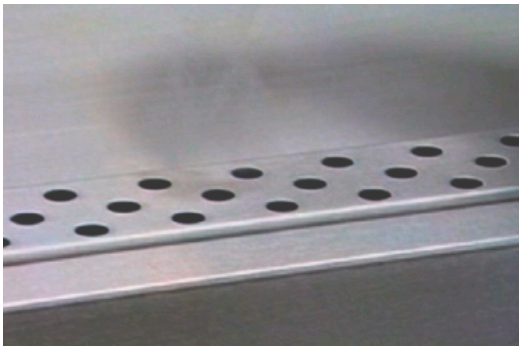
Independent airflow testing on the AFOS down draught autopsy table

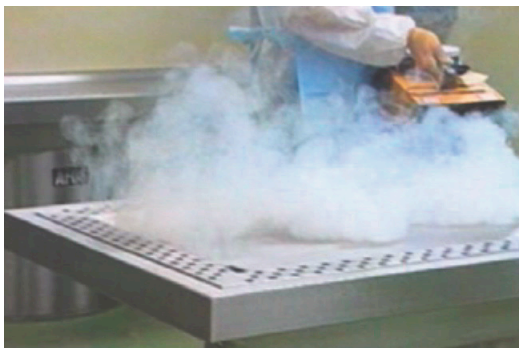
Conducted at Hull City Mortuary

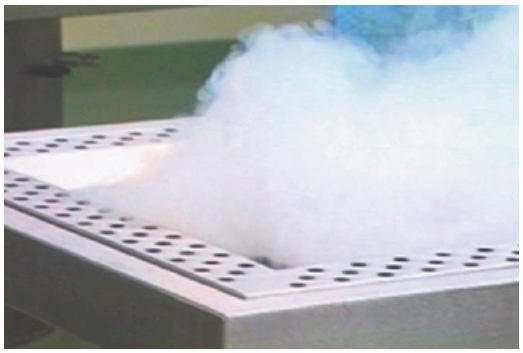
The still photographs are extracts from the official test video

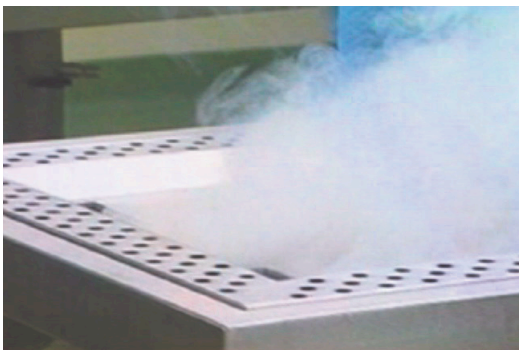
The results show:
Clean air breathing zone
All air around the body contained by the table

The Full test video is on the attached CD, please note this shows part of a live autopsy









TESTS ON FORMALDEHYDE LEVELS FOR THE AFOS VENTILATED SPECIMEN TABLE

BY THE NORTH WEST
REGIONAL HEALTH AUTHORITY,
AT THE ROYAL ALBERT EDWARD
INFIRMARY, WIGAN
ON 26TH APRIL 1984

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with an introduction by J.D. Kelly, Technical Advisor to Afos Ltd

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Introduction

These notes provide an interim appraisal of the functioning of the Afos ventilated specimen table during working operations. Measurements were carried out by engineering staff from the North West Regional Health Authority, whose report is enclosed. All quantitative data relating to measured levels of formaldehyde were reported to us verbally by the test engineers. All data relating to air flow measurements were established at the time by Afos using their own equipment.

Design Parameters

Several systems are currently used to reduce the levels of formaldehyde in tissue cutting areas. These can be broadly categorised as "open bench" systems and "closed bench" systems. Closed bench systems have the advantage that being based on the classical fume hood they can be relied on to give a guaranteed containment without the need to resort to extensive testing and costly development. Their disadvantages are immediately apparent. Access and working space are limited, viewing is often distorted through the glass sash and the positioning of the hood in the laboratory is limited.

Open systems have not enjoyed an immediate popularity, probably due to the fact that extensive development is required without any guarantee that the system will function adequately in the working environment. Various so-called ventilated bench designs have been tried in the past, mostly extracting air from vertical slots immediately behind the work-top. This has two disadvantages. Firstly it is necessary to move relatively large volumes of air through small extract slots with the attendant problems of noise and disturbance of papers and materials on the bench. Secondly, and like the fume hood, positioning in the laboratory is limited, only allowing access to one side of the bench.

