ETHYLENE OXIDE (ETO) FUMIGATION

Prepared by:
PT BIOSECURITY SOLUTION
Consultant on Sanitary & Phytosanitary
MATERIAL SAFETY DATA SHEET (MSDS)

• Common Name: ETHYLENE OXIDE (C2H4O)
• CAS Number: 75-21-8
• Synonyms:
  ✓ ethoxyethane
  ✓ oxirane
  ✓ dimethylene oxide
  ✓ ethane oxide
  ✓ ethoxofume® 1000

  o Supplier: PT Linde Indonesia & PT Aneka Gas
  o Product of Chemogas Belgium
Characteristics Ethylene Oxide (EtO)

- Liquid gas below 51°F (10.6°C)
- Gas ≥ 51°F (10.6°C)
- Smells like ether at toxic levels.
- Heavier than air (1,7)
- Flammable (10.5%)
- LEL 3.5%
SCOPE OF USES

Fumigation for sanitary & phytosanitary purposes

Sterilization of medical equipment and supplies, as well as animal cages

used as an intermediate in the production of several industrial chemicals, the most notable of which is ethylene glycol (anti-freezing)
COMMODITIES REQUIRED ETO FUMIGATION

- Water hyacinth handycrafts (bags, furnitures)
- Laquered / painted / varnished / teak oiled wooden, rattan and bamboo handycrafts (mostly furnitures, wooden carving)
- Timber / wooden handycrafts with dimension > 20 cm
- Feather handycrafts
- Thatching grass for roofing
- Spices
TARGET OF ETO FUMIGATION

Desinfestation of:
  o Arthropods (insects, mites and others)
  o Microorganisms (fungi, bacteria, virus)

Devitalization of:
  o Seeds
  o spores
AQIS’S ETO TREATMENT

Treatment  T9020
Ethylene oxide

Initial vacuum pressure minimum 50 kilopascals with dosage rates:

1. 1200 gr /m³ / 5 hours exposure time at 50°C
   atau
2. 1500 gr /m³ /24 hours exposure time at 21°C.
PERMISSIBLE EXPOSURE LIMITS (PELs)

8-hour time-weighted average (TWA) exposure limit: one ppm in the air

Short-term exposure limit (STEL): five ppm in the air
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<tr>
<th>Company Name</th>
<th>Address</th>
<th>Email</th>
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</thead>
<tbody>
<tr>
<td>CV KARYA MANDIRI (AIN : 000816)</td>
<td>Jl Taman Baruna 2  Jimbaran, Bali</td>
<td><a href="mailto:etointernational@yahoo.com">etointernational@yahoo.com</a></td>
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<tr>
<td>CV PATRIOT MURNI (AIN : 003106)</td>
<td>Safe n Lock Warehousing Estate , Jl. Lingkar Timur, Sidoarjo.</td>
<td><a href="mailto:etopatriotmurni@yahoo.com">etopatriotmurni@yahoo.com</a></td>
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ETO FACILITIES BALI
ETO FACILITIES SURABAYA
FACILITIES OF ETO FUMIGATION

- Receiving area for incoming goods
- Pre-fumigated goods-area
- Fumigation area
- Post fumigation area
- Clean storage
- Loading area
- General storage
- Office
VACUUM FUMIGATION CHAMBERS
BASIC PRINCIPLES

Safety of operators

Safety of commodity and environment

Effectiveness
STANDARD ETO FUMIGATION

Well trained operators

Personal Protection Equipment

Good engineering systems

Standard Operation Procedure of: Safety, Fumigation, Maintenance, Documentation
ETHYLENE OXIDE
FUMIGATION PROCEDURE
LOADING AND STACKING

Commodities are loaded into the chamber and the stacking should not contact the wall of the chamber to provide enough free space in all directions to allow gas circulation.

Each pack of loaded commodity is labelled with treatment batch code/number.
CLOSE VALVE OF AIR INTAKE (VACUUM BREAKER)
OPEN VACUUM VALVE
VACUUM PROCESS

Close the door and lock tightly
Open the vacuum valve
Turn on the vacuum machine
Close the vacuum breaker valve
Turn off the vacuum machine when the vacuum pressure 80 kpa
Wait for 10-15 minutes in to make the vacuum pressure stable at 80 kpa
Vacuum process fail if the vacuum pressure below 80 kpa
GAS INJECTION

Gas injection into chamber through evaporator (1200 or 1500 grams/ M³)

Gas composition: ETO is 90% + CO2 is 10%

Injection is started when the temperature and vacuum of chamber is minimum 50°C and 80 kpa respectively

After gas injection complete, the vacuum pressure will decrease below 80 kpa but should not below 50 kpa.
GAS INJECTION & DETECTION
AQIS Guidelines-Ethylene Oxide (T9020):

- 5 hours with dosage rate 1200 grams/M³, at minimum 50°C and initial vacuum of 50kPa
- 24 hours with dosage rate 1500 grams/M³, at 21°C and initial vacuum of 50kPa
TERMINATING FUMIGATION PROCESS
Removing the eto gas out of the chamber for terminating the fumigation process.

Fumigation is success when during exposure time the temperature and vacuum pressure remain 50°C and 50 kpa respectively.

When the aerating process has completed, open the door of chamber, and check the gas concentration already below limit (1 ppm).

Unload the goods from chamber and move to the clean room separately from un-fumigated one.
AERATING PROCESS

1. Open the vacuum breaker valve and close again when the vacuum pressure zero
2. Open the vaccum valve and turn-on the vacuum machine.
3. Turn-off the vacuum machine when the vacuum pressure 80 kpa

Repeat the process 1-3 several time, 6-8 times depend on the quantity and type of commodity.
DETECTION OF GAS RESIDU
POST FUMIGATION HANDLING