METHYL BROMIDE EMISSION CONTROL FROM COMMODITY FUMIGATION

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SUMMARY

A proprietary process to control emissions of Methyl Bromide (*MB*) to the atmosphere is undergoing verification at USDA-ARS in Fresno. The process consists of trapping the *MB* with an appropriate adsorbent, such as activated carbon, reactivation of the carbon for further use as adsorbent, thermal destruction of the desorbed *MB*, and the recycling of its bromine content for reuse in the manufacture of new *MB* and other brominated compounds.

The process has several advantages:

A. The fumigation procedures will remain as they are now. The fumigant will be "virgin" *MB*, since the *MB* made with recovered bromine is indistinguishable from that produced with naturally occurring bromine.

B. The control process does not interfere with current fumigation operations. The contaminated air, instead of being discharged directly to the atmosphere, passes first through an adsorption vessel charged with activated carbon. A properly sized blower maintains the current ventilation rate, and the fumigated commodity is not affected by the presence of the activated carbon.

C. The reactivation and thermal destruction of *MB* does not generate a secondary waste stream. The carbon and hydrogen content of the *MB* (15% w/w) forms carbon dioxide and water. The bromine content of the *MB* (85% w/w) is recovered for recycle in a convenient form, such as sodium bromide, and reused by itself, or used to manufacture *MB* and other brominated compounds.

D. The cost of the control process is reasonable. An estimate shows that *MB* can be sold to the end user together with the required control process for no more than $15/lb *MB*. The cost includes the *MB* and the delivery of the adsorption vessels with fresh adsorbent. It also includes the return of the adsorption vessels and the reactivation of the carbon. The fumigator has to supply the blower, ducting and controls to connect to the adsorption vessel(s).

DISCUSSION

The ban of *MB* for commodity and quarantine fumigation will cause serious economic losses to agriculture, especially for countries which import and export agricultural products.

There are two ways of protecting the stratospheric ozone layer: The first way, which has been selected by some countries because of existing laws and agreements, is to ban all production and use of *MB*. This will guarantee reduced *MB* emissions, but at a considerable economic cost to society. The second way to protect the ozone layer is to allow the continued use of *MB* for commodity fumigations, and to control the *MB* emissions to the atmosphere. There will be a major economic benefit to society by controlling *MB* emissions, rather than by banning *MB*. The ozone layer is protected in either case.

