



SUBMISSION FORM

For Hazardous Substance and New Organism Applications



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Submission on application number:	APP 203660
Name of submitter or contact for joint submission:	Stephen C. Scherrer
Organisation name (if on behalf of an organisation):	Great Lakes Chemical Corporation a company of the LANXESS group
Postal address:	<div style="background-color: black; width: 100%; height: 15px;"></div> <div style="background-color: black; width: 100%; height: 15px;"></div>
Telephone number:	<div style="background-color: black; width: 100%; height: 15px;"></div>
Email:	<div style="background-color: black; width: 100%; height: 15px;"></div>

I wish to keep my contact details confidential

The EPA will deal with any personal information you supply in your submission in accordance with the Privacy Act 1993. We will use your contact details for the purposes of processing the application that it relates to (or in exceptional situations for other reasons permitted under the Privacy Act 1993). Where your submission is made publicly available, your contact details will be removed only if you have indicated this as your preference in the tick box above. We may also use your contact details for the purpose of requesting your participation in customer surveys.

The EPA is likely to post your submission on its website at www.epa.govt.nz. We also may make your submission available in response to a request under the Official Information Act 1982.

-
- I support the application
- I oppose the application
- I neither support or oppose the application

The reasons for making my submission are¹: (further information can be appended to your submission, see footnote).

I am employed by Lanxess Corporation, a major manufacturer of methyl bromide. As such, I have relevant knowledge and experience regarding the subject matter of the application. I have conducted research and large scale trials of systems to capture methyl bromide following fumigations, and have closely examined alternative fumigants. I wish to bring additional considerations to the attention of decision makers. Additional comments are attached.

All submissions are taken into account by the decision makers. In addition, please indicate whether or not you also wish to speak at a hearing if one is held.

- I wish to be heard in support of my submission (this means that you can speak at the hearing)
- I do not wish to be heard in support of my submission (this means that you cannot speak at the hearing)

If neither box is ticked, it will be assumed you do not wish to appear at a hearing.

I wish for the EPA to make the following decision:

I wish for EPA to adopt the recommendations of Stakeholders in Methyl Bromide Reduction Inc. (STIMBR)

¹ Further information can be appended to your submission, if you are sending this submission electronically and attaching a file we accept the following formats – Microsoft Word, Text, PDF, ZIP, JPEG and JPG. The file must be not more than 8Mb.



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Comments of LANXESS Corporation in Support of Application APP203660 Regarding Regulations on the Capture or Destruction of Methyl Bromide from Log Fumigation

LANXESS Corporation, through its subsidiary Great Lakes Chemical Corporation (“Lanxess”), is a major manufacturer of methyl bromide used in QPS fumigations around the world, including in New Zealand. Methyl bromide manufactured by Lanxess is sold in bulk to repackagers who put the product into cylinders using their own pesticide labels. Lanxess and its predecessor companies (Great Lakes Chemical Corporation, Chemtura Corporation) have manufactured methyl bromide since the 1960s and have maintained continuous registrations for pesticide use since that time.

Having sponsored many toxicological studies, environmental fate studies, worker safety studies, epidemiological studies, and air dispersion studies, Lanxess is very familiar with all aspects of methyl bromide health and environmental effects, and is qualified to assess and comment on these effects. Lanxess has also invested in research on systems to capture methyl bromide released from fumigations and are qualified to comment on these systems as well.

Lanxess has studied the Stakeholders in Methyl Bromide Reduction Inc. (STIMBR) Application for Reassessment. It presents a solid, well-reasoned case in support of the changes sought by STIMBR. Based on Lanxess’ experience with methyl bromide and systems for emission mitigation, the company will present additional evidence in support of the STIMBR changes.

Lanxess adheres to the highest standards of product stewardship and supports efforts to reduce human exposure and environmental harm from use of our products. Our company supports the intervention of STIMBR and is pleased to offer comments on the STIMBR recommendations.

1. Methyl Bromide Recapture and Destruction Technologies

1.1 Definition of amount to be recaptured or destroyed

The New Zealand Environmental Protection Authority (EPA) regulation from 28 October 2010 defines recapture or destruction as follows: “...a system that mitigates methyl bromide emissions from fumigation enclosures such that the residual level of methyl bromide in the enclosed space is less than the Worker Exposure Standard set under section 77B.” Since the WES is set at 5 ppm, the maximum permitted residual without recapture is 5 ppm.

