'Bubble' Fumigation: a New Concept

C.P. Smith
Rentokil PLC, Felcourt, West Sussex RH19 2JY, U.K.

Traditional methods of fumigation have a number of limitations. Chief among these for small stack fumigations are inefficient sealing and, when using methyl bromide which is 3.5 times heavier than air, the phenomenon of layering.

These limitations can be overcome by the use of fumigation chambers, but such devices are expensive and for the most part their installation is feasible only for the regular treatment of high-value commodities.

Another major problem of traditional methods of fumigation is, of course, that of the likely occurrence of residues in food and the environment, a situation to which there is increasing resistance among consumers and regulatory authorities.

Against this background, Rentokil set about developing a new, portable fumigation system to overcome current limitations. The result is the so-called 'Bubble' fumigation system, the 'bubble' being a sealed plastic enclosure as described in subsequent paragraphs and shown in Fig. 1.

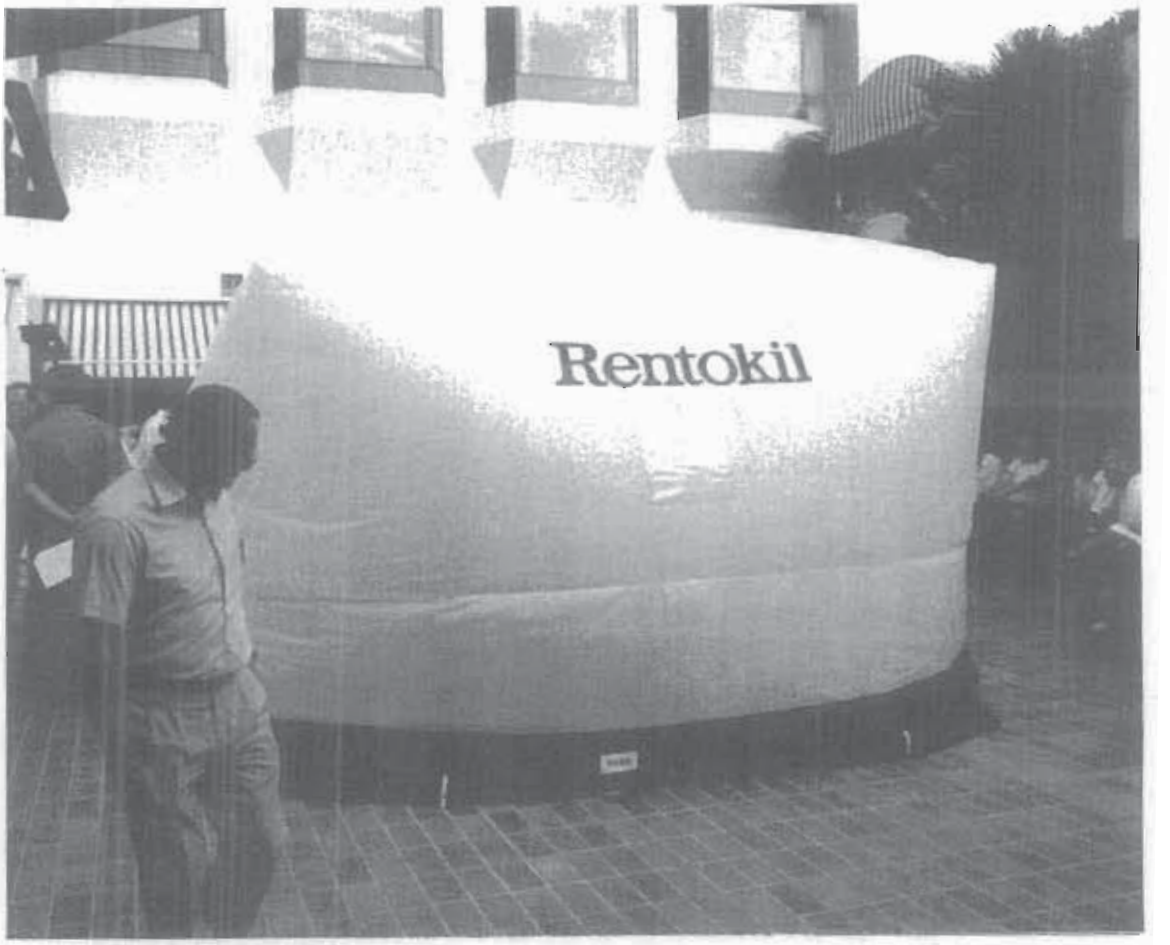

Fig. 1. Sealed enclosure of Rentokil Fumigation System

The key to the system is a unique, purpose-made, gastight zip for sealing the enclosure. The zip is made from a mixture of hard-wearing durable plastics. One half of the zip is welded to the leading edge of a purpose-made top cover, made from a PVC, polyester-net-reinforced fumigation sheet. The other half is welded to a base sheet made from a hard-wearing chloro-sulphonated polyethylene.