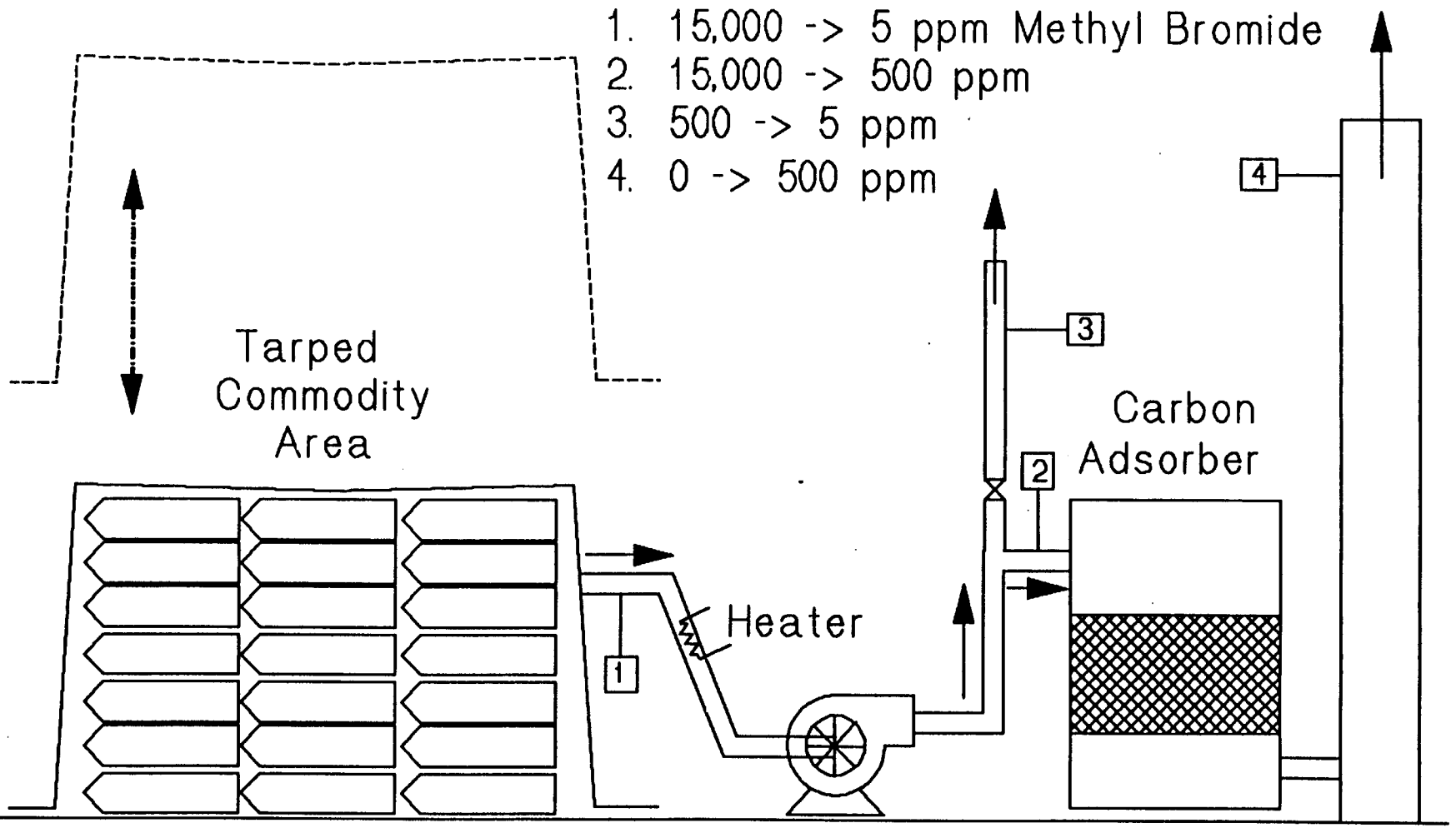
Tests are in progress at the USDA-ARS Horticultural Crops Research Laboratory in Fresno under a *Cooperative Research and Development Agreement* (*CRADA*) between USDA and GFK Consulting Ltd. We are optimizing the *MB* adsorption capacity by evaluating three types of activated carbons supplied by Calgon, Norit and West States Carbon. Other variables under investigation are temperature, humidity, and *MB* concentration. Pilot scale commodity testing will be done in a 500 cft VacuDyne chamber operating at atmospheric pressure to simulate "grid" fumigations. The carbon adsorption equipment, which was paid for by Great Lakes Chemical Co., was designed and built to demonstrate the suitability of commercial equipment.

The spent carbon will be transported off-site for regeneration and thermal destruction of the desorbed *MB*. Special combustion conditions, which are required to convert all of the bromine to HBr in the combustion process, will be verified. The HBr will be absorbed with caustic as an aqueous NaBr solution, and recycled to the bromine plants of Great Lakes Chemical Company.

Regulatory personnel (US-EPA, USDA-APHIS, CAL-EPA, CA-DPR, South Coast [Los Angeles] Air Quality Management District) have been kept informally appraised of our efforts. The spent carbon is not a RCRA Hazardous Waste. It may be a CA listed waste, unless we can meet California's "recycling" criteria.

The next step in the verification of the process is to perform emission control at a commercial site. Commercial adsorption vessels are available and can be placed in service on short notice if the appropriate blower and ducting are available.

Fig 1. Typical Methyl Bromide Commodity Fumigation



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