Conclusions

Rodent control is vitally important due to direct and indirect danger rodents might cause to humans. Efficient rodent control is needed and is an integrative part of good agricultural and public health practice. Important is to perform proper sanitation, to exploit all available rodent proofing methods and remove all water and food sources for rodents. Rodent control has to be carefully planned. The most suitable rodenticide formulation has to be applied.

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06 - EcO2 controlled atmosphere® & heat for stored product protection (incl. structural disinfestation)

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Abstract

The EcO2 Controlled Atmosphere treatment (CA), based on low-oxygen in combination with increased temperatures (e.g. 35° Celsius), is commercially used world-wide to control insects in post harvest commodities, structures, silos, and container cargo (imported and exported and treated according Quarantine and Pre-shipment regulations). CA treatments have gained industry and government acceptance as the non-toxic fumigant technology for a variety of applications. EcO2 applies it in the market on a practical basis, making it available for the industry. Treatments are carried out by applying them in climate controlled rooms, silos, barges or containers with fixed or mobile installations. CA has shown to be effective in controlling eggs, larvae and pupae, present in different sorts of (dried) commodities.

CA treatments have many advantages over traditional fumigants, including no pest resistance, residue-free and safe. In addition, installations equipped to carry out CA treatments are yet available in 13 countries serving a wide variety of industries.

CA treatments are applied to control insects in a wide variety of post harvest commodities like dried fruits, nuts, spices, seeds, rice, grains, tobacco etc.

Keywords: Stored product pest control, controlled atmospheres, heat, disinfestations, post harvest, environmentally-friendly, Methyl bromide, Phosphine and Sulfuryl Fluoride.

Introduction

EcO2 Controlled Atmosphere® (CA):

CA is based on the establishment of a low-oxygen environment which kills pests. The Dutch company EcO2 BV is using CA to control all stages of insects, rats and mice in food, associated products, artefacts, silos, food (processing) facilities, airplanes and barges.

CA is designed by EcO2 is established by means of the EcO2 converter which is able to create levels varies between 0% and 1.5% O2. It can be applied in airtight environments which will be designed on customs needs. Insects in all stages are eliminated (99,996% Lt) because of the lack of oxygen which causes the insect to dry out and suffocate.

The use of CA on post-harvest durables is growing rapidly and replacing Methyl Bromide and Phosphine more and more. The phase out of Methyl Bromide pushed the increase of world-wide Phosphine use. The product is easy to use and affordable although this product takes long exposure times to be effective. Unfortunately the product is meeting increased levels op pest resistance and requires more investments to be applied on an acceptable level. This is in line with chemicals such as Sulfuryl Fluoride that can not guarantee an effectiveness level of 99,9% Lt , take long treatment times, need elevated temperatures and considerable investments in fumigation rooms and information technology, and as latest research showed in the USA it is also an ozone depleted substance even 4800 times more then CO2.

The treatment times of a CA treatment now vary from 24 hrs till 7 days. The treatment time depends on the type of product (density level) and type of insect (exposure level). These treatment times are faster than chemical alternatives for Methyl Bromide (including defumigation).

With CA treatments there is a 100% effective control of insects, rats and mice in every stage of development. There is no change of resistance in pest population and the treatments are independent of atmospheric influences. Beside this, CA can be used for quality preservation purposes for long term storage of food commodities.

During each CA treatment, there is full online control of each treatment and parameters based on a full database of insect control data. After each treatment date is recorded using software programmes for full traceability.

EcO2 Converter system and machinery are always constructed in a moveable 20ft container. The prices of the treatments are at expectable levels and units are available for small and medium sized companies. Prices of treatment of commodities, treated in treatment centers (based on lease) range from € 1,00 to € 10,00 p/mt based on yearly capacities of 20.000 and 2.500 tonnes. Prices are exclusive local energy costs which depend on local energy costs and climate.

EcO2 treatment facilities are customized to the need and desires of the customers and designed according:

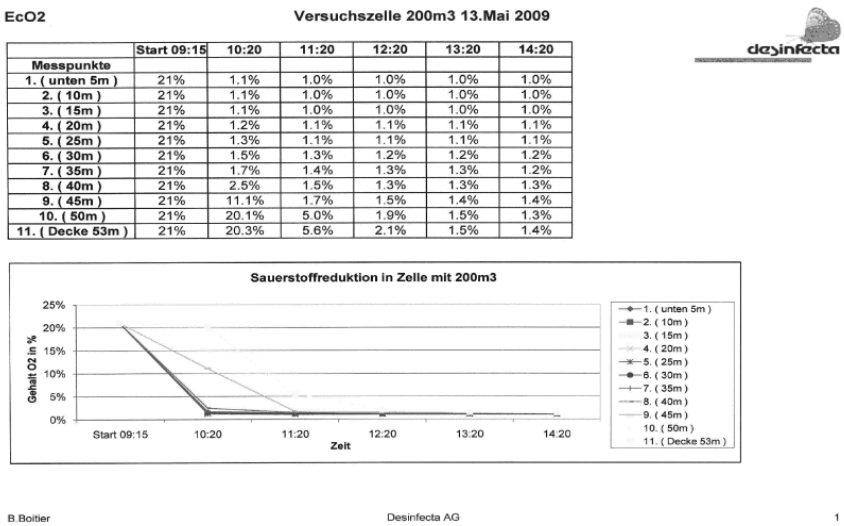
- yearly required treatment capacity (containers, tonnage)
- available area for construction
- products to be treated

Applying EcO2 Controlled Atmosphere® in Silos:

Since a very large portion of the storage of food is done in silos, it is a natural way to progress the application of EcO2 Controlled Atmosphere® in silos. This brings new challenges to the table. For instance the various ways that silos are constructed. There are many different shapes, seizes, used materials. Some silos are only used for storage and some are used for storage and as a treatment facility. Also the location can be an influence in this process.

The most important aspect is the air tightness of the silo. This can be an established after conducting a pressure test. The more the silo is air tight, the quicker it will be to reach the right low oxygen level within the silo.

EcO2 has conducted several tests together with Desinfecta AG. The subject of the tests was to make it insightful how long it would take to reach certain oxygen levels thought-out different heights within the silo (see figure 1)



	Start 09:15	10:20	11:20	12:20	13:20	14:20
Messpunkte						
1. (unten 5m)	21%	1.1%	1.0%	1.0%	1.0%	1.0%
2. (10m)	21%	1.1%	1.0%	1.0%	1.0%	1.0%
3. (15m)	21%	1.1%	1.0%	1.0%	1.0%	1.0%
4. (20m)	21%	1.2%	1.1%	1.1%	1.1%	1.1%
5. (25m)	21%	1.3%	1.1%	1.1%	1.1%	1.1%
6. (30m)	21%	1.5%	1.3%	1.2%	1.2%	1.2%
7. (35m)	21%	1.7%	1.4%	1.3%	1.3%	1.2%
8. (40m)	21%	2.5%	1.5%	1.3%	1.3%	1.3%
9. (45m)	21%	11.1%	1.7%	1.5%	1.4%	1.4%
10. (50m)	21%	20.1%	5.0%	1.9%	1.5%	1.3%
11. (Decke 53m)	21%	20.3%	5.6%	2.1%	1.5%	1.4%

Fig. 1 Oxygen levels thought-out different heights within a silo

EcO2 Heat Technology (HT):

This technology is used for the control of insects in flour mills, historical buildings and storage centres.

Heat treatments consist of raising the temperature of the structure to at least 56°C for an average of 36 hours. It can be used to control all stages of insects in different types of buildings and structures, including historic buildings. Mobile heating equipment that also controls humidity is used to distribute heat as uniformly and as slowly as possible to avoid damage to the building. The mobile equipment is generally not expensive and the energy costs are modest.

In The Netherlands, heat treatments have replaced MB for disinfestation of flour mills and aircraft. Heat applied over a period 24 hours, in compliance with ISPM-15, is also an approved disinfestation treatment for the treatment of pallets, SWPM and dunnage. The same heat treatment can also control fungi on wet timber. Although heat requires investment in specialised facilities, it is a safe, non-toxic, environmental-friendly and effective substitute for MB.

Heat combined with controlled atmospheres:

Heated-CA is commercially available as “EcO2 Quarantine and Pre-Shipment Treatment®” (“EcO2 QPS treatment”) for controlling insects in a range of products. It is a proprietary system which is specifically developed for the treatment of containers, general cargo and big bags, containerised wooden pallets, packaging materials and dunnage. The treatment combines heat with low-oxygen and takes 24 hours. The temperature is controlled in strict compliance with ISPM-15 while the low-oxygen concent

Commercially, “EcO2 QPS Treatment” is applied in service terminals or at container terminals where full containers, loaded with packaging materials together with the goods, can be treated together. Located in the Port of Rotterdam, the REST provides a total solution for the treatment of import and export containers. Containers treated with the “EcO2 QPS Treatment”, or heat alone, are vented in a closed circuit in order to conserve heat and gas mixtures (Figure 2). The process runs automatically and toxic gases are filtered with the use of a sophisticated filter system in a fast and safe way. ration protects the product from oxidation.

