



VESSEL FUMIGATION RISK MANAGEMENT & MITIGATION

2024 DBTG OPERATIONAL & TECHNICAL CONFERENCE

LONDON



Introduction

Fumigant Overview

Ignition Risk Discussion

Respiratory Risk Discussion

Summary and Questions

NAEGA Values

The NAEGA Mission:

To promote and sustain the reliability of commercial exports.

How do we do this? NAEGA acts globally, promoting policies and practices that support the commercial international trade in grains, oilseeds, and their derived products.

Our Guiding Principles

Our guiding principles shape our culture and define the character of our organization.

- 1 NAEGA is the global leader in shaping commercial solutions rooted in contractual expertise, commercial knowledge and industry innovation.
- 2 NAEGA values trade facilitative information exchanges to identify and secure achievable precompetitive market solutions.
- 3 NAEGA maintains a steadfast commitment to outcomes that are risk proportionate and science based.



Introduction to NAEGA

- Contractual expertise
- Arbitration
- Focus for 2025
- contract education
- Trade policy (GMO)

WHO IS DEGESCH



Care. Protection. Quality.



- Strategically located near all bulk grain exporting facilities on the Atlantic, Pacific and Gulf coasts
- Applicators Licensed in 25+ States and Canada

Affiliated Organizations



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- Only Phosphine fumigant Registrant, Manufacturer and Application Company in the USA
- First GAFTA Approved Fumigator in the USA
- Only USA member of the International Maritime Fumigation Organization
- Actively involved with NAMA, NGFA, NAEGA, GEAPS, and others





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YOUR GLOBAL PARTNER

We protect your commodities anywhere, anytime!



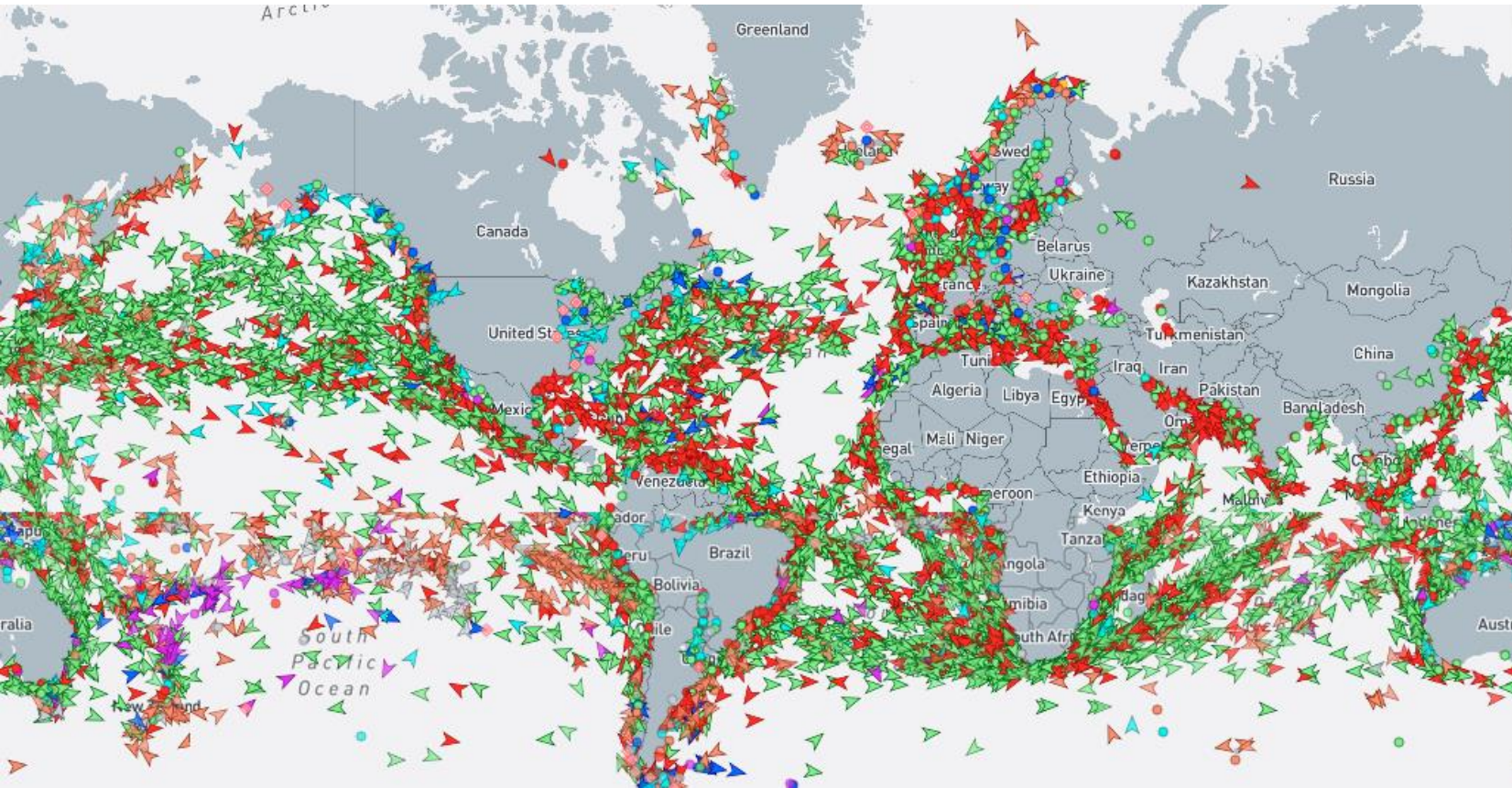
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Vessel Traffic – 01 November 2024



