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SIMULATION OF THE EFFECT OF HUMAN SMOKER BLOCKING

THE TIP VENTILATION ON CAMBRIDGE

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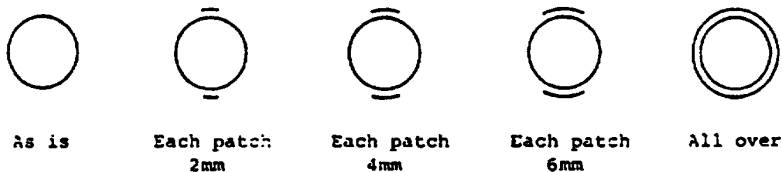
A small experiment was carried out to investigate the effect of blocking the tip ventilation on:

- (a) TPM delivery;
- (b) unbound cigarette pressure drop; and
- (c) tip ventilation.

The cigarettes used were the 1mg soft-cup version of Cambridge as supplied by B&W last September.

Initially it was planned to determine deliveries in five states of tip ventilation blockage and at two puff volumes (35cc and 50cc per 2-second puff at 1 puff per minute). However, after the first set of smoking runs it was discovered that the puffing frequency used was 2 puffs per minute instead of the required 1 puff per minute. Therefore the smoking runs were repeated. As it happens, the frequency of 2 puffs per minute is probably closer to the human situation (although the puff volume of 50cc is probably on the low side) and therefore these results have also been included in Table 1. *lh*

The butt mark used during smoking was as per FTC method of overtipping (32mm) plus 3mm. The cigarettes were smoked on the 20 port Borgwaldt smoking machine (Pluto III) and the mean deliveries are based on 10 cigarettes. The ventilation and pressure drops are means of 20 cigarettes. The following ventilation blockages were achieved by using self-adhesive labels:



The four-row perforation zone on Cambridge is 4mm wide and each patch was 6mm in width. The deliveries obtained are shown in Table 1 and Figure 1.

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TABLE 1

BLOCKING EFFECT

(TPM deliveries in mg/cig)

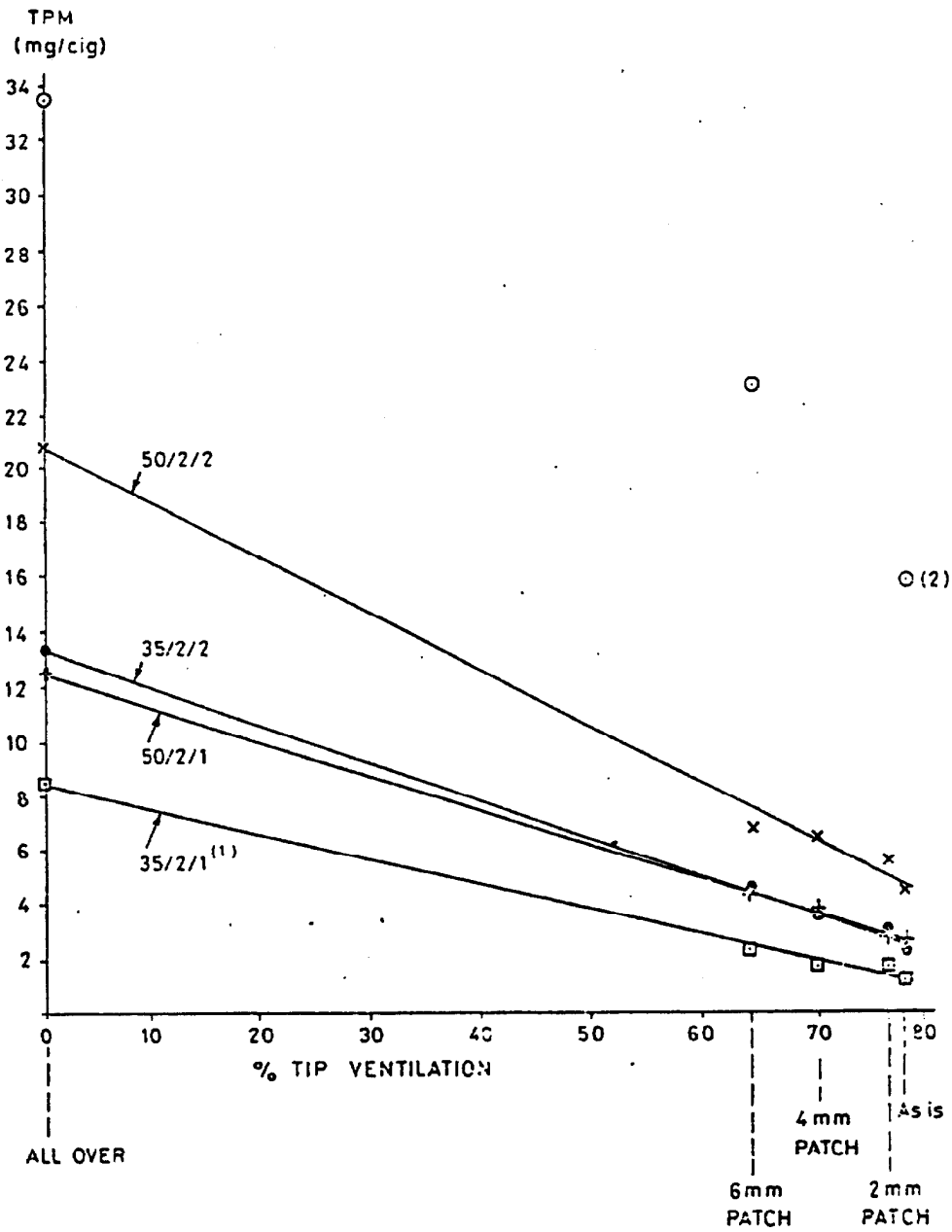
	PATCH SIZE				
	None	2 x 6mm	4 x 6mm	6 x 6mm	All over
Unbound cig p.d. (mm WG)	105	114	117	128	216
Tip ventilation (%)	78.4	76.8	70.4	64.5	1.8
<u>1 puff/min</u>					
35cc/2 sec	TPM 1.29	1.61	1.69	2.30	8.44
	Puff No. 8.0	7.5	6.9	7.2(?)	5.8
50cc/2 sec	TPM 2.63	2.83	3.69	4.35	12.58
	Puff No. 7.2	7.2	7.1	7.0	5.0
<u>2 puffs/min</u>					
35cc/2 sec	TPM 2.29	3.00	3.48	4.61	13.24
	Puff No. 14.5	14.5	14.2	13.2	9.3
50cc/2 sec	TPM 4.52	5.63	6.51	7.83	20.9
	Puff No. 13.1	12.5	12.3	11.5	7.7
<u>75cc/1 sec/puff every 25 sec*</u>					
	TPM 15.21			23.07	33.36
	PMWNF 12.03			16.27	17.35
	Nicotine 0.92			1.32	1.42
	Puff No. 13.0			10.4	9.4