Afos recognising these problems, decided to embark on the development of a new approach to the problems of tissue cutting and the extract of formaldehyde and other noxious vapours. The need to have access to the work station from at least two sides was immediately apparent, especially in the case of ventilated postmortem tables, where the same principles of ventilation are becoming increasingly required. The need to draw air away from beneath the worktop was the choice solution to the problem. In proposing a suitable design, the following features were considered:-

a. The problem of avoiding loss of tissue either down the drain or into the extract duct.

b. The need to ensure that the table functioned adequately in the working environment, and not purely in a hypothetical situation. For example, it was recognised that at least half the table surface would be covered with sample jars and equipment during the cutting operation.

c The need to provide a system which not only meets the currently accepted levels of formaldehyde vapour (2ppm), but which would be able to meet the requirements of more stringent standards currently adopted in certain other countries (1ppm).

d. The need to have independent testing of the table in a working situation ideally during operations most likely to increase formalin levels in the surrounding air to unacceptably high levels.

A full literature search has been carried out which reviews the current legislative position relating to formaldehyde vapour and also the most recent information on formaldehyde toxicity.

Materials and Methods

The Ventilated Specimen Table was set up in a histology cutting room. The table was connected to a centrifugal extract fan taking the extracted air directly to the outside of the building to discharge into the atmosphere vertically at high velocity. The table extract rate was set to 0.2360^ with an air velocity immediately over the table of 0.33m/s with the table clear, and 0.38m/s with sample pots and cutting board on the table. The air velocity was determined using a rotating vane anemometer. Formalin levels were determined using a Wilks Miran infra-red gas analyser calibrated for formaldehyde and a sensitivity greater than 0.1 ppm. The gas analyser was coupled to a pen recorder to give continuous read-out during the measurement period.

Anemometer readings were taken at a constant position on the diagonally opposite corner to the cutting board, 200mm from the side and rear edge.

During the time of measurement approximately 50 of the extract holes on the table were covered with cutting boards and pots.

Results

Measurements were taken in a number of situations during the cutting of tissue and the disposal of formalin solution (10 formalin).

1 Cutting a large mass of colon, fat and mesentery (approx. 0.5kg)

Formaldehyde concentration in the technicians breathing zone, 580mm above the bench was less than 0.2ppm.

Formaldehyde concentration 150mm above the bench level was O.Sppm.

2 Cutting a medium mass of tissue (uterus and ovary)

The results were as in 1.

3 Cutting spongy placenta, normally generating much vapour

The results were as in 1.

4 Repeat of 1 with the extract fan switched off

Up to 3ppm was measured above the bench.

5 The sink extract was tested during the time of pouring 2 litres of 10 formalin down the sink. With the sink extract open or closed, the level of formalin did not exceed 1ppm at a position 300mm above the sink.

Discussion

This interim report summaries the testing carried out on the ventilated specimen table. In all situations tested in a working laboratory the maximum allowed levels of formaldehyde were not exceeded in the working zone. Results of the testing of the sink extract indicate a degree of over provision in the first production models, as extract via the bench top appears to be quite adequate without the need for sink dampers.

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Tests were conducted following the installation of the new ventilated specimen table in the above department.

The concentration levels of formaldehyde were assessed using a Miran single beam infra-red gas analyser. The sensing head of the analyser was positioned at a height of 61 Omm above the cut up table, to accurately assess the concentration levels in the operative breathing zone. A typical tissue cut up, session was conducted, followed by a specimen disposal session. The results are shown on the attached graph.

Tissue Cut Up

Four specimens were examined and the concentration levels monitored with the extract ventilation system on. The extract ventilation system was then completely switched off, to assess the rise in concentration levels when a specimen was examined. Four further specimens were examined with the extract ventilations systems switched on. The results were as follows:-

(i) Highest short term exposure levels (10 minute period)

(a) Before extract system switched off, STEL0.48 ppm

(b) The extract system was switched off (for a 1.5 minute period), in which time the concentration levels rose to 2.6 ppm

(c) The extract was then switched on again and the STEL noted at: 0.76 ppm

(ii) Time weighted average for the cut up sessions was: 0.55 ppm (This average omits the 2.5 peak when extract switched off)