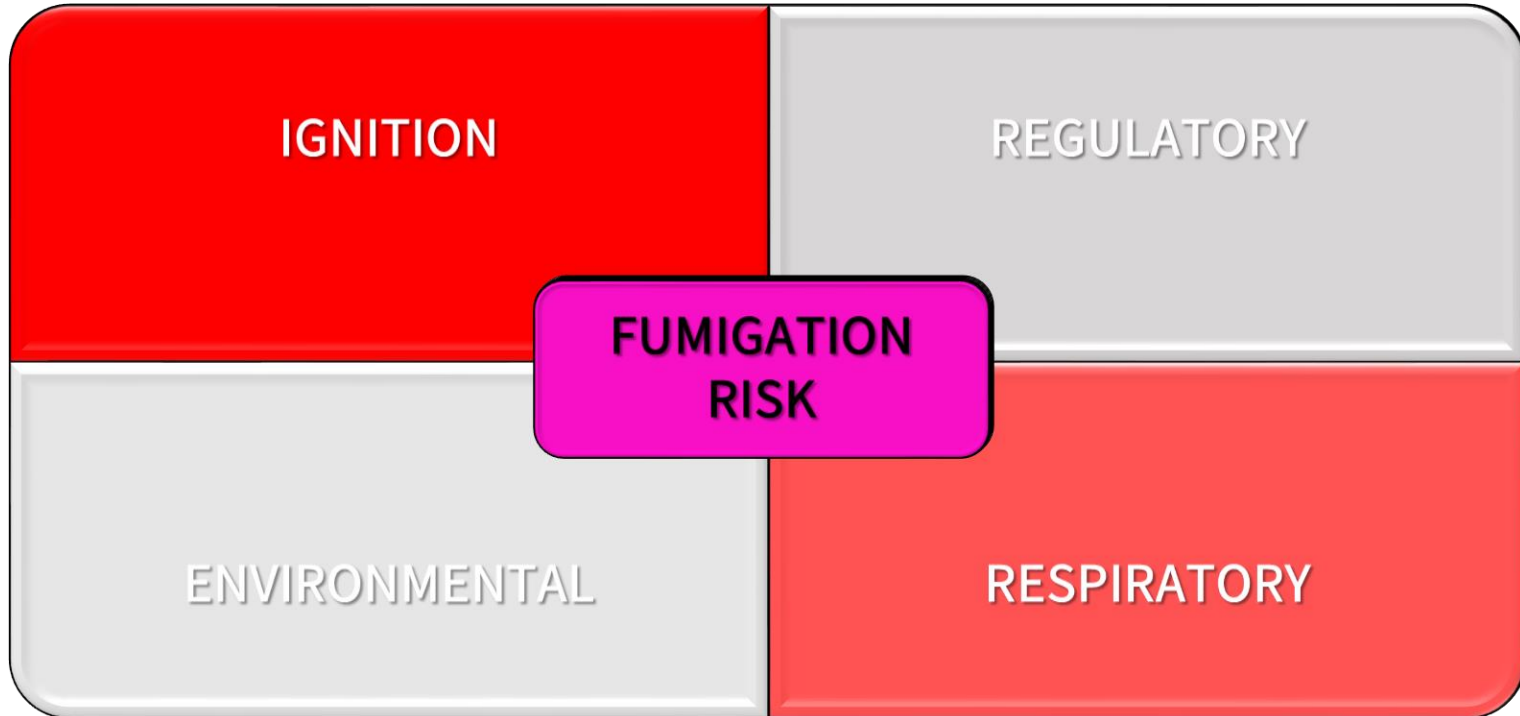
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RISK PROFILE



