Knowing the pest is half the battle in controlling it.

Cold Blooded Insects vs. Warm Blooded Mammals
Fumigants and Eggs

**Micropyles** are openings on the surface of the egg wall through which male insect sperms enter the egg causing fertilization.

**Moth eggs**
Fumigants and Eggs

Aeropyles:
• Holes in the egg wall that allow gases to enter the egg.

Beetle eggs.
Flour Mill Fumigation
ProFume® (sullfuryl fluoride)

Six floor mill @ 35° C
Warehouse and offices @ 20° C

Twice as much ProFume needed for warehouse/m3
Fumigant Buffer Zones

What is a Buffer Zone?
Port Botany Methyl Bromide Detection

This image shows the concentrations of Methyl Bromide after release from fumigations in a major Australian Port. The contours on this graph were created after readings were taken from live fumigations at the Port depots, and results incorporated into computer models showing gas dispersions. Present fumigation methods result in risks categorized as ranging up to Moderate and Extreme, risks which can exceed current and proposed regulatory criteria. Nordiko’s systems reduce these risks by recapturing the highly toxic, colourless, odourless gases that are used in fumigation.
Fumigant Buffer Zones

Wellington, New Zealand
Scrubber Fumigants
Sulfuryl Fluoride Scrubbing
Research Fumigation Chamber (28m$^3$)  n=4

Concentration (oz. / 1000cu.ft.)

Time (min.)

Chamber
Exhaust

Sulfuryl Fluoride PPM
SCRUBBING EXPORT LOGS

- 70% retention of fumigant to be scrubbed

USDA Export Log Fumigation Warehouses in Westfield, Indiana; Joliet, Illinois; and Heyworth, Illinois.
ISPM -15 Fumigations
NEW Labeling for Sulfuryl Fluoride
ProFume from Dow Agrosciences
New ProFume Low Range Monitor

- The CLIRcheck monitor utilizes infrared technology to measure sulfuryl fluoride (Vikane® gas fumigant) concentrations for clearance and re-entry
- The CLIRcheck features a warm-up time of about 12 minutes with a digital LCD readout and battery status indicator
Labeling Updates

ProFume gas fumigant in the United States

> Residue tolerances for food expanded in US
> Export log fumigation approval pending
> Europe has an issue with food tolerances with Sulfuryl fluoride

Training for fumigators will be provided on the new labeling changes
Temperature & Insect Biology

Response of Stored Product Insects to Temperature

- Metabolism and Activity Level
- Temperature °C

-25 -20 -15 -10 -5 0 5 10 15 20 25 30 35 40 45 50

Insects exhibit different activity levels based on temperature, with peak activity at around 10-20°C and decreased activity at extreme temperatures.
Ethylenedinitrilo

- EDN
  (New fumigant from BOC)

BOC Sydney researching EDN for Soil, Timber and Fruit fumigations.
Sydney
Phosphine Insect Resistance

Insect Resistance is Genetically Linked
Red Flour Beetle
*Tribolium castaneum* 89%

Lesser Grain Borer
*Rhyzopertha dominica* 100%
3200 PPM

Flat/Rusty Grain Beetle
*Cryptolestes spp.*

Rice Weevil
*Sitophilus oryzae*
Laboratory Test

- FAO United Nations Method: 20 hour lab test

Pasta testing, Canada and Italy
The Australian Story

Ryzopertha dominica

0Fumigation Update
Advantages of Resistance Testing

- Level of Resistance?
- Dosage Rate and Duration
- National and Global Survey
- Recommendation **Not** to Use
- Rotation to Alternatives
Key Points

- Some insects have developed a genetic resistance to phosphine fumigations.
- Phosphine fumigant resistance has increased in both frequency and strength worldwide.
- Phosphine fumigant management starts with phosphine resistance testing.
INVITATION
12th Fumigants & Pheromones Technical Conference
March 6-9, 2016
Adelaide, South Australia