 1 results summarized in Table 3 below:

Table 3. Summary of Trap Capture Reductions by Campell (2008).

Fumigant	**Reduction**	
	% Average Trap Capture	**% Proportion of Traps with Captures**
Sulfuryl Fluoride, low rate	98	71
Sulfuryl Fluoride, high rate	96	93
Methyl Bromide, normal rate, single	84	28
Methyl Bromide, normal rate,	92	55

overall average		

Campbell (2008) also presented data regarding rebound after fumigation. He found that season and pest density did have an impact on rebound. Rebound was slower during the fall. The use of aerosols and enhanced IPM also slowed rebound. This multiyear study has taken place in only two flour mills, and needs to be demonstrated in other locations.

One study that compared sulfuryl fluoride and methyl bromide in mill fumigations (Tsai *et al*., 2008) found that methyl bromide killed RFB and Indianmeal moth (IMM) eggs more effectively than sulfuryl fluoride, but that sulfuryl fluoride killed RFB and IMM pupae better than did methyl bromide. There was no difference in the fumigants on the mortality of larvae and adults. These were commercial fumigations, but rates and exposure times were not reported. Rebound in the mills in the study varied by both season and mill. For example, one mill which responded only under critical conditions averaged a rebound rate of eight months, whereas other mills had a spring rebound average of three months. Summer populations of flour beetle averaged a nearly five-month rebound period. Fall fumigations took advantage of the lower ambient temperature by increasing rebound periods to an average of seven months. (Tsai *et al*., 2008)

Reichmuth and Klementz (2008) have investigated how to improve the use of sulfuryl fluoride to manage pest populations. They report that in Germany and UK that many mills have considerable numbers of surviving pests despite strict dosage schedules. The authors propose an increased dosage of sulfuryl fluoride or perhaps to use the fumigant in combination with heat or another chemical. They cite the methyl bromide CT for RFB as 5 g/m^3 in the laboratory but the field (structural) requires $20 g/m^3$. For sulfuryl fluoride, the CT for RFB post-embryonic is 113 gh/m^3 but eggs require 1,669 gh/m^3. In addition to heat, the authors examine sulfuryl fluoride with phosphine, with carbon dioxide, with hydrogen cyanide. They provided data on the combination with hydrogen cyanide, but since cyanide is not registered for use in the U.S., it will not be considered further. The authors also looked at Pulsed Fumigation. As the authors noted this method has a longer down time and potentially an MRL problem. The conclusion was that although these combinations may be clumsy or time consuming, there is still a potential that further research may be able to overcome these weaknesses. (Reichmuth and Klementz, 2008)

Indianmeal moth is a ubiquitous stored product pest and information on aerosol efficacy on eggs and larvae is limited. One investigation examined methoprene alone and in combination with esfenvalerate (Arthur *et al*., 2008). Percent mortality of IMM eggs exposed to esfenvalerate was about 65% and about 65% when exposed to methoprene. Percent mortality of IMM larvae exposed to esfenvalerate was 10% but 99.6% when exposed to methoprene. The combination of esfenvalerate aerosol with an IGR like methoprene does control eggs and larvae of IMM. In addition to efficacy, an economic analysis was also conducted, which demonstrated that this combination was cost effective.

4. ECONOMIC INFEASIBILITY OF ALTERNATIVES

TABLE 4. ECONOMIC SUMMARY FOR EACH ALTERNATIVE

METHYL BROMIDE ALTERNATIVE	ECONOMIC SUMMARY
HEAT TREATMENT	Food processing facilities located in cold climates (which are able to convert to heat treatment) may experience economic losses from additional production downtimes associated with heat-up time. Economic losses in cold weather facilities due to downtime with heat treatment are persistent. However, some facilities experience better insect control with heat than fumigation due to leaky structures that allow gas to escape.
SULFURYL FLUORIDE	A portion of the food processing facilities can economically convert to sulfuryl fluoride. Other facilities cannot due to economic losses that would result from higher treatment costs which arise at lower temperatures. For a small percentage, SF is not technically feasible due to cold temperatures. Adding heat to increase the efficacy of SF is also not an economically feasible option.

Sulfuryl Fluoride

Results of the assessment of using sulfuryl fluoride as an alternative to methyl bromide are provided in Tables 2-4. For purposes of this analysis, current prices of sulfuryl fluoride and methyl bromide were assumed equal and plant temperatures are assumed to be 29.44 degrees centigrade (85 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. Sulfuryl fluoride is technically feasible only in facilities that do not prepare mixed products (e.g., cake mixes) due to labeling.

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).

Production downtime is estimated at one additional day for cold facilities due to longer heat-up period. Costs of heat treatment include all labor, transportation, and fuel. Fuel used is generally propane and could increase significantly with fuel costs.