When the top cover and base sheet are zipped together they form a bubble that is, for all practical purposes, gastight and has the ability to safely receive, hold, and be purged of fumigants. The enclosure also allows fumigations to be carried out in locations where they would not normally be permitted.

The standard fumigation bubble has a capacity of 30 m^3, but virtually any shape or size between 1 and 90 m^3 could be made. The 30 m^3 enclosure will hold up to 12 loaded pallets, but as few as one pallet can be fumigated, or even a single object such as a table. There is virtually no restriction on the type of commodity, or item, that can be treated. Moreover, the enclosure, attached to a dehumidifier, can be used as a pesticide-free dehumidification chamber for mite and booklouse control.

For methyl bromide fumigations a purpose-built dispenser unit is used (Fig. 2). This first creates a partial vacuum within the enclosure, so aiding the subsequent penetration of fumigant into tightly packed commodities and permitting some reduction in fumigation times.

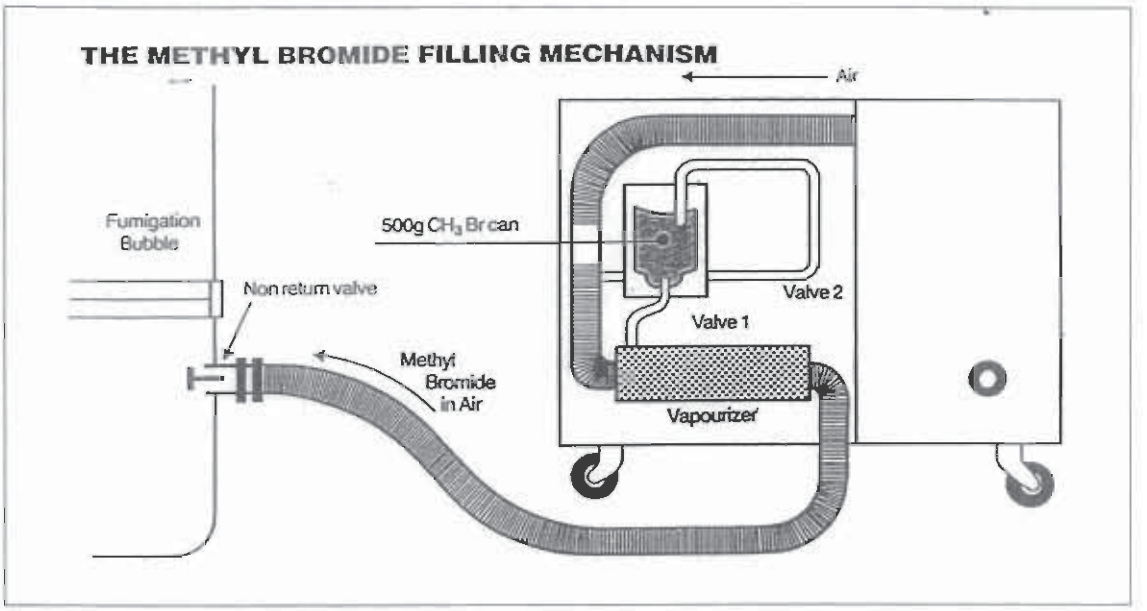

Fig. 2. Rentokil Fumigation System methyl bromide filling mechanism

If phosphine is used, standard phosphine-generating tablets are simply placed in the enclosure before it is zippered up.

At the end of a fumigation the gas contents of the enclosure are force ventilated to a suitable discharge point, or can be vented through a gas scrubber of, for example, activated carbon, so ensuring the release into the atmosphere of clean air only (Fig. 3).

The chamber is also suitable for fumigations using carbon dioxide or nitrogen.

As regards gas retention and Ct products, the bubble fumigation system behaves as a fumigation chamber. Trials conducted with empty bubbles and methyl bromide (Fig. 4) demonstrate the gastightness of the system. Fig. 5 shows the performance of the system for a methyl bromide fumigation of 8 tonnes of bagged cocoa beans. A Ct product of more than 300 g hours/m^3 was achieved.

