

2020

FUMIGATION SECTOR COMPLIANCE AUDIT

INTEGRATED PEST MANAGEMENT ACT



Ministry of
Environment and
Climate Change Strategy

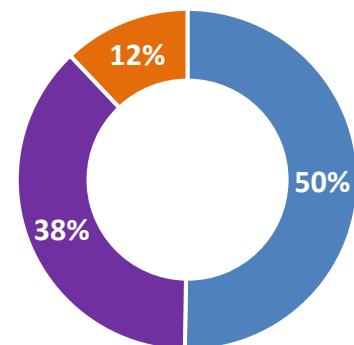
EXECUTIVE SUMMARY

In 2020, the Compliance and Environmental Enforcement Team of the Ministry of Environment and Climate Change Strategy conducted an audit of the fumigation sector to gain a snapshot of compliance under the *Integrated Pest Management Act* (IPMA or Act) and Regulation (IPMR). The fumigation sector in B.C. includes pest control operators who are licensed to use fumigant pesticides in cargo holds of ships and shipping containers to meet the quarantine requirements of the receiving countries. Regulatory oversight of this sector is important as fumigants are highly toxic, restricted-class substances, that can cause serious injury or death to workers or others if used or stored improperly.

The main objective of the audit was to verify compliance with the fundamental requirements of licensing, certification, and fumigant pesticide sale and use. Each inspection included in-depth assessments for compliance with the requirements for fumigant pesticide storage and use, specifically as they relate to protection of human health and the environment. In addition, the annual pesticide sale and use data for three years (2018-2020) submitted by fumigant vendors and users across the province were analysed to gain a further understanding of the fumigant use practices in this sector.

A total of 16 inspections were conducted across the province. The results of this audit found:

- 50% of the inspected parties were fully in compliance. The audit resulted in eight notices (50%), six advisories (38%), and two warnings (12%, figure at right).
- All of the inspected fumigators met the pesticide storage requirements and the pre-fumigation site inspection requirements. 50% of the inspected fumigators complied with the post-fumigation gas monitoring requirements, and 33% were compliant with fumigant use record keeping requirements.
- For license conditions, 86% of the inspected parties complied with the Fumigation Management Plan (FMP) submission requirements, 33% complied with the FMP content requirements, and 50% complied with the requirements for monitoring and recording temperatures.
- Between 2018 and 2020, the fumigation sector across the province used a total of 53,038 kgs of two active ingredients; 98.7% was aluminum phosphide and the remaining 1.3% was methyl bromide.



■ NOTICE ■ ADVISORY ■ WARNING

Many of the non-compliances found were minor or administrative in nature, and these typically resulted in an advisory of non-compliance, the lowest level of enforcement response. However, a small number of inspected parties received warning letters for more serious non-compliances. This included a vendor

selling fumigants without holding a valid authorization, and a fumigator licensee failing to submit FMPs for multiple fumigation treatments. In all cases, appropriate corrective measures were communicated to each inspected party both verbally and in writing.

From the findings of this audit, the Compliance and Environmental Enforcement Team is recommending:

- That all fumigators focus on staff training to ensure that fumigant pesticide use and monitoring records are complete and in full compliance with the IPM Regulation and Fumigation License Conditions.
- That a regulatory amendment be considered that would move the License Condition requirements that currently apply to all fumigation licensees into the IPM Regulation. This would allow for consistent compliance verification, clearer enforcement responses for non-compliance, and more effective compliance promotion.
- That an amendment to the IPM Regulation be considered to enhance the storage restriction requirements for fumigants to avoid inadvertent exposure, i.e. that a storage facility of fumigants must not be attached to or within a building used for living accommodation, work areas (e.g. office buildings), and animal quarters.
- That an amendment to the IPM Regulation and/or Fumigation License Conditions be considered to require licensees to measure and record ambient moisture or humidity levels along with temperatures.

LIST OF ABBREVIATIONS USED

Acronym	Definition
ENV	<i>Ministry of Environment and Climate Change Strategy</i>
IPMA	<i>Integrated Pest Management Act</i>
IPM	<i>Integrated Pest Management</i>
PCP	<i>Pest Control Products Number</i>
FMP	<i>Fumigation Management Plan</i>

ACKNOWLEDGEMENTS

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CITATION AND FURTHER INFORMATION

This report should be cited as:

2020 Fumigation Sector: Compliance Audit Report, Integrated Pest Management Act. Regional Operations Branch, British Columbia Ministry of Environment and Climate Change Strategy.

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INTRODUCTION

BACKGROUND

The Compliance and Environmental Enforcement Team of the Ministry of Environment and Climate Change Strategy (ENV) regularly conducts audits to verify compliance within a specific sector under the *Integrated Pest Management Act* (IPMA or the Act). Audits are typically conducted through a combination of onsite inspections and reviews of submitted records and associated pesticide use data.

The fumigation sector in B.C. includes licensees who are authorized to use fumigant pesticides in ships, structures, and shipping containers. For example, the industry uses highly toxic fumigants for in-transit fumigations in ships to meet the receiving country's quarantine requirements. The safe and appropriate use of fumigants is important to protect persons who may be on board during or after a fumigation, in particular crew members, fumigation applicators, marine safety and security inspectors, and cargo handlers.

Fumigants are labelled as Restricted-Class pesticides due to their high acute inhalation toxicity to non-target animals, including humans. Regulatory oversight of the fumigation sector is important as inadvertent exposure to fumigants can cause serious injury and/or death if products are used or stored improperly. All fumigation licensees are required to comply with the requirements under the provincial IPMA and Regulation, which include Fumigation License Conditions attached to all Pesticide User Licenses with the "Fumigation" category. These additional license conditions ensure that fumigants are used and stored in a manner that is protective of human health and the environment. In addition to the ENV regulatory requirements, the fumigation sector receives regulatory oversight from WorksafeBC and multiple federal agencies, including Health Canada through the *Pest Control Products Act*, and Transport Canada through the *Canada Shipping Act*.

The ENV Compliance and Environmental Enforcement Team conducted this audit of the fumigation sector for a snapshot of compliance with all relevant requirements under the provincial IPMA and Regulation. The specific objectives of the audit were to:

- Verify compliance with the fundamental requirements of licensing, certification, fumigant pesticide storage, and fumigant use meant to protect human health and the environment
- Assess whether fumigation sector licensees are meeting the requirements of the Fumigation License Conditions, which includes the preparation and submission to the ministry of a Fumigation Management Plan for every fumigation conducted
- Determine the types and amounts of fumigant pesticides being sold and used in B.C.
- Use the results of the audit to inform future management decisions and recommendations for amendments to the legislation
- Share the ministry's work with the public

This report covers the results of inspections of fumigation licensees under the IPMA and Regulation conducted in 2020. Each inspection represents a point in time assessment of the compliance of a regulated party for multiple parameters. It is important to note that when a single non-compliance is found during an inspection, the whole inspection is deemed out of compliance, regardless of the seriousness of the violation. Many non-compliances could be minor or administrative in nature, with low or no impacts to the environment and human health.

