

TO Dr. L.C.F. Blackman,
 Director,
 Millbank.

FROM Dr. T. Hirji

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REF TH/AH

DATE 5th July, 1982.

SIMULATION OF THE EFFECT OF HUMAN SMOKER

BLOCKING THE TIP VENTILATION ON CAMBRIDGE

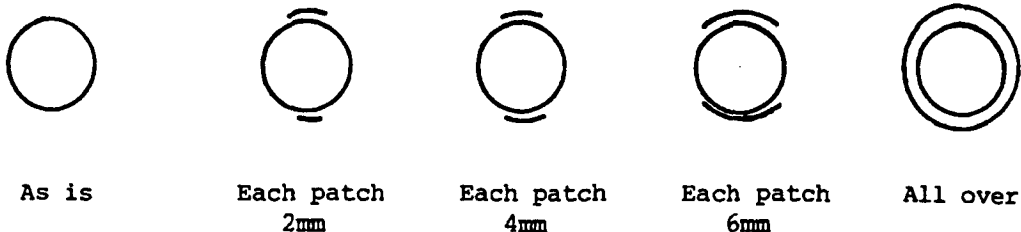
A small experiment was carried out to investigate the effect of blocking the tip ventilation on:

- 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 5 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/ 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.

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 4 row perforation zone on Cambridge is \approx 4mm wide and each patch was 6mm in width.

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The deliveries obtained are shown in Table 1 and Figure 1. In addition, 5 cigarettes were smoked at 35cc, 2 sec duration, 1 puff per minute on a single port Borgwaldt smoking machine. In this instance, the operator actually blocked the ventilation zone with his fingers during smoking. The average TPM delivery obtained was 3mg which suggests that in this case the effect was roughly equivalent to blocking the ventilation zone with 2 6mm x 6mm patches. Since the circumference of Cambridge is 25mm, this is equivalent to blocking 50% of the circumference.

The practical work was carried out by Paul Case, John Courtney, David Creighton and Colin Greig.



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TABLE 1

BLOCKING EFFECT

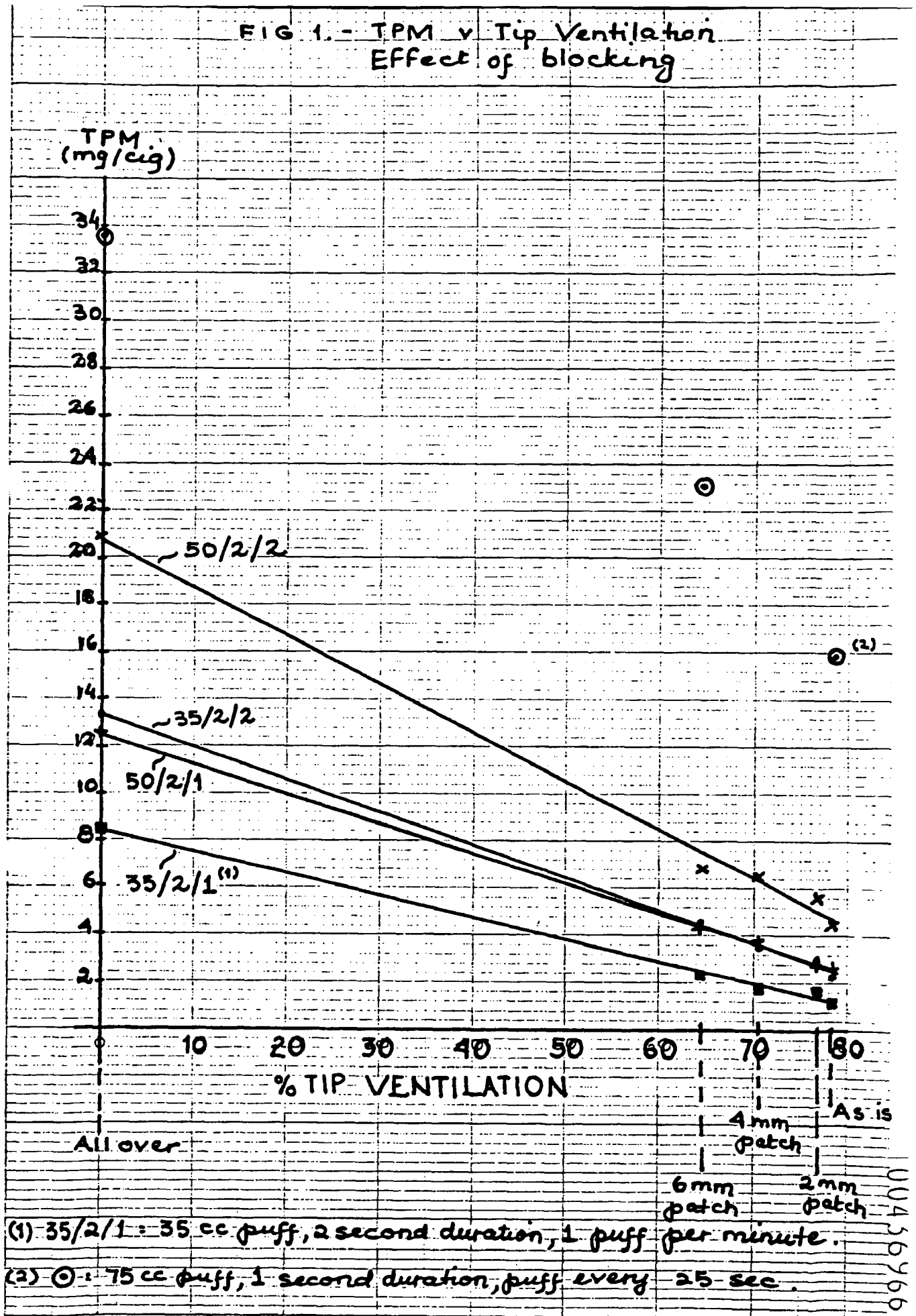
(TPM deliveries in mg/cig)

