

The dispersion of fumigants around containers treated for pest control (Health risks in the Surroundings of Containers containing Dangerous Volatile Substances)

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In 2006 the Dutch National Institute for Public Health and the Environment investigated safe distances around fumigated export containers. Fumigation in the Netherlands is only allowed when a receiving country requires treatment of the goods or the container and no other means than fumigation are applicable. After fumigation degassing is obliged before the container is available for transportation. Degassing means airing the container by opening the doors so that the fumigation gases can evaporate. During this release a safe distance might have to be maintained to protect humans from exposure to dangerous concentrations.

To establish that distance groups of three empty containers were fumigated twice. One group of containers was treated with methyl bromide, a second group with sulfurylfluoride (vikane) and a third group with phosphine. The concentrations in the containers were comparable to what is common practice: methyl bromide concentrations of about 48 g per m³, sulfurylfluoride concentrations of 65 per m³ and phosphine concentrations of 1 g per m³. Per group three containers were fumigated to simulate what might happen in practice in a worse case.

After gassing the normal operating period - of 24 hours for methyl bromide and sulfurylfluoride and of ten days for phosphine - was maintained before opening the containers. Two experiments were done in august 2006.

During the airing of the containers the concentrations of the gases were measured in the surroundings from 5 to 100 metres. Several instruments were used, all validated methods. Results indicated that high concentrations (20 – 800 mg per m³) of methyl bromide were measured from 5 to 30 metres downwind of the containers in a period of minutes just after opening the containers. This resulted in hourly averages of a few mg per m³ methyl bromide. This does not exceed the Dutch standard of 10 mg per m³ 1-hour averaged.

With model calculations the results were extrapolated to other weather conditions than met during the experiments. Concentrations up to the Dutch standard for 1-h averages were only calculated around the container (up until 20 metres). At a distance of 50 metres the concentrations were less than 20% of the standard for all weather conditions (except wind still weather).

There are several considerations. Choices in the set-up of the experiments were always made so that the results would be yield high concentrations. For example a set of three containers was used and the airing started at the same moment. On the other hand, the gassing concentrations did not always reach its targeted value and was for example ten times less than the target value. In that case the container contributed not that much to the concentrations in the surroundings.

The fact that the containers were empty was probably a more important factor. The main release of the fumigations gases happened in a few minutes. In containers loaded with goods it is assumable that due to adsorption a lower amount is released initially but the release until gas free will take more time.

We have advised safe distances depending on the amount of gases in the container and based on the rule that on a safe distance the maximum concentration is not more than 20% of the Dutch standard.

This means that no one should be allowed to enter a restricted area of 50 metres around containers with amounts of detergents up to 5 kg methyl bromide or sulfur dioxide. When smaller amounts (up to 1 kg for methyl bromide) are applied or occur (in import containers) an area of 20 metres will be sufficient. Within these distances concentrations may occur that are harmful to human health and breath protection equipment should be used.

The restricted areas should be established at the start of the treatment (gassing) because of possible leakage from the containers.

Another recommendation is to prohibit (starting) the release of the detergents under calm weather conditions. High concentrations may then occur for some time and at distances greater than 50 metres.