The ENV uses a variety of compliance and enforcement tools to ensure compliance with regulatory requirements. When responding to non-compliance, ENV considers:

- a) the severity of actual or potential impact to the environment and human health,
- b) the factual circumstances of the alleged contravention, and
- c) the compliance history of the offender.

Further information on how ENV responds to non-compliances can be found in the [Compliance and Enforcement Policy and Procedure](#).

DEFINITION OF TERMS USED IN THIS REPORT

PESTICIDES AND ACTIVE INGREDIENTS

Pesticide formulations are composed of two parts: active ingredient(s) and formulants. The active ingredients in a pesticide are what control the target pest, and a pesticide may contain one or more active ingredients. Formulants may aid in the stabilization, mixing, or application of the pesticide.

FUMIGANTS

Fumigants are pesticides that are designed to act in a gaseous phase, even though they may be applied as solid or liquid formulations from which the gas arises. Various active ingredients, such as aluminum phosphide, methyl bromide and carbon dioxide are registered for fumigant use in Canada. Fumigants are only permitted to be used by certified specialists as they are highly toxic to humans and require special equipment and skills in application. All fumigation certificate holders are required to abide by specific [Certificate Conditions Regarding Use of Fumigant Pesticides](#).

FUMIGATION

Fumigation is an action or process of introducing fumigants into an area to control pests. Fumigation is performed by authorization holders who are required to follow requirements under the provincial IPMA and Regulation as well as specific [Pesticide User License Conditions for the Use of Fumigants](#) attached to all fumigation licenses. These conditions include the preparation and submission of a detailed [Fumigation Management Plan \(FMP\)](#) for each fumigation treatment.

CONTAINER FUMIGATION

Fumigation of containers is typically completed pre-shipment or at the border on arrival. Shipping containers and their contents are treated with fumigants such as methyl bromide and aluminum phosphide for bio-security reasons to eliminate the risk of pests from entering or leaving an area.

IN-TRANSIT FUMIGATION

The fumigant is introduced in the ship's cargo hold before departure (figure 1). The fumigation continues during the voyage and is not finished until the ventilation and removal of residues is completed, which is normally at the first discharge port.



Figure 1. Cargo ship berthed at Vancouver Anchorage was subjected to an in-transit fumigation

METHODS

FUMIGATION SECTOR INSPECTIONS

A total of 16 inspections were conducted for this audit; 15 inspections occurred in the Lower Mainland and one inspection in the Okanagan (figure 2). In B.C. in 2020, there were two licensees who held fumigation licenses and were actively operating at the time of audit. Four licensees were “non-active fumigators” who held licenses or certificates but were not involved in fumigations at the time of this audit and had not conducted any fumigations in the previous several years. There was one pesticide vendor supplying fumigants to the active fumigation licensees in 2020.



Figure 2. Geographical distribution of B.C. regions

The inspections primarily focused on the following regulatory requirements:

- Pesticide user license requirement (*IPMA Section 4 and IPMR Section 44*)
- Pesticide applicator certification requirement (*IPMR Section 50*)
- Pesticide annual use summary requirements (*IPMR Section 39*)
 - Summary submission by due date
 - Summary content
- Pesticide storage requirements (*IPMR Sections 33, 65 & 66*)
 - Pesticide containers and labels
 - Storage facility
- Treatment notification requirements (*IPMR Sections 10, 62 & 83*)
 - Notification/ protocols of restricting access to the fumigated area
 - Notice content
- Fumigation requirements (*IPMR Sections 71(1), 82(1) & 35(5)*)
 - Pre-fumigation site inspection
 - Post-fumigation gas monitoring
 - Fumigation monitoring records
- Pesticide use record-keeping requirements (*IPMR Section 35 (1)*)
 - Client’s name and address/site of the pesticide use
 - Applicator’s name and certificate number
 - Date and time of the pesticide use
 - Target pest or purpose of the pesticide use

- Trade name of each pesticide used and its registration number under the federal Act
- Application method, rate of application and the total quantity of each pesticide used
- Pest monitoring methods and injury thresholds used to fulfill the IPM requirements
- Prevailing meteorological conditions, if applicable
- Precautionary advice given to the client (e.g. safe re-entry time)
- Fumigation license conditions (1.1, 1.2, 8, 9 & 14)
 - Fumigation Management Plan (FMP) content
 - FMP submission date
 - Fumigant gas detection devices and proficiency
 - Monitoring and recording temperatures (commodity and ambient air)

Each inspection of the active fumigators, non-active fumigators and the vendors included compliance verification with the fundamental requirements of licensing, certification, and annual pesticide use and/or sale summary reports.

In addition, the licensees actively conducting fumigations received both onsite and records review inspections. Two types of onsite inspections were conducted: vessel pre-fumigation inspections (figure 3) and fumigant storage facility inspections.

- The vessels were inspected for in-depth compliance verification of licensees' pre-fumigation procedures for developing their FMP, determining vessel's suitability for an in-transit fumigation, safety protocols in place to restrict access for the ship's crew to the fumigated spaces, fumigation methods and the use of relevant fumigation application equipment, procedures for monitoring fumigant concentrations in the fumigated cargos, procedures for detection and monitoring of potential gas leaks in the non-fumigated areas (e.g. ship's accommodations, deck space, engine room, control room, etc.), and the fumigation staff's proficiency in the calibration and use of gas detection devices.
- The storage site inspections focused on compliance verification of the licensees' fumigant storage facility.
- For records review inspections, three recent in-transit vessel fumigation treatments for each active licensee were inspected. The submitted records were reviewed for compliance verification with the fundamental requirements of licensing, certification, and pesticide use records, as well as in-depth assessments of pre-fumigation checklists, FMPs, and post-fumigation monitoring requirements under the IPM Regulation and Fumigation License Conditions.

For all onsite inspections, inspectors followed COVID-19 requirements and guidance of the ENV, Provincial Health Officer and Federal Government. Prior to travel for any site



For all onsite inspections, IPM Officers adhered to the ENV, Provincial Health Services Authority and Federal Government's coronavirus (COVID-19) safety protocols.

inspection, inspectors completed the mandatory pandemic awareness training and completed a pre-inspection checklist. Specifically, the inspectors:

- contacted the site manager to schedule the inspection in advance and asked if there were any confirmed COVID-19 cases or exposures at the site,
- followed any additional screening criteria that were in place at the site upon arrival,
- wore mask and gloves, and maintained physical distancing aligned with current guidance (2 m between people) during the inspection, and
- maintained high levels of personal hygiene at all times, especially after contacting commonly touched surfaces.

Upon completion of the compliance inspections, licensees were issued an inspection report using the ministry's Natural Resource Inspection System (NRIS), a provincially standardized database to house and capture inspection records. In each inspection report, the inspector detailed the requirement measured, findings and assessment of whether the licensee was in or out of compliance with the requirement. If a non-compliance was noted, the report outlined actions to be taken to correct the non-compliance. All inspection reports are available in the [Natural Resource Compliance & Enforcement Database](#).