	PATCH SIZE				
	None	2 x 6 mm	4 x 6 mm	6 x 6 mm	All over
Unbound cig p.d. (mmWG)	105	114 ^{+8.5%}	117	128 ^{+17.5%}	216
Tip ventilation (%)	78.4	76.8 ^{-2%}	70.4	64.5 ^{-17.5%}	1.3
<u>1 puff/min</u>					
35cc/2 sec TPM	1.29	1.61 ^{+24.8%}	1.69	2.30 ^{+78.3%}	8.44
Puff No.	8.0	7.5	6.9	7.2(?)	5.3
50cc/2 sec TPM	2.63	2.83	3.69	4.35	12.58
Puff No.	7.2	7.2	7.1	7.0	5.3
<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</u>					
<u>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	8.4

(+) Work carried out in October 1981.

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FIG 1. - TPM v Tip Ventilation
Effect of blocking



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 acutally blocked the ventilation zones with their fingers during smoking and to be realistic the smoking on each cigarettes was stopped at the end of the puff closest to the butt mark. The mean deliveries obtained are shown on p6.

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 - 4.0mg TPM suggests that the effect of covering ventilation holes by smokers is at least equivalent to blocking the ventilation with two 6mm x 6mm patches. Since the circumference of Cambridge is 25mm, this is equivalent to blocking 50% of the circumference.

Figure 1(a) shows the staining patterns in the mouth end of the filter during the smoking run by Operator B (TPM = 4mg/cig). These may be compared with the staining pattern obtained on the same machine using cigarettes with two 6mm x 6mm patches shown in Fig. 1 (b).



Fig. 1 - Staining pattern of the filters

(a) Human

(b) Two 6mm x 6mm
patch

This work is now brought to the attention of the MPDC and its implications will be discussed further at the Research Conference in 1982.

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RESULTS: TPM deliveries (mg/cigarette)

	PATCH SIZE				
	None	2 x 6 mm	4 x 6 mm	6 x 6 mm	All-over
Unbound cig p.d. (mmWG)	105	114	117	128	216
Tip ventilation (%)	78.4	76.8	70.4	64.5	1.8
<u>1 puff/min</u>					
35cc/2sec 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/2sec 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</u>					
<u>25 sec</u> (+) TPM	15.21	N/A	N/A	23.07	33.36
PMWNF	12.03	N/A	N/A	16.27	17.35
Nicotine	0.92	N/A	N/A	1.32	1.42
Puff No.	13.0	N/A	N/A	10.4	8.4

(+) Work carried out in October 1981.

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35cc/1sec/1puff/min

"Human blocking" (Single port machine)

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

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