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ALUMINUM PHOSPHIDE



- Reacts With Ambient Humidity (Water/Moisture In Air)
- Produces **Aluminum Hydroxide** And Phosphine Gas
- Time, Temperature, Humidity
- LEL and How to Get There
- Give It “Air”/ Do Not Confine



IGNITION RISK

DO NOT OVERREACT (the fumigant)

3 Paths to Ignition

- Moisture
- Confining
- Overdosing
- All 3 Paths Lead to the LEL



IGNITION RISK



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REAL WORLD SCENARIOS

- Fumigation of Wet Grain or In Adverse Weather
- Improper Usage or Disposal of Sleeves (Dust Retention)
- Abnormally High Dosages or Dosage Errors

DOSAGE DISCUSSION



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- Issues With Higher Dosages
- Safety And Overuse
- Recirculation Required For 2g And Above
- What it means to this group? Vet your fumigator!

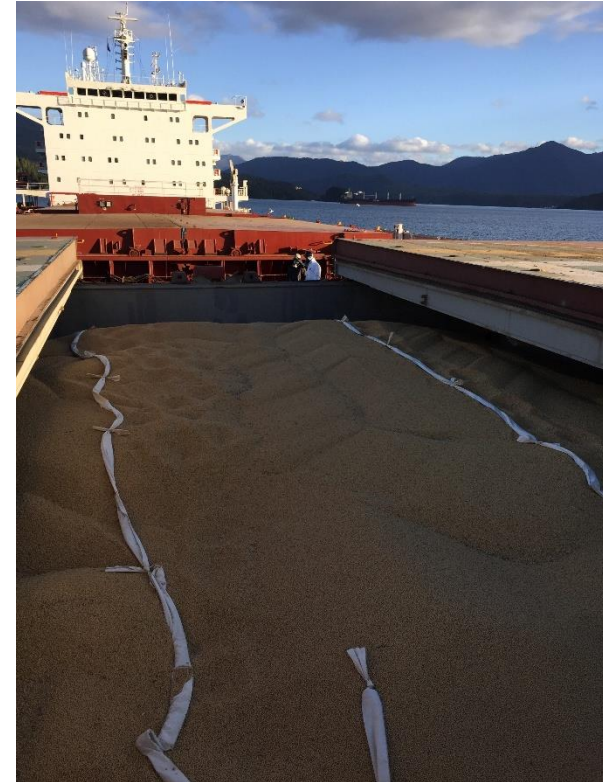


SLEEVE DISCUSSION



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- Place Fumigant (Packaged In Fumisleeves® To Retain Residual Dust)
- PH3 Reaction in Sleeve
- Brief discussion on hazards
- 2 Issues For Discussion
 - Usage for Short Voyage
 - Removals



SLEEVE DISCUSSION



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SHORT VOYAGE

- NOT INTENDED FOR REMOVAL OF UNREACTED FUMIGANT!!!!
- Oh Let Me Count The Reasons Why, NOT
- Solutions – Magnesium, Prepacs, CYL

<u>Temperature</u>	<u>Minimum Exposure Periods for FUMITOXIN®</u>	
	<u>Pellets</u>	<u>Tablets</u>
40° F (5° C)	Do not fumigate	Do not fumigate
41° -53° F (5-12° C)	8 days (192 hours)	10 days (240 hours)
54° -59° F (12-15° C)	4 days (96 hours)	5 days (120 hours)
60° -68° F (16-20° C)	3 days (72 hours)	4 days (96 hours)
above 68° F (20° C)	2 days (48 hours)	3 days (72 hours)

SLEEVE DISCUSSION

REMOVAL AND DISPOSAL

- DDG Interests Are Not „Where“ Vessels Stop, But Who and How
- Qualified Individuals
- Not the Crew *Unless Trained
- Proper/Safe Disposal and Clear Accurate Direction
- Not „Gas Free“ Upon Removal
- R&D (Cryo)