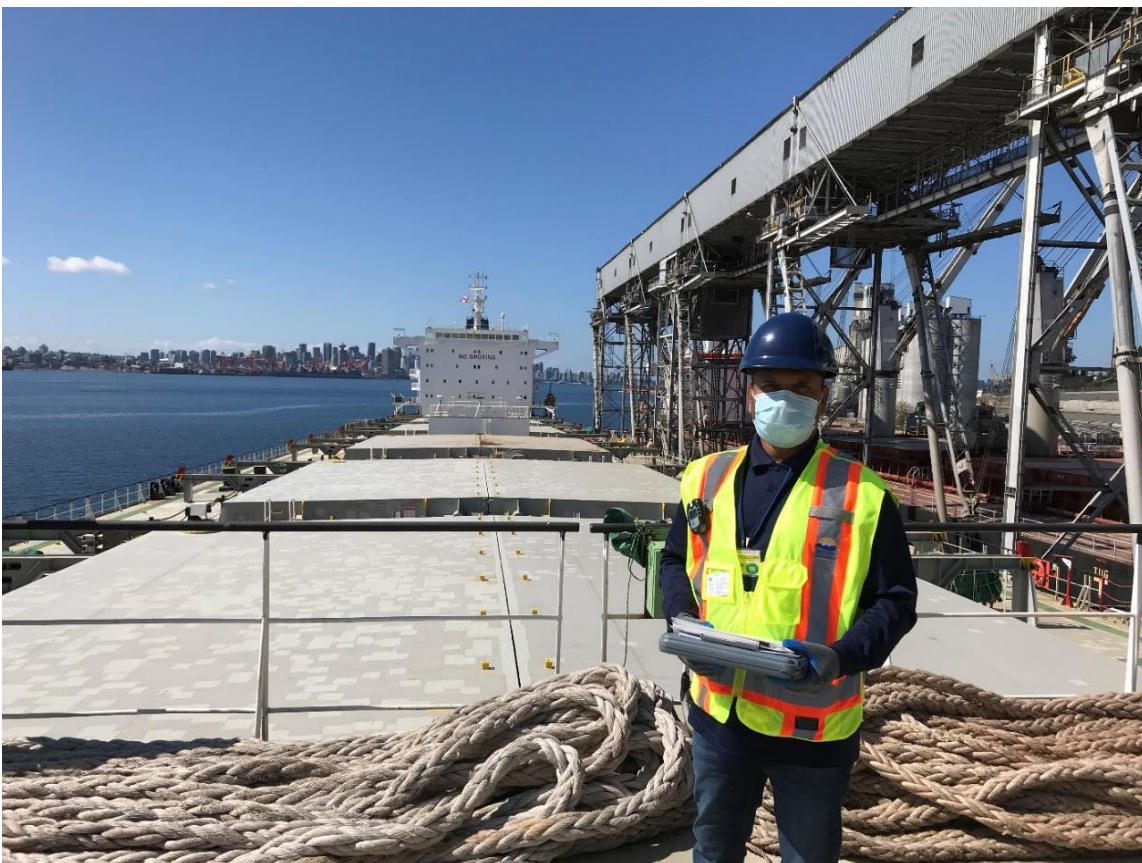


Figure 3. Ministry inspector conducting pre-fumigation inspection on a vessel

Inspections consisted of evaluating whether the authorization holder was compliant with IPMA requirements and their license conditions on a section-by-section basis. Compliance findings for each section and condition were one of four outcomes:

In	ENV determined that the authorization holder is in compliance with the regulatory requirement at the time of the inspection
Out	ENV determined that the authorization holder is out of compliance with the regulatory requirement at the time of the inspection
Not determined	There was not enough information for ENV to determine whether the authorization holder is in compliance with the regulatory requirement at the time of the inspection
Not applicable	Compliance with the regulatory requirement did not apply to the authorization holder at the time of the inspection

ENV determined the appropriate administrative response based on the compliance verification findings of the inspection using the non-compliance decision matrix contained in ENV’s Compliance and Enforcement Policy and Procedure. A detailed description of some common administrative responses is included below:

Notice	A notice of compliance is a written confirmation that ENV determined that the authorization holder is in compliance with all of the regulatory requirements evaluated at the time of the inspection
Advisory	An advisory notifies the non-compliant party in writing that they are not in compliance with a specific regulatory requirement and often recommends a course of action that is expected to achieve compliance. An advisory is often the first enforcement response taken in cases of minor to moderate non-compliance when there is a high likelihood of achieving compliance.
Warning	Similar to an advisory, a warning notifies the non-compliant party in writing that they are not in compliance with a specific regulatory requirement; however, the warning differs from an advisory in that it warns of the possibility of an escalating response should non-compliance continue. Warnings are generally used when it is determined that an exchange of information alone would not be sufficient in achieving compliance.

The response of a notice of compliance is only issued if none of the assessed sections are found to be out of compliance. If a single non-compliance was found during an inspection, the minimum compliance response is an advisory, regardless of how many sections were in compliance or how minor the non-compliance was.

Both advisories and warnings serve as a formal record of the alleged non-compliance and form an important element of the compliance history of the party in question. Other responses such as orders, administrative monetary penalties, etc., within ENV's enforcement toolkit can be found in ENV's [Compliance and Enforcement Policy and Procedure](#).

The results of each inspection, along with the administrative responses, were summarized in an inspection record, a copy of which was provided to the authorization holder.

DATA ANALYSIS FOR FUMIGANT SALES AND USE BY THE INDUSTRY

To complement the inspection results, ministry staff compiled and analysed the annual fumigant use data reported by fumigation licensees for the three calendar years of 2018, 2019 and 2020. Under section 39 of the IPM Regulation, an annual summary of pesticide use is required to be submitted to the ministry by all licensed pesticide users by January 31st for the previous calendar year. For each pesticide used, licensees are required to report the product name, the active ingredient(s), the federal *Pest Control Products Act* registration number (PCP number), and the total quantity of product used in kilograms.

Fumigation licensees were asked to provide information on where they purchased their fumigants, and the vendors identified were then requested to provide annual sales data for the three calendar years of 2018, 2019 and 2020. As an additional layer of verification, annual sales records of 15 major pesticide vendors who sold a variety of non-excluded commercial- or restricted-class pesticides in B.C. were reviewed for any fumigant sales in the calendar years of 2018 and 2019. Under section 34 of the IPM Regulation, an annual summary of pesticide sales is required to be submitted to the ministry by all licensed pesticide vendors by April 1st for the previous calendar year. For each non-excluded commercial- or restricted-class product sold, the vendor lists the product name, the active ingredient, the PCP number, and the total amount of the product sold, in litres or kilograms, over the previous calendar year.