* Work carried out in October 1981

In addition to the objective work using patches, 3 batches of 5 cigarettes each were smoked on a single port Borgwaldt smoking machine by 2 operators. In these instances, the operators actually blocked the ventilation zones with their fingers during smoking and to be realistic the smoking on each cigarette was stopped at the end of the puff closest to the butt mark. The mean deliveries obtained are shown in Table 2.

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FIG.1
TPM VERSUS TIP VENTILATION
EFFECT OF BLOCKING



(1) 35/2/1 = 35cc PUFF, 2 SECOND DURATION, 1 PUFF PER MINUTE.

(2) ○ = 75cc PUFF, 1 SECOND DURATION, PUFF EVERY 25 SEC.

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TABLE 2

HUMAN BLOCKING

(Single Port Machine, 35 cc/1 sec/1 puff/min)

Operator A	TPM	3.1
	Puff No.	7.6
Operator A	TPM	2.5
	Puff No.	N/A
Operator B	TPM	4.0
	Puff No.	7.4

Bearing in mind that the latter smoking runs were carried out on a different smoking machine and that the final deliveries will be very sensitive to the pressure applied by the fingers during smoking, the delivery range of 2.5-4.0 mg TPM suggests that the effect of covering ventilation holes by smokers is at least equivalent to blocking the ventilation with two 6 mm x 6 mm patches. Since the circumference of Cambridge is 25 mm, this is equivalent to blocking 50% of the circumference.

Figure 2(a) shows the staining patterns in the mouth end of the filter during the smoking run by Operator B (TPM = 4 mg/cig). These may be compared with the staining pattern obtained on the same machine using cigarettes with two 6 mm x 6 mm patches shown in Figure 2(b). It should be pointed out that during human smoking it is unlikely that the smokers will block exactly the same portion of the tipping during each puff and hence the staining patterns shown in Figure 2 may not be achieved.

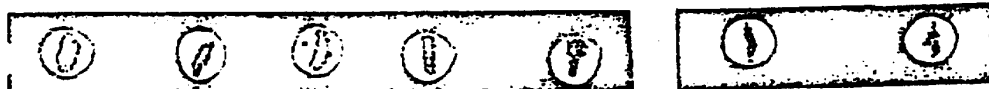


Fig. 2 - Staining pattern of the filters

(a) Human

(b) Two 6 mm x
6 mm patch