RESPIRATORY RISK



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MONITOR, MONITOR, MONITOR

- Low Range, IH Readings
- Personal Safety Monitor
- Respiratory Protection
- Training
- Communication and Planning



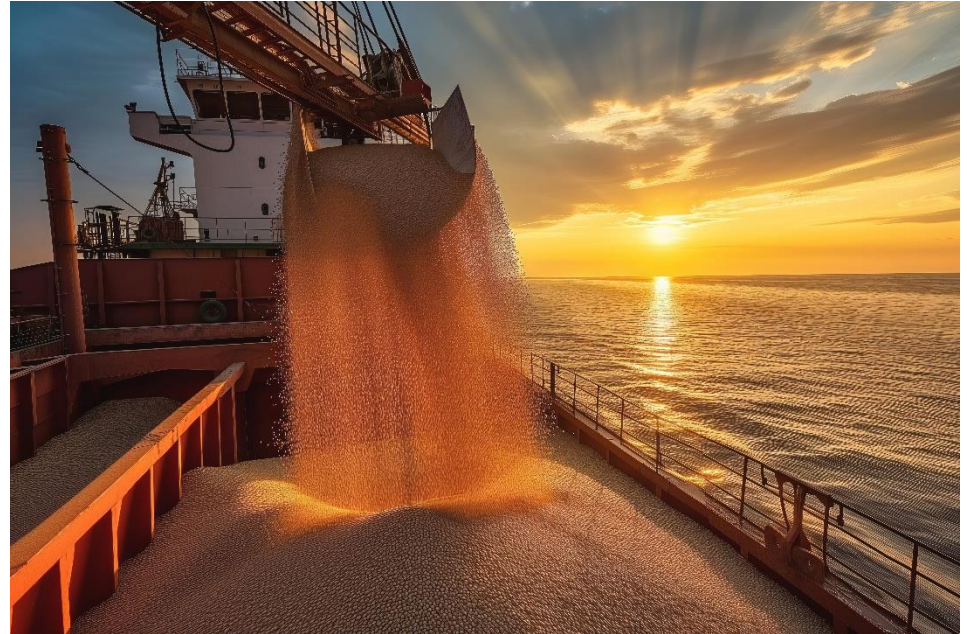
RESPIRATORY RISK



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REAL WORLD SCENARIOS

- Discharging Cargo
- Voyage Underway
- Bystanders of Application or Aeration

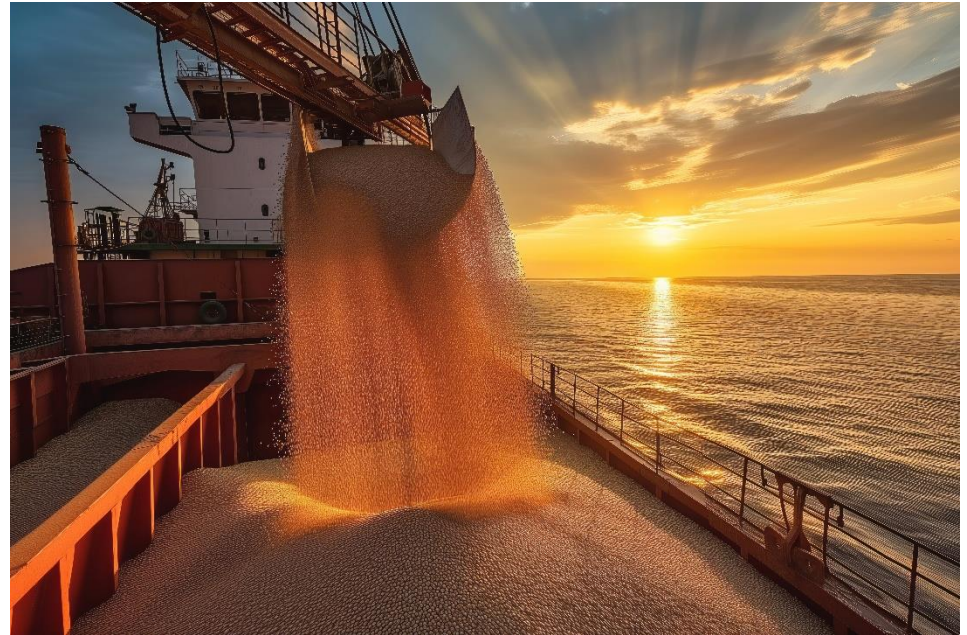


RISK MITIGATION



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- Educate Crews (Vessel/Port)
- Is Discharge the gap?
- PreFume Post Fume Meeting