This audit report summarizes the annual sales and use data for 2018, 2019 and 2020 for the total quantities of the fumigants reported by the fumigation sector.

RESULTS

NUMBER OF INSPECTIONS

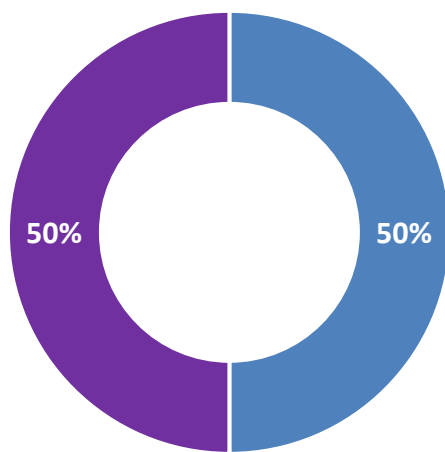
The audit comprised a total of 16 inspections: 11 inspections (onsite and records review) of the two active fumigators, four non-active fumigator inspections (records review), and one vendor inspection (records review). See Appendix A for the list of inspected parties.

COMPLIANCE OUTCOMES

COMPLIANCE RATE AND REGULATORY RESPONSES

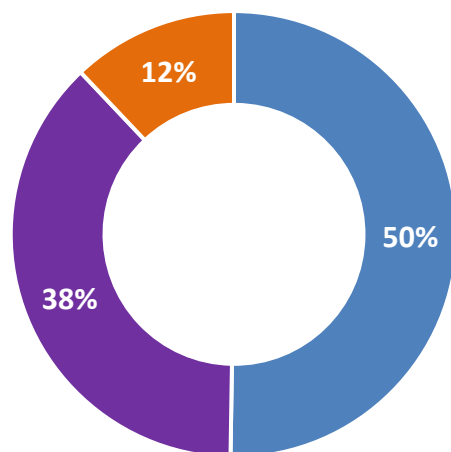
Of the 16 fumigation audit inspections, eight were found to be fully in compliance and eight were out of compliance with at least one aspect of the Regulation (figure 4a).

Fumigation companies compliant with the Regulation were issued a notice of compliance, whereas non-compliant companies were issued either an advisory or warning in accordance with the ministry's Compliance & Enforcement Decision Matrix. Overall, the audit resulted in eight notices (50%), six advisories (38%), and two warnings (12%) (figure 4b). The non-compliant parties in receipt of warning letters included a vendor selling fumigants without holding a valid authorization and a fumigator licensee failing to submit FMPs for multiple fumigation treatments.



■ IN ■ OUT

Figure 4a. Compliance summary of inspected fumigation licensees



■ NOTICE ■ ADVISORY ■ WARNING

Figure 4b. Compliance response of inspected fumigation licensees

COMPLIANCE RESULTS FOR FUMIGANT STORAGE AND FUMIGANT USE NOTICE

The compliance results for fumigant storage and fumigant use notice requirements are presented in figure 5.

For fumigant storage, both inspected fumigators complied with the requirements assessed under sections 33, 65 and 66 of the Regulation (figure 5). Fumigant pesticides were stored in their original containers and their labels displayed the appropriate information. Fumigants were stored in shipping containers that were not attached to nor within a building used for living accommodation. The storage containers were locked, signed, and actively vented to the outside (figure 6).

For fumigant use notification, both of the inspected fumigators complied with the requirements assessed under sections 10 and 82 of the Regulation, i.e. posting notification and restricting access to the fumigated areas (figure 5). For fumigation notice content, 50% (1 out of 2) of the inspected fumigators complied with the requirements assessed under section 63 of the Regulation (figure 5). The non-compliant treatment notice was missing the licence number of the fumigation company.

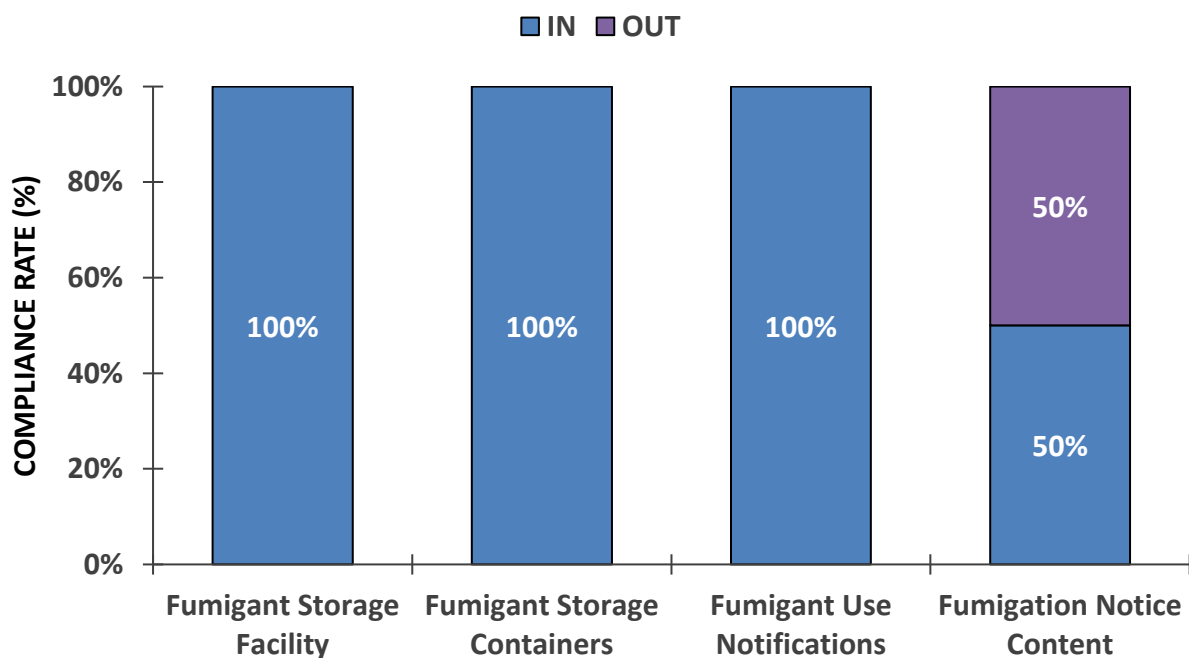


Figure 5. Compliance results of inspected fumigant pesticide users for storage and treatment notice requirements under the IPMR (sections 10, 63, 65, 66, and 82)

Figure 6.

Top: Ministry inspector conducting inspection of a fumigant storage facility

Bottom: Cases of fumigant, Weevil-cide stored in original containers



COMPLIANCE RESULTS FOR PRE-FUMIGATION AND POST-FUMIGATION REQUIREMENTS

The compliance results for pre-fumigation and post-fumigation requirements are presented in figure 7.