TABLE 5. ANNUAL ECONOMIC IMPACTS OF METHYL BROMIDE ALTERNATIVES FOR RICE MILLER'S ASSOCIATION

Rice Millers [1]	Units	MeBr [2]	SF [2]	Heat: 7 ºC	Heat: 29 ºC	SF + 7 ºC Heat
Total Operating Costs	**$/year**	na	na	na	na	na
Total Fumigation/Heat Costs	**$/year**	$ 24,300.00	$ 30,000.00	$ 70,000.00	$ 150,000.00	$ 100,000.00
Quantity of Fumigant (One treatment per year)	**kgs/facility**	703	1,134	na	na	na
Fumigant cost (i.e., gas)	**$/year**	$ 9,300.00	$ 15,000.00	na	na	$ 15,000.00
Other fumigation costs (i.e., labor, equip., etc.)	**$/year**	$ 15,000.00	$ 15,000.00	$ 70,000.00	$ 150,000.00	$ 85,000.00
Other Operating Costs	**$/year**	na	na	na	na	na
Time Lost	**days**	0	0	0	1	0
Total Loss (MeBr to alt)	**$/year**	$ -	$ 5,700.00	$ 45,700.00	$ 125,700.00	$ 75,700.00
Average Facility Loss per Kg MeBr Requested	**$/kg MB requested**	na	8.11	65.00	178.79	107.67

1 Analysis for a 28,317 cubic meter (1,000,000 cubic foot) facility
2 Temperature 29.44 degrees C

TABLE 6: ANNUAL ECONOMIC IMPACTS OF METHYL BROMIDE ALTERNATIVES FOR PET FOOD INSTITUTE

Pet Food [1]	Units	MeBr [2]	SF [2]	Heat: 7 ºC	Heat: 29 ºC	SF + 7ºC Heat
Gross Revenue	$/year	$ 33,176,000.00	$ 33,176,000.00	$ 33,176,000.00	$ 33,060,000.00	$ 33,176,000.00
Total Operating Costs	$/year	na	na	na	na	na
Total Fumigation/Heat Costs	$/year	$ 9,612.50	$ 11,637.50	$ 17,500.00	$ 37,500.00	$ 29,137.50
Quantity of Fumigant (One treatment per year)	Kgs/facility/ treatment	18.42	40.05	na	na	na
Fumigant cost (i.e., gas)	$/year	$ 782.45	$ 1,700.97	na	na	$ 1,700.97
Other fumigation costs (i.e., labor, equip., etc.)	$/year	$ 3,577.71	$ 3,577.71	$ 7,937.87	$ 17,009.71	$ 11,515.58
Other Operating Costs	$/year	na	na	na	na	na
Time Lost	days	0	0	0	1	0
Total Loss (MeBr to alt)	$/year	$ -	$ 2,025.00	$ 7,887.50	$ 27,887.50	$ 19,525.00
Average Facility Loss per Kg MeBr Requested	$/kg MB requested	$ -	$ 109.93	$ 428.17	$ 1,513.88	$ 1,059.92
Loss as % of GR with MeBr		0%	0.01%	0.02%	0.08%	0.06%

1 Analysis for a 28,317 cubic meter (1,000,000 cubic foot) facility
2 Temperature 29.44 degrees C

TABLE 7. ANNUAL ECONOMIC IMPACTS OF METHYL BROMIDE ALTERNATIVES FOR NORTH AMERICAN MILLER'S ASSOCIATION

NAMA**	Units	MeBr [2]	SF [2]	Heat: 7ºC	Heat: 29 ºC	SF + 7ºC Heat
Total Operating Costs	$/year	na	na	na	na	na
Total Fumigation/Heat Costs	$/year	$ 13,001.75	$ 26,932.75	$ 70,000.00	$ 150,000.00	$ 96,932.75
Quantity of Fumigant	kgs/facility	566.99	1,587.57	na	na	na
Fumigant cost (i.e., gas)	$/year	$ 7,500.00	$ 21,000.00	na	na	$ 21,000.00
Other fumigation costs (i.e., labor, equip., etc.)	$/year	$ 5,501.75	$ 5,932.75	$ 70,000.00	$ 150,000.00	$ 75,932.75
Other Operating Costs	$/year	na	na	na	na	na
Time Lost	days	0	0	0	1	0
Total Annual Loss (MeBr to alt)	$/year	$ -	$ 13,931.00	$ 56,998.25	$ 136,998.25	$ 83,931.00
Average Facility Loss per Kg MeBr Requested	$/kg MB requested	$ -	$ 24.57	$ 100.53	$ 241.62	$ 148.03

1 Analysis for a 28,317 cubic meter (1,000,000 cubic foot) facility
2 Temperature at 29.44 degrees C

CITATIONS:

Adam, Brian D. 2007. Cost comparison of methyl bromide and ProFume for fumigating a food processing facility. A report to National Pest Management Association and Dow AgroSciences. Economic Consulting LLC.

Arthur, F. H., E. A. Jenson, and J. R. Nechols. 2008. Esfenvalerate plus methoprene aerosol to control the Indianmeal moth. Presented at MBAO, Orlando, Fl. November 2008. Available at: http://mbao.org

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Reichmuth, C. and D. Klementz. 2008. How to overcome the egg-weakness of sulfuryl fluoride – combinations of control methods. Presented at MBAO, Orlando, Fl. November 2008. Available at: http://mbao.org

Tsai, W-T., L. J. Mason, K. E. Ieleji, and D. E. Maier. 2008. Sulfuryl fluoride and methyl bromide fumigations in Midwestern US flour mills. Presented at MBAO, Orlando, Fl. Novermber 2008. Available at: http://mbao.org