In summary, the Rentokil Fumigation System overcomes many of the disadvantag-

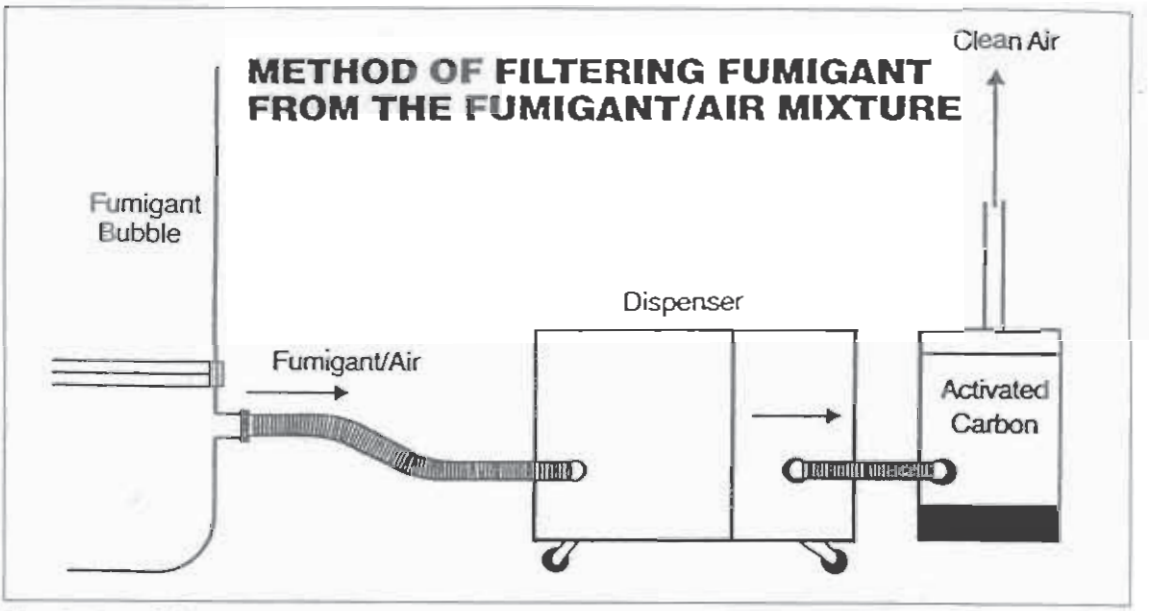

Fig. 3. Rentokil Fumigation System: method of scrubbing fumigant from ventilated enclosure.

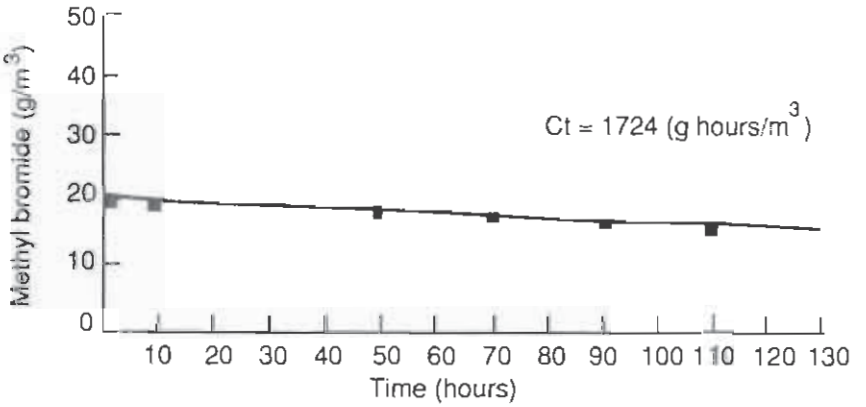

Fig. 4. Retention of methyl bromide in an empty fumigation 'bubble'.

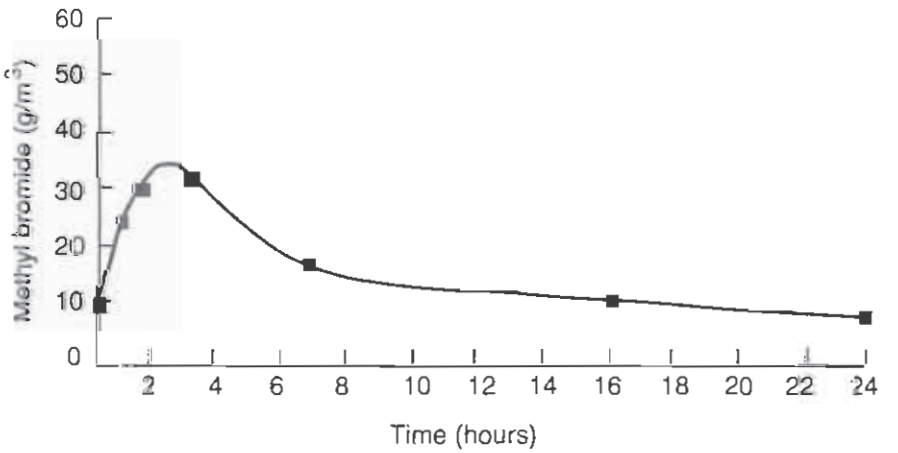

Fig. 5. Methyl bromide concentration in a 30 m^3 fumigation 'bubble' during fumigation of 8 tonnes of bagged cocoa.

es associated with traditional stack and chamber methods of fumigation. It enables fumigations to be safely undertaken in locations previously deemed unsuitable, and may enable the wider use of alternative fumigants such as carbon dioxide.