Application Method with Minimum Fumigant Dosage Rate and Exposure Time in Days by Cargo Hold Depth				
Application Method and Minimum Dosage Rate Per 1,000 Cubic Feet of Storage Space	CARGO HOLD DEPTH IN METERS			
	< 6	6 – 12	>12 – 20	>20
	FUMIGANT EXPOSURE TIME IN DAYS			
Surface Application 45 grams of metal phosphide per 1,000 cu. ft	9	15	Not Acceptable	Not Acceptable
Subsurface / Trench-in Application 45 grams of metal phosphide per 1,000 cu. ft	8	15	18	Not Acceptable
Recirculation Application – Method A 33 grams of metal phosphide per 1,000 cu. ft	4	7	9	9
Recirculation Application – Method B 45 grams of aluminum phosphide pellets per 1,000 cu. ft or 30 grams of magnesium phosphide per 1,000 cu. ft	3.5	3.5	3.5	3.5

2.7 FUMIGATION CHECKLIST

FGIS agency personnel must complete and sign the following checklist to indicate that they have fulfilled their responsibilities under this chapter. Field Office Manager may modify to suit needs however the items below must be covered.

ITEM	Description	YES	NO
1	STATEMENT OF VESSEL SUITABILITY		
1a	Did you obtain a written statement from the certified fumigant applicator that the vessel is suitable for fumigation?		
2	PRE-FUMIGATION CONFERENCE		
2a	Did you attend the pre-fumigation conference conducted by the certified fumigant applicator? and:		
(1)	Did you receive a copy of EPA-registered label for the fumigant to be used?		
(2)	Did the certified fumigant applicator identify holds or tanks to be fumigated?		
(3)	Did the certified fumigant applicator state the intended fumigant dosage to be applied?		
(4)	Did the certified fumigant applicator describe the method of fumigant application?		
(5)	Did officer in charge of the vessel state voyage length?		
2b	Did the certified fumigant applicator discuss safety precautions including:		
(1)	Symptoms of fumigant exposure.		
(2)	First aid procedures.		
(3)	Instruct two crew members in the use of respiratory protection equipment and phosphine detection equipment?		
(4)	List of areas that are judged to be safe and those judged to be unsafe for crew members during the voyage.		
(5)	Checklist of areas that must be monitored daily for phosphine leaks.		
(6)	Hold or tanks under fumigation must be closed for the entire voyage length.		
2c	Did the certified fumigant applicator provide the officer in charge of the vessel instructions for aerating the holds or tanks upon arrival at the discharge port?		
2d	Did the certified fumigant applicator provide the officer in charge of the vessel instructions for the retrieval and disposal of residue retention device (bags, belts, ropes) at the discharge port?		
3	IF RECIRCULATION METHOD IS USED (See section 2.3d(3))		
3a	Did you verify that the blower motor has the capability to move the fumigant at a minimum rate of 300 cubic feet per minute?		
3b	Did you have the certified applicator demonstrate the fan/blower is moving air in the proper direction? (See section 2.4 b. (6)).		
3c	Did you verify that the 4 inch (minimum) solid tubing is securely attached to the output side of the blower motor housing with a semi-permanent method such as a bolt, screw, clamp, etc.?		
3d	Did you verify that the 4 inch perforated/slotted tubing was placed on the bottom of the hold and attached to the 4 inch (minimum) solid tubing?		
3e	Did you verify that the 6 inch perforated/slotted tubing is securely attached to the input side of the blower motor housing with a semi-permanent method such as a bolt, screw, clamp, etc.?		

Fumigation Management Plan

A Fumigation Management Plan (FMP) is an organized, written description of the required steps involved to help ensure a safe, legal and effective fumigation. It will also assist you and others in complying with pesticide product label requirements. The guidance that follows is designed to help assist you in addressing all the necessary factors involved in preparing for and fumigating a structure and/or area.



Your global partner in stored product protection

Before any fumigation begins, carefully read and review the label which includes the container label and Applicator's Manual.