For pre-fumigation site inspections, all inspections (8 out of 8) were found compliant with the requirements assessed under section 71(1) of the Regulation. Both onsite vessel inspections and records review indicated that licensees perform extensive pre-fumigation inspections to determine vessel suitability for fumigation and to ensure that the applicable regulatory requirements and standards are met in carrying out the in-transit fumigant use. This included, but was not limited to, verifying integrity of seals of manholes, hatches, vents, drains, cargo hold covers, duct tunnel access points, cable pipe passages, deck storages, crane towers, water drains in each cargo hold, and CO2 lines, etc. prior to completion of loading (figure 8). They also explained their gas-tight sealing procedures in case any deficiencies are observed during their pre-fumigation inspections.

For post-fumigation gas monitoring, 50% of the fumigator inspections (3 out of 6) complied with the requirements assessed under section 82(1) of the Regulation. In-depth records review of the six recent in-transit vessel fumigations indicated that the non-compliant fumigator failed to monitor and document gas concentrations in the fumigated holds but did document gas levels in the adjacent non-fumigated spaces.

For fumigant pesticide use record-keeping, 33% of the fumigator inspections (2 out of 6) complied with the requirements assessed under section 35(1) of the Regulation. The most common non-compliances under record keeping requirements included: missing time when fumigation took place, and recording incorrect PCP number of the fumigant used.

For post-fumigation gas record keeping, all the fumigator inspections (6 out of 6) complied with the requirements assessed under section 35(5) of the Regulation.

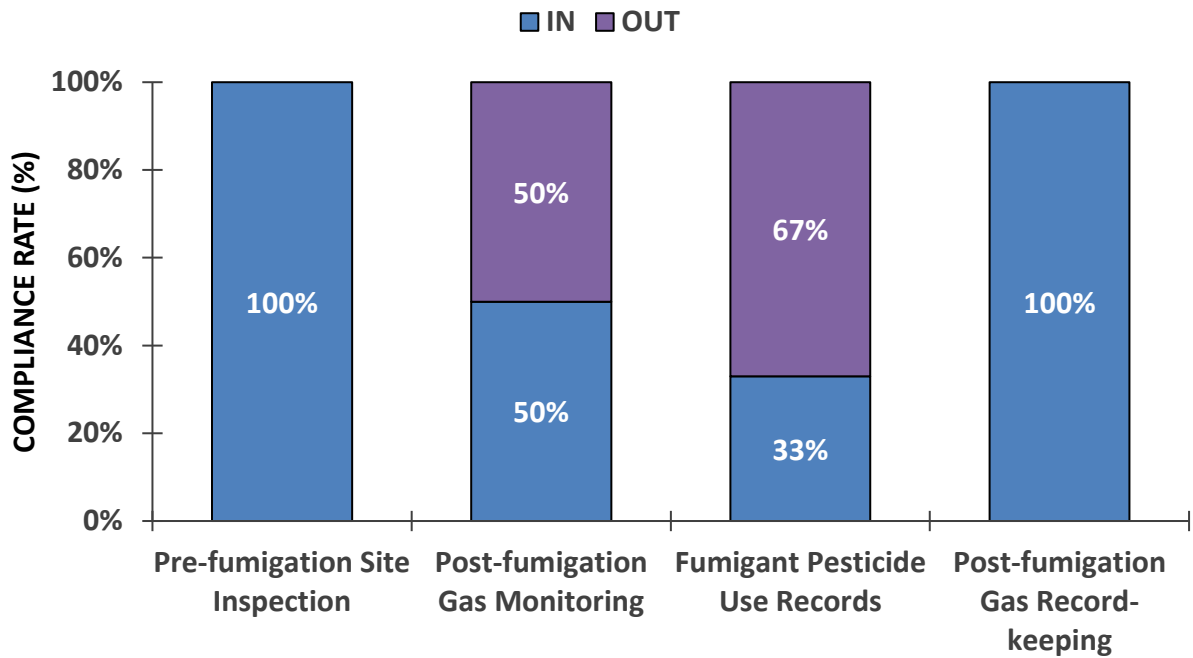
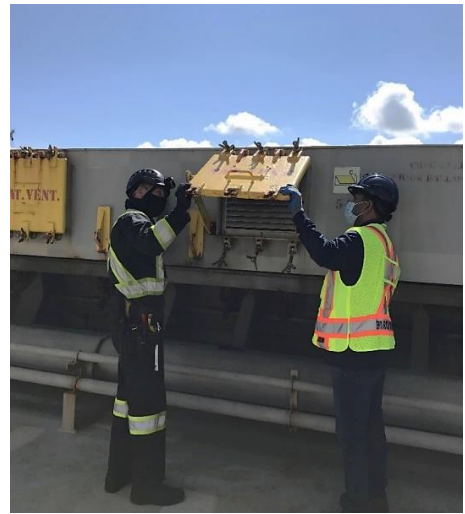
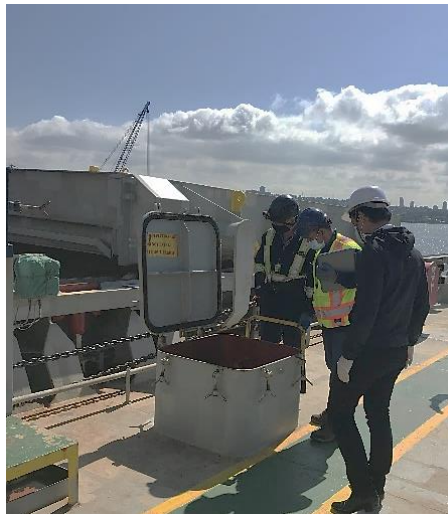


Figure 7. Compliance rate of inspected fumigant pesticide users with pre-fumigation inspection, post-fumigation gas monitoring and record-keeping for fumigant use and gas monitoring requirements under the IPMA and Regulation (sections 71(1), 82(1), 35(1) and 35(5))

Figure 8. Examples of pre-fumigation inspection procedures to check vessel suitability for in-transit fumigation:

Left: Seals of manholes or access points

Right: Seals of natural air vents



COMPLIANCE RESULTS FOR FUMIGATION LICENSE CONDITIONS REQUIREMENTS

The compliance results for fumigation license conditions requirements are presented in figure 9.

For FMP content, 33% of the fumigator inspections (2 out of 6) complied with the requirements assessed under Fumigation License Condition 1.1. The most common non-compliance was failure to include the names of the people authorized by the licensee to be involved with any phase of the fumigation and their duties.

For FMP submission date, 86% of the fumigator inspections (6 out of 7) complied with the requirements assessed under Fumigation License Condition 1.2. An authorization holder failed to submit FMPs for several fumigation treatments by the required timeframe of at least 24 hours prior to the proposed fumigation.