In the petition for reassessment, STIMBR seeks to change the definition to: “Recapture technology is a system that mitigates methyl bromide emissions from fumigation enclosures such that the residual level of methyl bromide in the enclosed space is at least 80% less than that at the end of the fumigation period.”

In the petition for reassessment, STIMBR demonstrates that implementation of the EPA regulation would result in significant disruption to New Zealand’s import and export markets,



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particularly for logs due to the lack of technology to achieve the levels of emission reduction required by the regulation.

1.2 Difficulty of achieving residual level of 5 ppm

In a 1998 presentation, Knapp and McAllister demonstrated that concentration decay in a fumigation enclosure during ventilation can be modeled as a “continuous stirred tank reactor”, and follows a decaying exponential curve (Knapp, G. G., and McAllister, D. L. 1998. Methyl bromide recovery. <https://mbao.org/static/docs/confs/1998-orlando/papers/058knapp.pdf>). Using the Knapp equation, ventilation of a log stack can be modeled:

$$C_{(t)} = C_{(0)}e^{(-Ft/V)}, \text{ where}$$

$C_{(t)}$ = Concentration at time t

$C_{(0)}$ = Initial concentration

F = Ventilation flow rate

V = Volume of the fumigation enclosure

t = Time in minutes

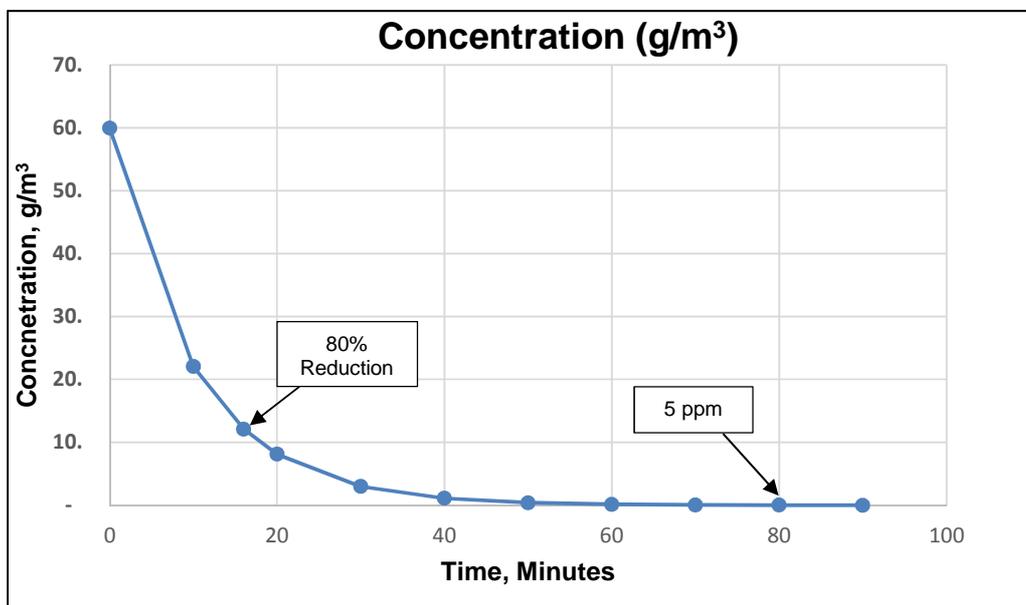
Assuming a concentration of 60 g/m³ at the beginning of ventilation, an enclosure volume of 500 m³, and a ventilation flow rate of 50 m³/minute, the data table and graph below were generated:

Time	Concentration (g/m3)	Kg Remaining
0	60.000	30.00
10	22.073	11.04
16	12.114	6.06
20	8.120	4.06
30	2.987	1.49
40	1.099	0.55
50	0.404	0.20
60	0.149	0.07
70	0.055	0.03
80	0.020	0.01
90	0.007	0.00



Energizing Chemistry

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These calculations demonstrate that under these assumptions, the 80% reduction requested by STIMBR is reached in 16 minutes, but an additional 64 minutes is required to reach the 5 ppm WEL. The time scale will change for different enclosure volumes and ventilation flow rates, but the proportional difference will remain the same. Regardless of the type of emission mitigation used (activated carbon, liquid scrubber, or thermal destruction), the additional time represents added expense and delay in completing the fumigation. While the initial 80%, or 24 kg, of methyl bromide could be removed in 16 minutes, an additional 64 minutes, or four times as long, would be required to remove the remaining 6 kg. In addition, the model assumes that no methyl bromide enters the fumigation enclosure during ventilation. Actually, the fumigated commodity (logs) would continue to emit absorbed methyl bromide, so a much longer time would be required to reach 5 ppm.