FUMIGATION MANAGEMENT PLAN

Job Name/ID:			
Planned Start Date:		Planned End Date:	
DAI Division, Address & Emergency Contact:		Customer Name, Address & Emergency Contact:	
CHEMTREC: 1-800-424-9300			
Product(s) Applied			
<input type="checkbox"/>	72959-1 Fumitoxin® Tablets	<input type="checkbox"/>	72959-8 Phostoxin® Tablet Rope
<input type="checkbox"/>	72959-2 Fumitoxin® Pellets	<input type="checkbox"/>	72959-9 Phostoxin® Tablet Prepacs
<input type="checkbox"/>	72959-4 Phostoxin® Tablets	<input type="checkbox"/>	72959-6 Magtixin® Cels/Strips
<input type="checkbox"/>	72959-5 Phostoxin® Pellets	<input type="checkbox"/>	72959-7 Magtixin® Spot Fumigant
Product not listed, Enter Name & EPA Reg. Number:			

This checklist is provided to help you take into account factors that must be addressed prior to performing all fumigations. It emphasizes safety steps to protect people and property. The checklist is general in nature and cannot be expected to apply to all types of fumigation situations. It is to be used as a guide to prepare the required plan. Each item must be considered. However, it is understood that each fumigation is different and not all items will be necessary for each fumigation site.

A. PRELIMINARY PLANNING AND PREPARATION

- Determine the purpose of the fumigation: Elimination of insect infestation
- Determine the type of fumigation: Space: tarp, mill, warehouse, food plant, or outdoor areas

If applying to a vessel or barge,

In addition to the Applicator's Manual, read the U.S. Coast Guard Regulation 46CFR Part 147A.

- Fully acquaint yourself with the structure and commodity to be fumigated, including:
 - The general structure layout, construction (materials, design, age, maintenance), of the structure, fire or combustibility hazards, connecting structures and escape routes, above and below ground, and other unique hazards or structural characteristics. Prepare, with the owner/operator/person in charge, a drawing or sketch of structure to be fumigated, delineating features, hazards, and other structural characteristics.
 - The number and identification of persons who routinely enter the area to be fumigated
 - The specific commodity to be fumigated, its mode of storage, and its condition.
 - The previous treatment history of the commodity, if available.
 - Accessibility of utility service connections.

STATEMENT OF PREFUMIGATION NOTICE OF COMPLIANCE



TO: Person in Charge of the M/V _____

This is to notify you that the aluminum phosphide fumigant _____ will be applied to the cargo in Hold No(s) _____ between the hours of _____ and _____ on _____.

The fumigant will be applied as ALUMINUM PHOSPHIDE by the method of: _____

Hold(s) _____ Hold(s) _____

In accordance with applicable Federal, State and local laws, as well as IMO guidelines, the following information is provided.

- Safety precautions during voyage. (Handout: Safety Precautions During Voyage)
- Symptoms of exposure. (Applicator Manual Section 1 and 2)
- First aid procedures. (Applicator Manual Sections 1 and 2)
- Instructions for aerating holds or tanks. (Handout: Safety Precautions During Voyage)
- Instructions for retrieval & disposal of fumigant packages at destination. (Handout: Safety Precautions During Voyage)

It is hereby CERTIFIED that the following respiratory protection and gas detection equipment is onboard the vessel and that at least two responsible crew members have been instructed in its use:

Full-face Respirators: _____ Respirator Filters: _____
Gas Detection Pump: _____ Gas Detection Tubes: _____

In general, the following areas of the vessel may be considered as safe during the fumigation:

LIVING QUARTERS AND WORKING AREAS NOT PLACARDED WITH DANGER SIGNS.

The following areas of the vessel are not safe during the fumigation:

**CARGO HOLDS _____ AND
ANY OTHER AREA PLACARDED WITH DANGER SIGNS.**

Areas which must be tested at least daily for hydrogen phosphide during the voyage are all enclosed spaces occupied or frequented by crew members or any other person during the voyage such as, but not limited to:

Living Quarters Kitchens Day Rooms Engine Room Bridge
Mess Halls Store Rooms Keel Ducts Lockers Forecastle

- Do not enter fumigated holds.
- Should an odor of hydrogen phosphide be detected or suspected in an occupied area of the vessel, evacuate the area and check for the presence of hydrogen phosphide using appropriate respiratory protection equipment and a gas testing device. These items are on board and the captain or his designated representative is familiar with their use. Should a leak be found, seal it with tape or caulking on the exterior side of the space under fumigation. Wear respiratory protection during this operation.
- It is recommended that fumigated holds remain closed during entire voyage. If the vessel is equipped with power ventilators, these should be turned on to assist in the aeration process. Do not enter holds using aeration process until a gas reading taken over the grain surface indicated that it is safe to do so.