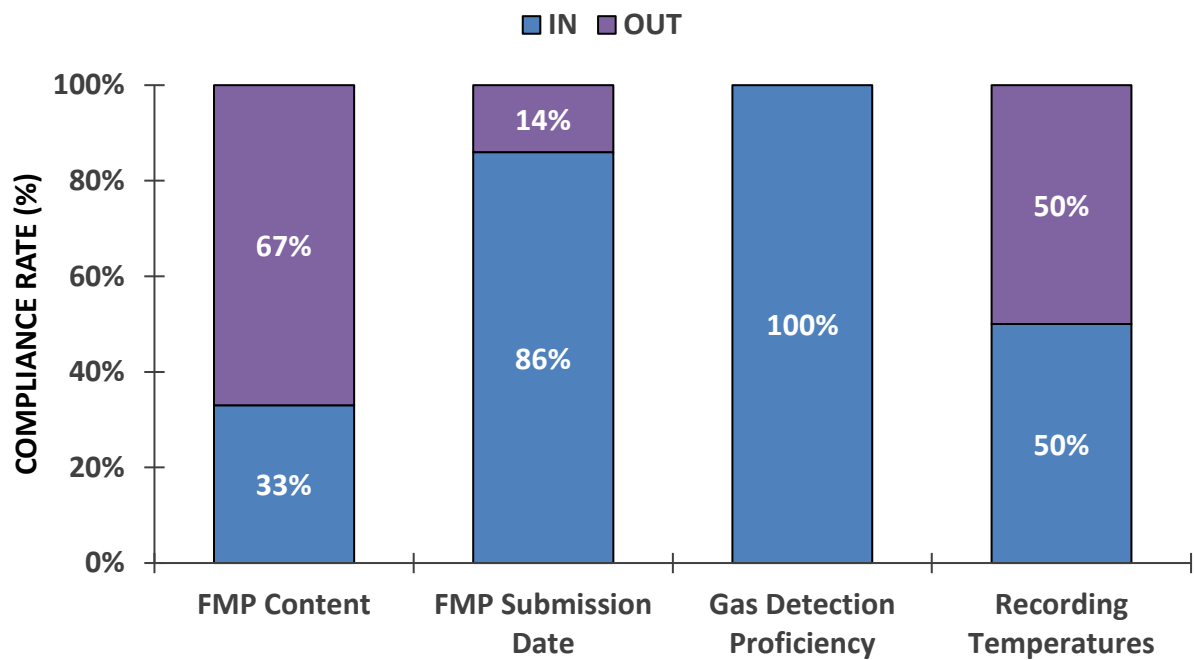


Figure 9. Compliance rate of inspected fumigant pesticide users with Fumigation License Conditions requirements (1.1, 1.2, 8, 9 and 14)

For fumigation gas detection proficiency, all the fumigator inspections (8 out of 8) were determined to be in full compliance with the requirements assessed under Fumigation License Conditions 8 and 9. These conditions require the licensees to provide, upon request by an inspector, evidence of possession of all monitoring equipment necessary to perform fumigations safely and effectively, and their ability to use, calibrate and maintain fumigant gas monitoring and detection devices. The audit inspections found that various types of devices are used for detection and monitoring of fumigant gas levels (figure 10).

For monitoring and recording temperatures, 50% of the fumigator inspections (3 out of 6) complied with the requirements assessed under Fumigation License Condition 14, which require licensee to accurately measure and record the temperature in representative portions of the commodity being treated as well as the ambient temperature. Temperatures are to be taken immediately before and during treatment as necessary to ensure efficacy and compliance with fumigant labels. Records review of the three recent in-transit vessel fumigations for each licensee indicated that the non-compliant fumigator failed to document the commodity temperature but did document the ambient air temperatures.



Figure 10. Example of gas detection and monitoring devices used in fumigations

ANNUAL SALES AND USE OF FUMIGANTS IN THE SECTOR

ANNUAL SALES OF FUMIGANT PESTICIDES IN THE PROVINCE

Analysis of the submitted annual sales summaries indicated that the sector as a whole sold a total of 9,193 kgs, 6,607 kgs and 2,873 kgs of aluminum phosphide in 2018, 2019 and 2020 respectively (figure 11).

Analysis of the submitted annual sales summaries indicated that the sector as a whole sold a total of 680 kgs of methyl bromide in 2019 but no methyl bromide was sold in 2018 and 2020 (figure 12). The photos in Figure 13 show these two fumigants in storage.

Figure 11. Total amounts (kgs) of aluminum phosphide active ingredient sold annually reported for 2018, 2019 and 2020

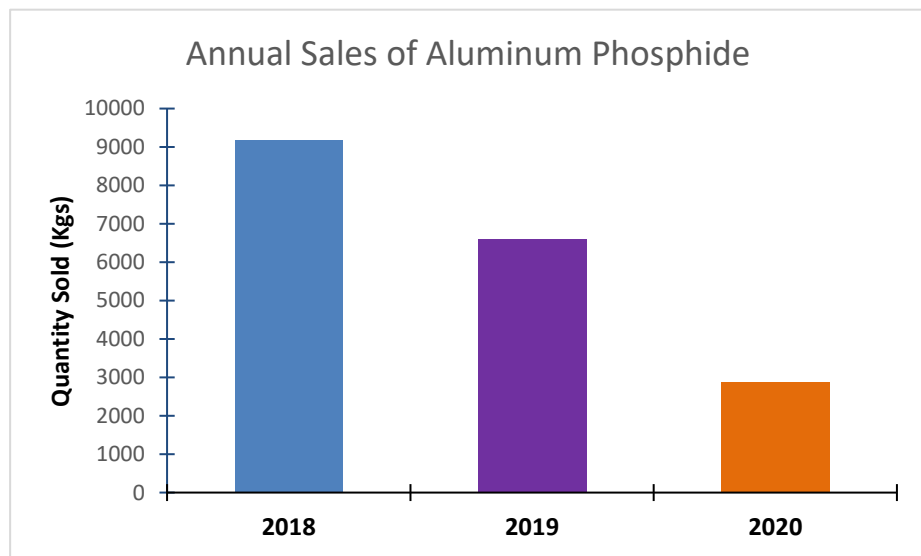


Figure 12. Total amounts (kgs) of methyl bromide active ingredient sold annually reported for 2018, 2019 and 2020