The added time and expense to reach 5 ppm creates a problem with any mitigation system, but it is particularly problematic with activated carbon systems. Even though methyl bromide binds strongly to activated carbon, the binding is not irreversible, so that some low concentration of methyl bromide remains in the air space surrounding the carbon. This is not an issue in the early stage of ventilation when the incoming air stream contains relatively high levels of methyl bromide. As the ventilation progresses, however, the methyl bromide concentration in the incoming stream becomes very low and actually begins to remove methyl bromide from the carbon. The solution to this problem is to install two carbon beds in series so that the second bed removes traces of methyl bromide. When the first bed has absorbed methyl bromide to capacity, the second bed is moved to the first position and a fresh bed is added. While this arrangement makes most efficient use of the methyl bromide, it also adds to the complexity and cost of the system.

In summary, the STIMBR recommendation of capturing or destroying 80% of the methyl bromide remaining after fumigation represents a reasonable and technically feasible solution.



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1.3 Comments on “Revised Review of Proposed Concepts and Technologies to Recapture and/or Destroy Residual Methyl Bromide (MB) after Log Fumigations at New Zealand Ports”, June 2019 Revision

This comprehensive report by Dr. Jack Armstrong is a thorough review of all available Methyl Bromide Recapture and Destruction Technologies (MBRDT). Lanxess wishes to add comments on a few of the technologies.

1.3.1 Activated Carbon

Activated Carbon (AC) has been used for many years for the removal of organic compounds from both aqueous and air streams. Advantages include fairly low cost, high efficiency, and high throughput. However, for applications in which fairly large amounts of organic compounds with high vapor pressure must be removed from moist air streams, AC systems become less attractive, as Dr. Armstrong demonstrates. Lanxess' work with AC systems supports the conclusions of Dr. Armstrong that loading is usually around 10%, and for optimum performance, moisture must be removed upstream of the carbon beds.

While Dr. Armstrong mentions moisture removal by cooling the incoming air stream, no specifics on the refrigeration required are given. The refrigeration load is significant and would add considerable cost to an AC system, especially for log stacks and ship loads. For example, cooling an air flow of 50 m³/minute from 20°C at 100% humidity to 5°C at 100% humidity would require cooling of 36.3 kW.

1.3.2 Ecotool Systems

According to Dr. Armstrong's report, Ecotool Systems “propose to build a trial plant to test the effectiveness of MB recapture using a cooling system to drop the temperature of the air and MB mixture below the boiling point of pure MB (<4.4°C).” The plan would apparently be to collect the liquid MB that would have condensed from vapor. Unfortunately, the temperature would have to be much lower than 4.4°C to accomplish the desired outcome. This is like saying one will design a system to condense steam to water by operating a condenser at 100°C. Such a system would be even more energy intensive than the AC system discussed above, not to mention the amount of water that would condense with the MB. It is highly unlikely that such a system could be successfully commercialized.

1.3.3 Genera Active Recovery Unit (GARU)

In his report, Dr. Armstrong presents convincing evidence that the GARU is one of the most promising systems for mitigation of MB emissions from log fumigations. The system absorbs MB onto AC, then desorbs using heat. The desorbed MB is then removed using reduced pressure and directed to another log stack for fumigation.



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This approach appears to be sound and should function as described, but there are at least two concerns that are not addressed in the General description.

1.3.3.1 Materials of construction

A system developed by Halozone in the 1990s similarly used heat to desorb MB from a substrate, zeolite. After only a few trials, severe corrosion problems caused Halozone to abandon the project. MB, absorbed on an active substrate like AC or zeolite, in the presence of water and heat, readily reacts with water to form hydrobromic acid and methanol. Any system using heat to desorb must be constructed of corrosion-resistant materials. If the MB is to be reused, the hydrobromic acid should be removed, lest it interact with the fumigated commodity or fumigation enclosure in undesirable ways.