Approximately 3,500 containers will be treated with the QPS treatment in 2004. “EcO2 QPS Treatment” can handle more than 95% of all export containers (depending on the heat sensitivity of the cargo). The treatment treated 77% of the containers that had to be fumigated in the Port of Rotterdam in January – June 2004 (Roteb 2004).

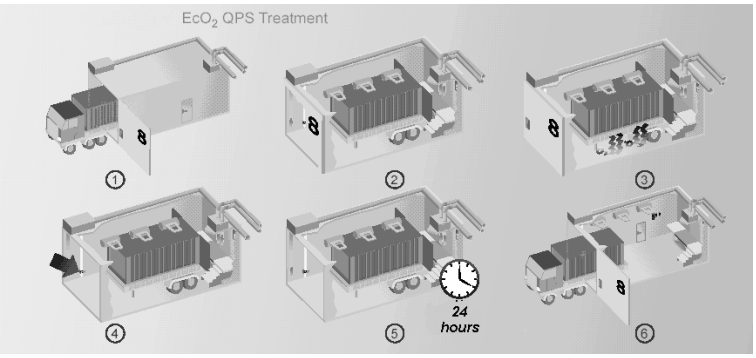


Fig. 2 Schematic of the “EcO2 QPS Treatment” that complies with the ISPM 15 norm (EcO2, 2004)

Conclusion and discussion points

EcO2 Controlled Atmosphere® is competitive against chemical fumigants and available world wide. Barriers of treatment time, price, usability and availability have been lowered. Chemical alternatives for Methyl Bromide and Phosphine share the problem of causing resistance, leaving residues, affect the ozone and a negative image; they become overall less competitive in comparison to natural alternatives. CA and HT (all combinations) reduce the risk for working personnel and consumers. All systems are used without waiting for a fumigator.

Without oxygen no insect will survive and although the system is toxic to insect and risks are reduced for working personnel and consumers, prudence is in order when operating the EcO2 systems since it can be toxic to people as well. Each insect stage of the insect species is controlled, taking into account that pupae and eggs are the most difficult ones. Each treatment is adjusted to the insect specie to control.

Large structures and objects are treated with HT, using steam heating systems to avoid the necessity of large electric power.

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07 - Five economic principles applied to stored product protection

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Abstract

Society has long recognized the critical importance of stored product protection for welfare of humans and domestic livestock. Economists note additional benefits in terms of more efficient resource use, facilitated trade, and market stability. Estimates of the stored product losses vary greatly but are large in aggregate and potentially economically devastating to individual enterprises. Economic principles can be applied to stored product protection to understand current practices and to indicate potential pathways to refine strategies for stored product protection. The appropriate selection of the adaequate method in stored product protection will choose the alternative that provides the greatest net benefits. Cost-benefit analysis is a powerful tool for rationalizing the resource allocation. The decision should focus on ”how much” or ”which one”. Economic threshold models offer insight into discrete choice problems. The good storage protection practice should recognize and deal with externalities. Protection activities may be driven by economic externalities and may themselves general externalities impinging on others. Economic theory discusses which goods should be provided privately and which publicly (by government). Economic theory identifies the circumstances where government supported research is sound policy. Minimize transactions costs to improve market efficiency. Contracts, voluntary industry standards, government regulations, and treaties, if properly formulated, can reduce transactions costs and improve commerce and trade.

Introduction

Society has long recognized the critical importance of stored product protection for the welfare of humans and domestic livestock. Protection technologies vary greatly across the globe. In some places protection technologies are very sophisticated and effective; in others losses are huge. Estimates of stored product losses vary greatly, but are large in aggregate and potentially economically devastating to individual enterprises (Grolleaud, World Resources Institute).

Economists note that successful stored product protection provides benefits beyond basic food security. Benefits include productivity gains from more efficient resources use, gains from trade, and market stability.

Economic principles can be applied to stored product protection to understand current practices and to indicate pathways to refine storage strategies. Five economic principles of general applicability are succinctly stated as: compare costs and benefits; model continuous and discrete choices; externalities exist; consider transactions costs; and public versus private goods.

Participants in the business of stored product protection are probably applying these principles. Presenting this information from the perspective of an economist may help storage practitioners refine their application. Each of these is now described more fully.

Compare Costs and Benefits: Cost-benefit analysis (CBA) is a powerful tool to guide decisions. All costs and benefits are quantified and monetized and the course providing the greatest net benefits is the preferred alternative. Benefits in stored product protection are the value of physical product at the end of the storage cycle for each storage regime. A baseline storage outcome is needed for making comparisons. Stochastic cost-benefit models can provide additional insights when certainty parameters can assume different values and there is some knowledge of the probability distribution of these values. Parameters that might vary include the initial pest pressure, efficacy of