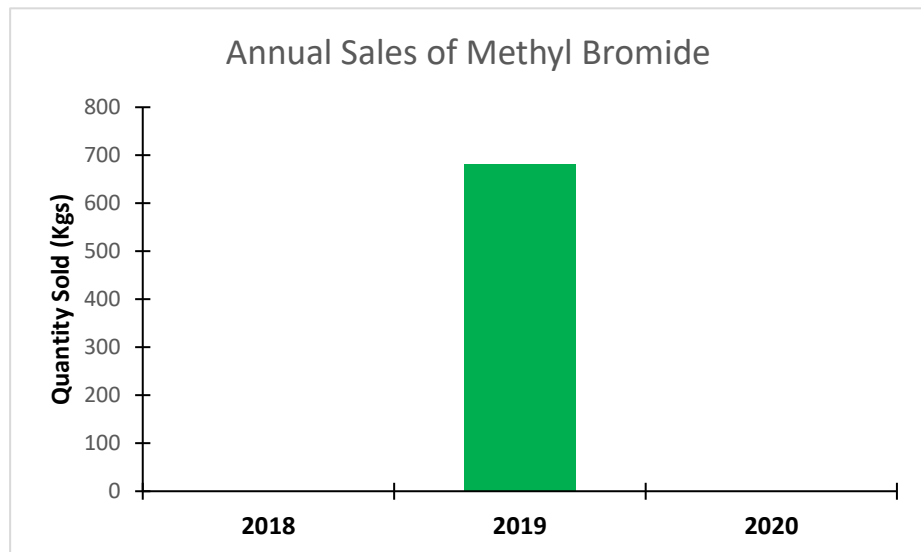
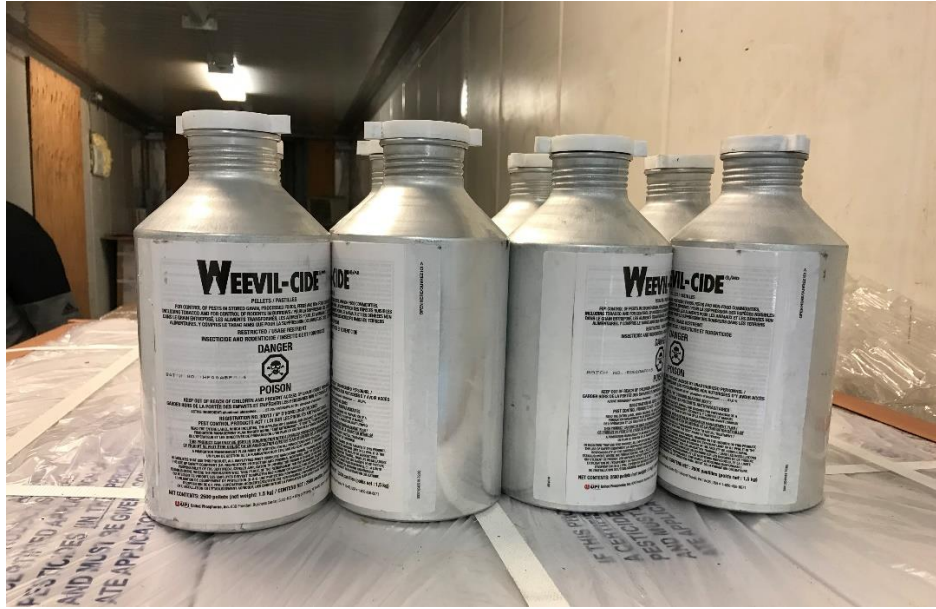


Figure 13.
Examples of two fumigants primarily sold and used in the provincial fumigation industry.

Top: Aluminum phosphide

Bottom: Methyl bromide



ANNUAL USE OF FUMIGANT PESTICIDES IN THE PROVINCE

Analysis of the annual use summaries submitted by active fumigator licensees in the province indicated that the sector as a whole used a total of 18,339 kgs, 18,392 kgs and 15,623 kgs of aluminum phosphide in 2018, 2019 and 2020 respectively (figure 14).

Analysis of the annual use summaries submitted by active fumigator licensees across the province indicated that the sector as a whole used a total of 400 kgs, 91 kgs and 193 kgs of methyl bromide in 2018, 2019 and 2020 respectively (figure 15).

Figure 14. Total amounts (kgs) of aluminum phosphide active ingredient used annually reported for 2018, 2019 and 2020

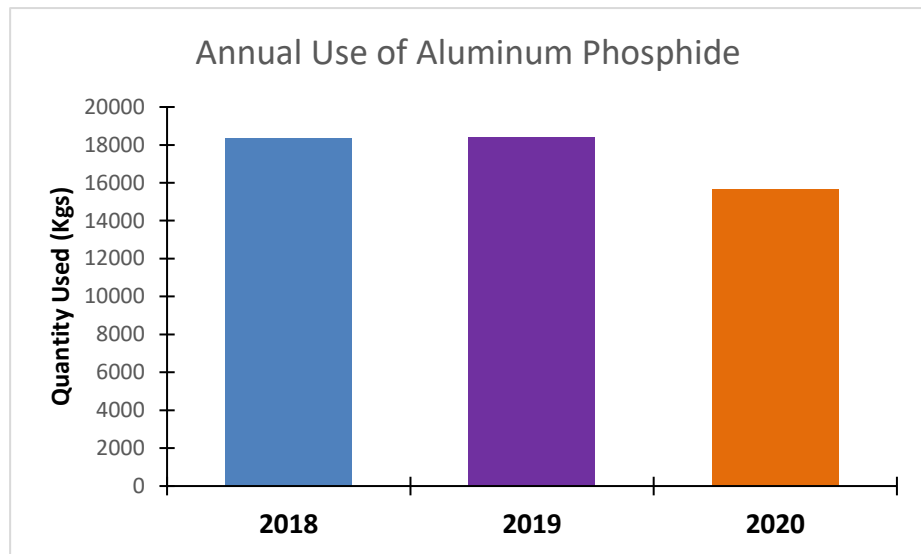
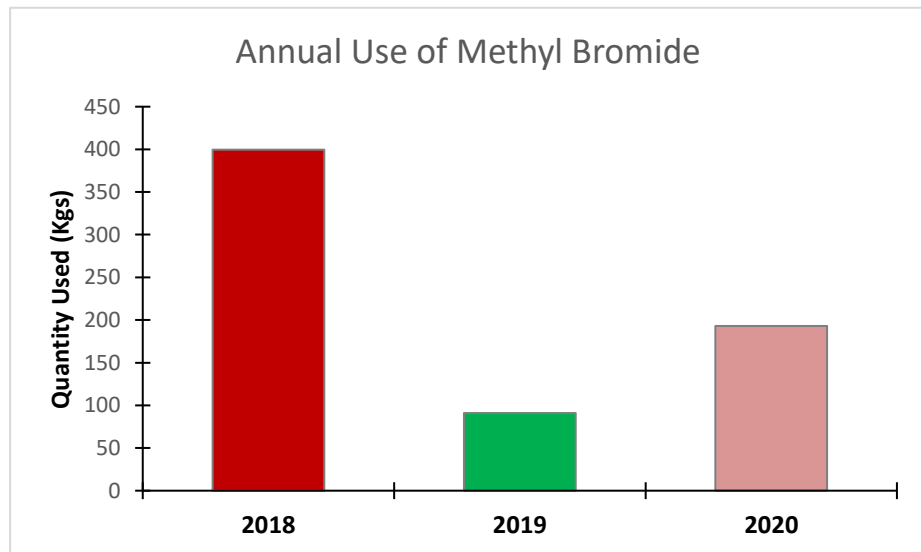


Figure 15. Total amounts (kgs) of methyl bromide active ingredient used annually reported for 2018, 2019 and 2020



DISCUSSION

COMPLIANCE WITH IPMA AND REGULATIONS

The overall compliance rate of the fumigation licensees inspected was moderate, as 50% of inspections conducted were fully compliant with the IPMA and Regulation. However, the majority of the non-compliances were minor or administrative in nature, with low potential risk to human health and the environment. These inspections resulted in an advisory, the lowest level of enforcement response.