STATEMENT OF FUMIGANT APPLICATION COMPLIANCE



TO: Person in Charge of the M/V _____

I hereby certify that aluminum phosphide fumigant formulation was applied to the cargo on the above referenced vessel on _____. I further certify that the fumigant formulation application was made in accordance with U.S. Environmental Protection Agency, U.S. Coast Guard, and Federal Grain Inspection Service regulations and instructions and applicable State and local laws and regulations. The cargo in the following holds or tanks was treated at a dosage rate of _____ grams per 1000 cubic feet of hold space.

Hold No.	Depth (M)	Capacity of Hold (FT3)	Fumigant Formulation	Quantity of Fumigant	Number of Fumigant Packages	Method of Application
1						
2						
3						
4						
5						
6						
7						
8						
9						

It is my understanding that the above named vessel will have an estimated voyage time of _____ days and is destined for _____. Prior to arrival at the first discharge port the Master should inform the authorities at the port that the cargo has been fumigated in-transit.

I certify that immediately following application of the fumigant formulation all openings to the fumigated space were closed and placarded with appropriate warning signs. I further certify that all openings to the fumigated space and crews working areas have been checked and no fumigant gas was leaking at the time of the vessel's departure. It is suggested a vessel Representative accompany the fumigator during this test. The Captain and or crew have confirmed the vessel has been inspected for stowaways and/or unauthorized personnel and none were observed.

VESSEL SUITABILITY STATEMENT



TO: Person in Charge of the M/V _____

I hereby certify that I have personally inspected or had inspected the holds or tanks aboard the above named vessel on _____ and found the following to be true regarding the suitability of the holds or tanks for in-transit fumigation.

HOLD/TANK NUMBER	SUITABLE	REASON FOR NON-SUITABILITY
1	Yes	
2	Yes	
3	Yes	
4	Yes	
5	Yes	
6	Yes	
7	Yes	
8	N/A	
9	N/A	

***** THIS STATEMENT ONLY APPLIES IF A RECIRCULATION SYSTEM WAS INSTALLED *****

This is to certify that the recirculation equipment for in-transit fumigation of the cargo aboard this vessel, including electrical leads, wiring, connections and electrical blowers, has been installed to FGIS standards and tested to the satisfaction and approval of the Officer in Charge of the Vessel. A daily inspection should be conducted to insure the system is operating.

Signed: _____
Certified Applicator _____ Print Name _____

Acknowledged: _____
Officer in Charge of the Vessel _____ Print Name _____

Safety Precautions During the Voyage



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DEGESCH America, Inc.

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info@degeschamerica.com

SAFETY PRECAUTIONS DURING THE VOYAGE

Each of the cargo holds/tanks will contain phosphine gas during the voyage or until the holds/tanks are ventilated. Because phosphine is a poisonous gas **ENTRY INTO THE CARGO HOLD/TANKS IS ABSOLUTELY FORBIDDEN** during the fumigation and aeration (ventilation) process. Immediately upon completion of the fumigant application, vessel's crew must close and secure all cargo hold openings to contain the fumigant gas within the cargo hold and protect the fumigated cargo from exposure to outside elements. In order to prevent moisture from leaking into the fumigated space, at no point should the hatch covers be cleaned with water until the tanks/holds have been opened and allowed to aerate/ventilate.

All other spaces and areas of the vessel are considered to be safe for occupancy during the voyage unless it has been noted on the Statement of Pre-Fumigation Notice of Compliance that there are other areas which **ARE NOT SAFE**.

As a precaution, all spaces and areas of the vessel considered to be safe for occupancy should be tested for the presence of phosphine gas daily until the vessel arrives at it's discharge port, or until the tanks/holds have been opened and allowed to aerate/ventilate.

The person appointed to be in charge of the gas detection detail should have a full-faced gas mask available for use if gas is detected.

