

To: Mr. K. L. Rush

Date: 4-26-88

From: Ms. V. C. Suh

SUBJECT: Summary Of Data Comparing New Outer Wrap Paper
(P1981-52-4) With The Current Outer Wrap Paper
(P1768-190-3).

This summarizes data, both performance and sensory perception, comparing the new, lower pH, outer wrap paper with the current outer wrap paper.

OBJECTIVE:

To determine if the new outer wrap paper provides performance and sensory perception equivalent to the current outer wrap paper and at the same time offer an improvement in color stability.

SUMMARY OF RESULTS:

All following results are comparisons of the new versus the current outer wrap paper.

I. Performance

- A. Totals, 50 cc/ 30 sec, S.I.P. - No significant difference in deliveries. See attachment I.
- B. CO / CO₂, FTC - No significant difference. See attachment I.
- C. Stress Smoking, 50 cc/ 15 sec, Double Clutch From The 13 Th Puff - No significant difference. See Folder.
- D. Paper Burn Back And Char Width - No significant difference. See attachment II.

- E. Color Stability Data - Kimberly Clark Corp.'s Paper Mill has brought to our attention that the current outer wrap paper will not and can not be guaranteed against yellowing before or after shipment to R.J.R. It is in our best interest to pursue a more color stable product like the lower pH outer wrap paper. In fact, their concern was of such magnitude that they shared the Hunter Color data obtained on the higher pH paper just before and after flavor treatment. Note that the lower " L " value means less brightness and the more positive " b " value indicates a more yellow color. Another important point is that the current outer wrap paper will have more variability in color as seen in the higher level of standard deviation. See attachment III.

A number of experiments run at Kimberly Clark Corp. support the observation that the current outer wrap paper will yellow upon exposure to the atmosphere, whereas the new outer wrap paper will retain its color even at stress conditions such as exposure to NO₂. Some level of NO₂ is present in the paper mill via exhaust gases released from trucks.

- F. Paper Burn Back With Respect To The Level Of Potassium Succinate - A new and important finding from our evaluation of burn back on models is that the lower pH paper is significantly less sensitive to the level of potassium succinate required to provide proper burn back.

See attachments IV - VI.

II. Sensory Perception

- A. Q.D.A. Panel - Five attributes broke out significantly and one trend was perceived. Three positive attributes ratings for the new outer wrap paper are more added flavor, more flavor consistency and more burning tobacco taste (This one was a trend). Three negative attributes ratings for the new outer wrap paper are less concentration of smoke, more irritating aftertaste, and more dirty after taste. See attachment VII & VIII.

Looking at historical Q.D.A. data on products similar to the control, we find the new outer wrap paper rates in the typical range for all five attributes where significant differences were perceived.



- B. Weekend Informal Smoking Panel - No significant difference in product preference, both overall and on various attributes. See attachment IX & X.
- C. Informal Sensory Panel - No significant difference for any of the seven attributes. It is interesting to note that although the Q.D.A. Panel showed less "concentration of smoke" for the new outer wrap paper, this informal panel showed equal "impact" for the two papers. For "off taste" in the later puffs, the new outer wrap paper had almost significantly lower level than the current paper. See attachment XI & XII.
- D. Room Aroma Study - No significant difference between the two papers, overall. However, among the smokers the current outer wrap paper was significantly better in acceptance ratings. See attachment XIII.

RECOMMENDATION:

The new outer wrap paper with the lower pH is recommended for the following reasons.

1. There are no significant differences between the new outer wrap paper and the current one in performance.
2. The new outer wrap paper offers a significant improvement in color stability, whereas the current outer wrap paper will not be guaranteed by our supplier to remain white even during shipment.

The supplier will refuse agreement of any kind of color specifications on the current outer wrap paper since that paper will yellow inconsistently, thereby presenting a quality and consistency problem.

3. The new outer wrap paper offers better quality assurance in terms of reduced sensitivity to the level of potassium succinate required to achieve proper burn back. This benefit is important for processing and performance. On the other hand, the current outer wrap paper will have a much narrower range of potassium succinate level required to achieve proper burn back, i.e. small changes in its level can cause either inadequate or excessive paper burn back.



