#### Cylinderized Phosphine

#### Fumigation: supporting a valid

#### alternative to Methyl Bromide

#### Quarantine Regulators Meeting

#### May 2021

#### Presenter:

André Nothomb and Mathew Murphy, Cytec Solvay Group

#### Solvay Today

We are a science company whose technologies bring benefits to many aspects of daily life.

Our innovative solutions contribute to safer, cleaner, and more sustainable products found in homes, food and consumer goods, planes, cars, batteries, smart devices, health care applications, water and air purification systems.

Our Group seeks to create sustainable shared value for all, notably through its Solvay One Planet plan crafted around three pillars: protecting the climate, preserving resources and fostering better life.

#### 2030 Solvay One Planet Goals & Achievements 2020

10 ambitious external objectives to reduce our global impact (basis: 2018)

(Graphics showing various objectives of Solvay)

* Post harvest crop protection against pests
* Preventing global biosecurity risks and huge food losses
* Post harvest fumigation is limited to confined spaces, involves small chemicals volume usage:
* Silos, warehouses, containers, bulk shiploads in intercontinental trade. No release in open spaces
* Preventing food losses reduces global pressure on food production
* According to various surveys, stored food losses due to pests range from 5% to up to 1/3 of total stored consignments thereby reducing fertilizer and other chemicals consumption
* Contribution to the circular economy and climate change mitigation: urea-based fertilizers emit GHG
* One application: quarantine & pre shipment fumigation
* A critical activity monitored by the Montreal protocol

Methyl bromide still accepted despite ozone depletion impact

Solvay alternative: Cylinderized phosphine gas ph3

#### Metal Phosphide and Cylinderized Phosphine: 2 Different Phosphine Delivering Products

**Aluminum/Magnesium Phosphide Tablets**

* Cheap and perceived easy use by anyone
* Available on internet
* Efficiency issues, especially in cold weather
* Leaves residues which damage fruits
* Costly removal of harmful metal dust residue
* Flammable in hot and humid conditions

**Solvay Phosphine Fumigant Gas**

* Pure Phosphine PH3 gas in reusable tanks
* Controlled sourcing: no parallel supplies
* Controlled fumigation atmosphere with Product Stewardship training
* No residue, no traces, no risks when used with dedicated equipment

#### Efficiency Comparison with Metal Phosphide

Narcosis:

Under too high fumigant gas concentration, some insects just stop breathing and can do so for days without dying. When fumigation ends, they simply come out of lethargy and proliferate. This is known as Phosphine resistance.

With PH3 controlled dosage, immediately reaching lethal dosage avoids gas peaks, when pests’ survival cases are observed

#### Responsible Care and Product Stewardship

Solvay implements Responsible Care initiatives and practices for all its businesses: responsible and ethical management of the health, safety and environmental aspects of our products from its inception through production to its ultimate use and disposal.

Product Stewardship trainings are conducted with Cylinderized Phosphine customers as standard practice, to ensure safe and effective use of our products. Essential requirement prior to shipping product.

#### Phosphine Fumigation Approved Uses for QPS

ECO2FUME ® and VAPORPH3OS® are recognized as efficient, safe and residue-free fumigant for control of phosphine resistant insects on grains and oilseeds, insect pests in produce, buildings, chicken sheds (new application), cut flowers, logs, etc.

Approved in a growing list of countries for Quarantine and Pre-Shipment (QPS) application, to treat various commodities, food and non-food:

(\*) when used in accordance to the legal label in a given country

* South Korea: ECO2FUME® approved replacement to methyl bromide for QPS treatment of cut flowers, nursery trees, pineapple, banana, pine wood, root, leafy and stem vegetables, rice grain and seeds
* Indonesia: ECO2FUME® approved as a primary fumigant for QPS treatment of rice, coffee, cacao, pineapple, mangosteen and tobacco.
* PNG, Fiji: ECO2FUME® approved as replacement to methyl bromide for QPS treatment of imported bulk rice, wheat and stock feeds and other bulk commodities as well as exported coffee beans.
* Uruguay: VAPORPH3OS® approved for QPS and in-transit fumigation of exported logs to China.
* New Zealand: VAPORPH3OS® for logs export under review by Ministry of Primary Industries
* US citrus exports to Australia and S Korea: VAPORPH3OS® approved in systems approach
* Turkey: ECO2FUME® approved as methyl bromide replacement for QPS of exported dried fruits.
* Chile: VAPORPH3OS® approved for QPS treatment of selected exported fruits and vegetables to the US, Japan, Mexico and other destinations
* UAE, Oman and Egypt: ECO2FUME® approved for QPS treatment of exported dates.
* Sri Lanka: ECO2FUME® approved for QPS treatment of exported mangoes, cucurbits, Ceylon tea, bitter gourd and imported rubber caps.
* Vietnam: ECO2FUME® and VAPORPH3OS® approved for DDGS grains exported from US
* Australia: ECO2FUME® and VAPORPH3OS® under approval process for Dark Beetle elimination for chicken sheds
* Newly established protocol for treatment of Khapra beetle under review of plant import quarantine team Australian DAWR
* Thailand ECO2FUME® under paid commercial trials for addressing Salmonella infestation on breeder house in a major chicken company Work in Progress in the EU towards registration in Belgium and Greece. This would allow massive use from Antwerp port.

#### Phosphine Fumigation Protocols for QPS



(List showing Commodity, Plant Pest Type, Phosphine Concentrate ppm, Exposure Time, Temperature and Reference)

#### Methyl Bromide ODS Fumigant Still in Use

* Methyl Bromide is an efficient fumigant but as an Ozone Depletion Potential material it was to be phased out following the Montreal Protocol.
* Methyl Bromide is a toxic material which poses other risks and harmful effects, in particular occupational neurologic effects upon prolonged exposure for fumigation employees <https://www.epa.gov/sites/production/files/2016-09/documents/methyl-bromide.pdf>
* Montreal Protocol Methyl Bromide phase out was effective but remains approved for QUARANTINE & PRE SHIPMENT (QPS) application since 1992 (Article 2H exception), following the absence of valid alternatives as considered at that time

**Fact** : Methyl Bromide for QPS application was insignificant when the Montreal Protocol was implemented, but grew unnoticed since then, thereby extending environmental impact

#### No Pressure to Replace Methyl Bromide for QPS

* Despite recommendation to find alternatives, Methyl Bromide consumption for QPS has not decreased under Montreal Protocol. The Article 2H exception acts as a disincentive to conversion to alternatives
* In 2005, the Critical Use Exception mechanism was set up to accelerate full phase-out of non-QPS MB use, imposing case by case annual capped MB consumption, after review of potential alternatives.
* The CUE process encouraged innovation in valid new pest control techniques.
* Non-QPS MB consumption almost disappeared by now

#### Submitting QPS Methyl Bromide Consumption to Cue Annual

#### Review

* **Fact:** since 1992, scientific progress in various techniques have been recognized as effective pest control methods for QPS, but have reached only limited deployment
* **Fact:** since 2010, the EU has fully banned Methyl Bromide use for QPS application, and have not faced any major pest crisis in this field since then
* **Fact:** meeting with various national biosecurity authorities reveal an interest for change, but the absence of strong incentive towards experimenting with alternatives due to Article 2H exception remains mainstream. Officially reporting QPS Methyl Bromide volume used appears only as a minor administrative burden
* **Fact:** efforts by Methyl Bromide proponents for QPS application to reduce Ozone Depletion emissions since then have been limited. Renewed efforts to be pushed from October 2020 will be costly. Besides, new questionable MB uses of QPS have recently been identified (TEAP Progress report, May 2019)

After nearly 3 decades of status quo and considering the clear success realized for non-QPS uses, subjecting annual CUE review of potential alternative processes to QPS application would be the safest way to achieve real ODS elimination.

Thank You.