Disposal

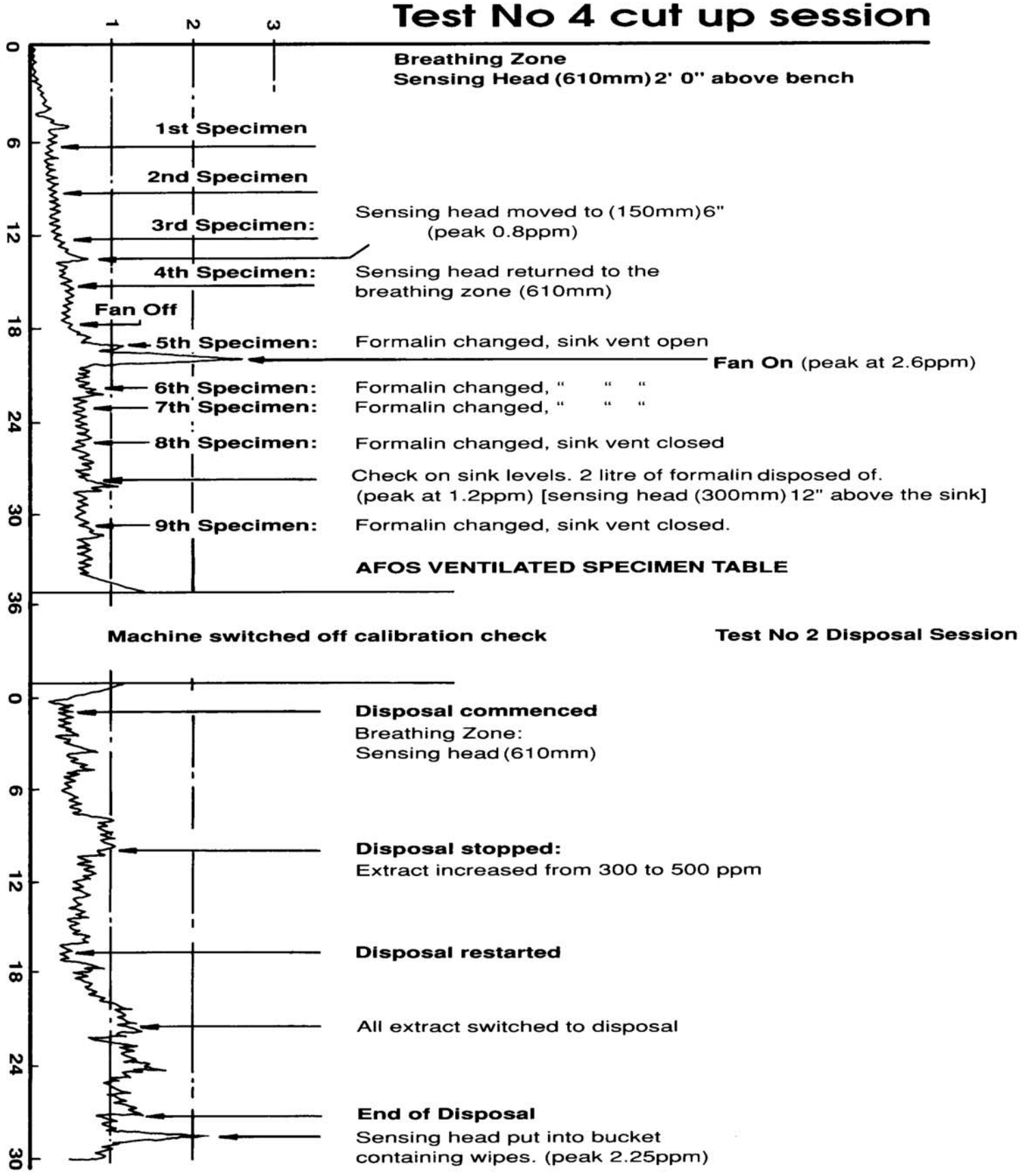
During the disposal session two techniques were employed. The first five specimens were disposed of with the container lids removed immediately at disposal, the containers were then thrown into a plastic sack. Five further specimens were disposed of, but this time the container lids were removed well in advance of the disposal, the containers being then thrown into a plastic sack. The results were as follows:-

(i) Highest short term exposure level (i.e. 10 minute period) over session: 1.25 ppm

(ii) Time weighted average concentrations over the session: 0.88 ppm. The mechanical extract ventilation was switched over from the dissecting bench to give maximum extract for the disposal of specimens.

The results of the tests fall well within the new Health and Safety publication, EH40 "Occupational Exposure Limit". This latest publication from the H.S.E. has dropped the former concept of the "ceiling limit" (a value that should not be exceeded). The new recommended limits published in EH40 refer now only to the short term exposure limit (10 minute period) and the time weighted average of 2 ppm for formaldehyde.

Concentration levels parts per million



Wigan Histopathology Reading Taken 20 April 84

Clear breathing zone

Table 1 - AFOS Down Draught Grossing Table	
Formaldehyde levels in the breathing zone, 580mm above the bench	
Activity	Concentration of formaldehyde - ppm
Cutting Colon	< 0.2 ppm
Cutting Uterus	< 0.2 ppm
< 0.2 ppm	< 0.2 ppm
< 0.2 ppm	< 1 ppm
Extract rate 500 cfm, Velocity over extract 65/75 feet/minute	

Analysis undertaken by the COSSH Department St.James' Hospital Leeds
Levels of Anaesthetic Agent at Head Height

The Red line illustrates the reduction in anaesthetic agent obtained with the Afos anaesthetic gas dispensing unit