1.3.3.2 Regulatory issues

Pesticide regulatory authorities typically require that pesticidal products be of known composition, that a clear sequence of operations flow from manufacture to use, that the manufacturer is clearly identified, and that the products are properly labeled. In the case of recycled MB, it is not clear how these requirements could be met. As discussed in the previous paragraph, hydrobromic acid and perhaps other compounds could be generated in the desorption process. Since the MB has been used and processed, presumably without rigorous quality checks before reuse, the original manufacturer's registration would no longer apply. For the recycle use to be practical, it seems that the operator of the system would be required to somehow register the recycled MB with the EPA, or obtain a waiver for its use.

The GARU concept certainly should be pursued, but addressing the concerns mentioned above, particularly the regulatory issues, could add significantly to the timeline.

2. Alternative Fumigants

In its assessment of October 2010, the Methyl Bromide Reassessment Committee of the Environmental Risk Management Authority comprehensively reviewed the risks and benefits associated with the use of methyl bromide (MB) as a fumigant. The Committee concluded that with the implementation of appropriate controls, including

- short term exposure limits (TELs) for MB;
- minimum buffer zones; and
- notification for large scale fumigations

the level of risk to human health is negligible.



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However, the Committee “acknowledges that there are significant concerns about the potential adverse effects on members of the public from the use of MB.” Further, the Committee states that the measures listed above will reduce the risk to society and communities to a negligible level.

2.1 Ethanedinitrile (EDN)

It is unlikely that any single fumigant will replace all uses of MB, but the most promising product for log fumigation appears to be EDN. EDN has high volatility, it is efficacious against all life stages of the target pests, and registration in New Zealand is in progress. Possible concerns include flammability, toxicity, and extraneous odors in fumigated commodities.

An issue which has not been addressed in the documents we have examined is public perception if EDN is approved and used as a fumigant. The Committee acknowledged in its review that public concern was a driver for the additional control measures recommended for MB. To minimize public concern, it is likely that similar measures would be required for EDN. In fact, such concerns might even be heightened once the public becomes aware that the most common chemical name for EDN is “cyanogen,” and the compound is closely related to hydrogen cyanide (HCN). It appears that the manufacturer may have intentionally chosen to refer to the compound as EDN to allay such concerns.

Additionally, EDN is rapidly absorbed by logs during fumigation. EDN is known to react readily with moisture to form HCN, and the assumption is that this is the mechanism responsible for the absorption. However, the decomposition products in logs have not been characterized. Considering the known breakdown products, it is highly likely that purchasers of the logs fumigated with EDN would demand solid evidence of safety before purchase.

For these reasons, it seems unwise to assume that EDN will be available as a MB alternative in the foreseeable future.

2.2 Other alternative fumigants

For some applications, phosphine is a viable alternative to MB for log fumigation. Because of the long exposure time required, its use is not practical except for in-transit ship hold fumigation. And most importing nations require the use of only MB.

Sulfuryl fluoride (SF) has been adopted as a MB alternative for many applications. The main weakness with SF as a fumigant is the lack of efficacy against the egg stage. In some application, this can be overcome by scheduling a second fumigation after the eggs hatch, but logistical considerations preclude this option for New Zealand log exports.

3. Conclusion

Following our review of the STIMBR Application Seeking Reassessment of Certain Controls on Methyl Bromide and the supporting documentation, Lanxess is convinced that STIMBR has devoted a good faith effort and sufficient resources in the search for viable means of compliance with the methyl bromide control measures scheduled to take effect in October 2020. STIMBR and its member



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companies are prepared to comply with buffer zone and notification requirements when implemented as scheduled, but achieving the standards set for recapture and emission mitigation has proven to be much more difficult.

In light of these difficulties, STIMBR put forth an interim position, protective of human health and the environment, but achievable using technologies developed over the past several years. In addition, STIMBR is continuing with a robust research program to develop methods to reach the goals set by the EPA as expeditiously as possible.

We encourage the EPA to adopt the STIMBR recommendations as presented, thereby accomplishing the dual goals of protection of human health and the environment while preserving the benefits of the log export industry.