If gas is detected, **EVACUATE THE SPACE/AREA IMMEDIATELY AND FORBID RE-ENTRY UNTIL THE SPACE/AREA IS RENDERED GAS FREE.**



SYMPTOMS OF EXPOSURE TO PHOSPHINE (HYDROGEN PHOSPHIDE, PH3) GAS

Symptoms of exposure to this product are **headaches, dizziness, nausea, difficult breathing, vomiting, and diarrhea**. In all cases of overexposure get medical attention immediately. Take victim to a doctor or emergency treatment facility. In accordance with IMDG and IMO Recommendations, the vessel is required to carry the necessary medicines and medical equipment and the latest version of the Medical First Aid Guide for Use in Accidents Involving Dangerous Goods (MFAG).

FIRST AID PROCEDURES FOR EXPOSURE TO PHOSPHINE (HYDROGEN PHOSPHIDE, PH3) GAS

If inhaled:

- Move person to fresh air.
- If person is not breathing, call 911 or an ambulance; then give artificial respiration, preferably by mouth-to-mouth, if possible.
- Keep warm and make sure person can breathe freely.
- Call a poison control center or doctor for further treatment advice.

If swallowed:

- Call a poison control center or doctor immediately for treatment advice.
- Have person drink one or two glasses of water and induce vomiting by touching back of throat with finger, or if available, administer syrup of ipecac.
- Do not give anything by mouth to an unconscious person.

If on skin or clothing:

- Brush or shake material off clothes and shoes in a well-ventilated area. Allow clothes to aerate in a ventilated area prior to laundering.
- Do not leave contaminated clothing in occupied and/or confined areas such as automobiles, vans, motel rooms, etc.
- Wash contaminated skin thoroughly with soap and water.

If in eyes:

- Hold eye open and rinse slowly and gently with water for 15-20 minutes.
- Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye.
- Call a poison control center or doctor for further treatment advice.

PHOSPHINE (HYDROGEN PHOSPHIDE, PH3) GAS DETECTION PROCEDURES

Testing for phosphine (hydrogen phosphide, PH3) gas consists of pulling air from the area or space being tested through a gas detector tube with a hand operated pump. The tube contains a special reagent which will discolor if phosphine (hydrogen phosphide, PH3) gas is present. The concentration of phosphine (hydrogen phosphide, PH3) gas in the air being tested can be determined by reading the scale on the tube at the point which the discoloration stops. Once the gas is detected the tube cannot be re-used. Shown below is an overview of the operating instructions for the Detia-Degesch pump. Consult the Operators Manual supplied with the pump for detailed operating instructions.

Step 1:

Break off the tips from both ends of the detector tube using the tube opener built into the pump.



Step 2:

Insert the tube into the pump with the arrow pointing towards the pump.



Step 3:

Completely depress and release the pump.

Step 4:

Repeat for a total of 3 strokes. Log the results and repeat this procedure as required.

INSTRUCTIONS FOR AERATING HOLDS/TANKS

Upon arrival at destination, weather permitting, hatch covers may be opened to commence aeration. If the vessel is equipped with power ventilators, these can be turned on to assist in the aeration process.

Phosphine (hydrogen phosphide, PH3) gas in the air space above the cargo in the hold will readily dissipate when the hatches are opened. There may be some gas remaining below the surface of the cargo which will dissipate as discharge continues.

However, should it be necessary for workers to enter fumigated holds to unload the cargo, use appropriate respiratory protection equipment and a gas testing device to test the air directly above the cargo in the vicinity of where the men will be working. Exposure Limits: Exposures to phosphine must not exceed the 8-hour Time Weighted Average (TWA) of 0.3 parts per million or the 15 minute TWA Short-term Exposure limit (STEL) of 1.0 parts per million phosphine. Remove workers and allow additional time for aeration should gas be detected.

It is IMPORTANT to aerate (ventilate) each cargo hold/tank in accordance with the instructions provided so that discharge of the cargo can proceed in a timely manner.

HOT LINE NUMBER

Have the product container label or Applicator's Manual with you when calling a poison control center, doctor, or when going for treatment. **CONTACT 1-800-308-4856 FOR ASSISTANCE WITH HUMAN OR ANIMAL MEDICAL EMERGENCIES**. You may also contact DEGESCH AMERICA, INC. at 540-234-9281/1-800-330-2525 or CHEMTRIC at 1-800-424-9300 for all other chemical emergencies.

SUMMARY



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PATHWAY TO SAFETY

- Make Appropriate Decisions in Real Time
- Trusted Vetted Fumigators
- Clear, Detailed, Communication
- DO NOT CONFINE or UNDERREACT
- TRAINING
- MANDATORY MONITORING

Thank You! Questions?



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