Furthermore, another problem presented by the current outer wrap paper is that in the future with larger production run, we can expect more variability in the potassium succinate level than what we have seen up to now. This increased variability will translate to performance (burn back) variability. The new, lower pH, paper will be much more tolerant of this potassium succinate level variability due to reduced sensitivity to the burn chemical on performance.

Vivian C. Suh

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QUALIFICATION OF NEW OUTER WRAP PAPER

PAPER I. D.	WTPM (mg)	NICOTINE (ug)	GLYCERIN (mg)	FTC CO (mg)	FTC CO2 (mg)	#PUFF
1768-182	24.6	943.7	11.8	12.4	31.3	14
#104 FL. NON-PERF.	+/-1.2	+/-43.1	+/- .9	+/-1.9	+/-1.5	
1768-182	24.5	953.3	10.8	10.1	26.4	15
#104 FL. PERF.	+/-2.1	+/-54.1	+/-1.3	+/- .9	+/-1.0	
1981-52-4	25.4	967.3	12.1	12.4	31.1	15
#104 FL. NON-PERF.	+/- .6	+/-69.8	+/- .8	+/-1.2	+/-1.2	
1981-52-4	25.6	966.3	11.5	9.3	25.8	16
#104 FL. PERF.	+/-1.6	+/-41.7	+/- .8	+/- .6	+/-1.0	

* 1786-182 #104 FLAVOR - 4% K₂SUCCINATE, PH-5.7

* 1981-52-4 #104 FLAVOR - 5.4% K₂SUCCINATE, PH-4.6

COMPONENTS: R-13 -4mm INSERTION; SP-2PM SUBSTRATE; DDG-2 SLOT CAPSULE;
100% BURLEY JACKET- NO CASING; C-GLASS; MEP-002 WITH 22% AIR DILUTION

ATTACHMENT II



QUALIFICATION OF NEW OUTER WRAP PAPER

PAPER I. D.	BURN BACK (mm)	CHAR-WIDTH (mm)
1768-182 #104 FL. NON-PERF.	+/- 3.5-6.5 2.0-2.6	+/- 1.3-2.3 .7-1.3
1768-182 #104 FL. PERF.	+/- 3.6-6.7 1.6-1.6	+/- 1.0-2.1 .0-1.3
1981-52-4 #104 FL. NON-PERF.	+/- 3.1-6.0 2.1-1.8	+/- 1.2-2.9 .7-1.6
1981-52-4 #104 FL. PERF.	+/- 3.5-6.2 1.6-1.4	+/- .9-2.2 .6-.9

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ATTACHMENT III

Hunter Color Measurement On Current Outer Wrap Paper Before And After Flavor Treatment

Roll No.	Before Flavor Treatment			After Flavor Treatment		
	L	a	b	L	a	b
8649	95.0	- 0.3	+ 3.2	94.5	- 0.3	+ 3.4
8650	95.2	- 0.3	+ 3.1	94.4	- 0.3	+ 3.3
8652	95.0	- 0.3	+ 3.2	94.8	- 0.2	+ 3.3
8654	95.0	- 0.3	+ 3.1	94.9	- 0.3	+ 3.2
8655	95.0	- 0.3	+ 3.2	94.9	- 0.3	+ 3.2
8656	95.1	- 0.4	+ 3.2	94.5	- 0.4	+ 3.5
8657	95.3	- 0.3	+ 3.0	94.6	- 0.5	+ 3.6
8658	95.3	- 0.4	+ 3.1	94.8	- 0.2	+ 3.1
8659	95.3	- 0.4	+ 3.1	95.0	- 0.4	+ 3.2
Mean	95.13	- 0.33	+ 3.13	94.73	- 0.32	+ 3.31
Std Dev	± 0.14	± 0.05	± 0.07	± 0.21	± 0.10	± 0.16

L : Measure of Luminescence. Scale of 0 - 100 (0 = Black; 100 = White)

a : Measure of Green To Red. More " + " Value is More Red.
More " - " Value is More Green.

b : Measure of Yellow To Blue. More " + " Value is More Yellow.
More " - " Value is More Blue.