A small number of inspections resulted in warning letters for non-compliances that included a vendor selling fumigants without holding a valid authorization and a fumigator licensee failing to submit FMPs for multiple fumigation treatments in 2020. The non-compliant parties in receipt of warning letters responded with the corrective measures to address non-compliances. For example, the non-compliant vendor applied for a Pesticide Vendor License to sell Commercial and Restricted pesticides in B.C. subsequent to the receipt of the official warning.

The inspected fumigators demonstrated proficiency in the use of fumigation equipment and gas detection devices. The audit inspections indicated that the fumigation sector in the province has rigorous safety protocols in place. For example, audit inspections found that fumigation licensees instruct the ship's master, officers and crew of the procedures and hazards related to the fumigation. The instructions provided to the master and/or chief officers include, but is not limited to: "Notice to Captain" requiring posting of gangway watchman during fumigation to restrict access by unprotected individuals to the treatment area (besides posting Warning Placards required under section 10(9)), mandatory safety meeting for in-transit fumigation, safety protocol and evacuation plan, symptoms of exposure, first aid procedures, material safety data sheet (MSDS), fumigant label/manufacturer's instructions, and instructions for aeration of the holds at the discharge port. The ship's crew is also instructed in the use of the safety equipment (i.e., respiratory protection and personal monitors) which is kept on board during the voyage.

Fumigant pesticides used by the industry in B.C. are Restricted-Class products due to their high acute inhalation toxicity to non-target animals, including mammals and birds. Under section 66(3) of IPM Regulation, a storage facility of fumigants must not be attached to or within a building used for living accommodation. The Regulation, however, does not contain any restrictions on the storage of fumigants away from normal work areas for humans (e.g. office buildings). Although this audit did not find any non-compliances concerning fumigants storage, it is recommended that the Regulation be amended to list full storage restrictions to further minimize any risk of inadvertent exposure.

Fumigation License Condition 14 requires licensees to measure and record temperature in representative portions of the commodity and ambient air before and during treatment. The records review of the three recent in-transit vessel fumigations for each licensee indicated that the non-compliant fumigator failed to document the commodity temperature. It is important to note that, in

addition to temperature, the humidity conditions must be favourable for safe and effective fumigation. For example, upon exposure to air, aluminum phosphide pellets react with atmospheric moisture to produce fumigant gas (hydrogen phosphide or phosphine), and at lower ambient temperatures and relative humidity levels, gas may require extended exposure to be fully active/effective. The IPM Regulation and Fumigation License Conditions do not require licensees to measure and record ambient moisture or humidity levels. It is recommended that the Regulation and/or License Conditions be amended requiring licensees to measure and record ambient moisture or humidity levels along with temperatures.

Fumigation License Conditions have been attached to all fumigation licenses in recent years to ensure safety standards for the protection of human health and the environment that go above and beyond the current standards in the Regulation. This audit confirmed that these additional license conditions are an effective tool for protection of human health and safety, and therefore it is recommended that the License Conditions be moved into the Regulation to ensure consistent compliance verifications and enhanced enforcement responses. Further, the Fumigation License Conditions duplicate several requirements from the Regulation, and therefore including these requirements in the Regulation would remove any duplication and streamline requirements. This should also allow ENV to promote compliance more effectively, as all the requirements being part of the Regulation will be clearly applicable to all users in the fumigation sector.

FUMIGANT USE AND SALES IN THE FUMIGATION SECTOR

Analysis of the annual use summaries for recent three years (2018-2020) submitted by the licenced fumigant users across the province indicated that a total of 53,038 kgs of two active ingredients was used, of which 98.7% was aluminum phosphide and the remaining 1.3% was methyl bromide. Aluminum phosphide was the most-used active ingredient from two fumigant products (WEEVIL-CIDE Pellets, PCP 30013 and WEEVIL-CIDE Tablets, PCP 29455) used in B.C. for in-transit fumigations to fulfil the receiving country's quarantine requirements. From the findings of this audit, WEEVIL-CIDE Pellets (figure 16) is the primary fumigant pesticide used by the industry. Annual use of aluminum phosphide was similar in 2018 and 2019 but declined in 2020.



Figure 16. Case of WEEVIL-CIDE Pellets (PCP 30013)

The fumigation sector uses methyl bromide (Meth-O-Gas, PCP 9564) for the fumigation of shipping containers to meet the quarantine requirements of the select destination country, such as Australia. Annual use of methyl bromide was higher in 2018 compared with 2019 and 2020.

The submitted annual sales data for recent three years (2018-2020) indicated that a total of 19,354 kgs of two active ingredients was sold, of which 96.5% was aluminum phosphide and the remaining 3.5% was methyl bromide. The difference between the sale and use data points likely relates to the fact that fumigators used their existing stocks of fumigants purchased in the years prior to 2018.

RECOMMENDATIONS AND NEXT STEPS

From the results of this audit, the ENV Compliance and Environmental Enforcement Team is recommending the following:

- That all fumigators focus on staff training to ensure that fumigant pesticide use and monitoring records are complete and in full compliance with the Regulation and Fumigation License Conditions.
- That an amendment to the IPM Regulation be considered to list full storage restrictions to avoid inadvertent exposure, i.e. that a storage facility of fumigants must not be attached to or within a building used for living accommodation, work areas (e.g. office buildings), and animal quarters.
- That an amendment to the IPM Regulation and/or Fumigation License Conditions be considered requiring licensees to measure and record ambient moisture or humidity levels along with temperatures.
- That an amendment to the IPM Regulation be considered to move the Fumigation License Conditions into the Regulation.
- That ministry inspectors continue to conduct compliance inspections of licensed fumigant users and ensure that all the regulatory requirements are being followed. It is expected that future inspections of the fumigation sector should result in higher compliance rates, as this audit has promoted awareness of the regulatory requirements under the Regulation.

APPENDICES

Appendix A: List of inspected parties. Note that the two active fumigation companies, SGS Canada Inc. and Universal Fumigation Services Ltd., each received multiple inspections (e.g. Fumigation Management Plan Office Review, Fumigant Use Records Office Review, Onsite Inspection – Vessel fumigation, Onsite Inspection – Storage facility).

Inspected Party	License number	Inspection Type
Abell Pest Control	803	Records Review
Knutt Pest	25898	Records Review
Cargill Ltd.	15062	Records Review
Rogers Foods	License not required– private facility fumigation certificate holders	Records Review
SGS Canada Inc.	7761	Onsite – Storage Facility Onsite – Vessel Fumigation Records Review
Universal Fumigation Services Ltd.	6367	Onsite – Storage Facility Onsite – Vessel Fumigation Records Review
United Phosphorous Ltd.	Unauthorized	Records Review