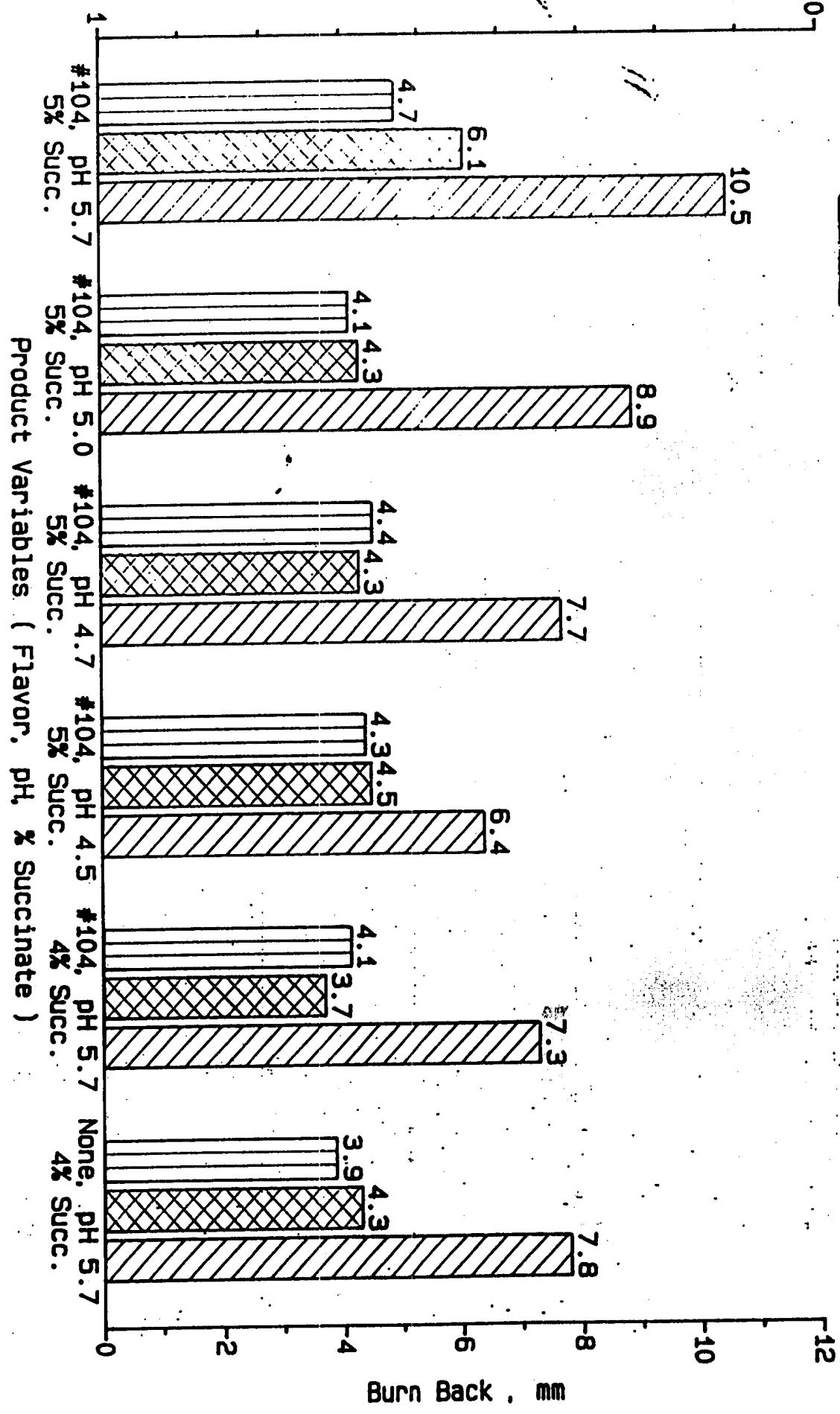
PAPER PH STUDY #1

Sidestream Irritation

Min. Burn Back

Max. Burn Back

Intensity Scale (1-10 Is Low To High)



PAPER pH STUDY #2

Sidestream Irritation



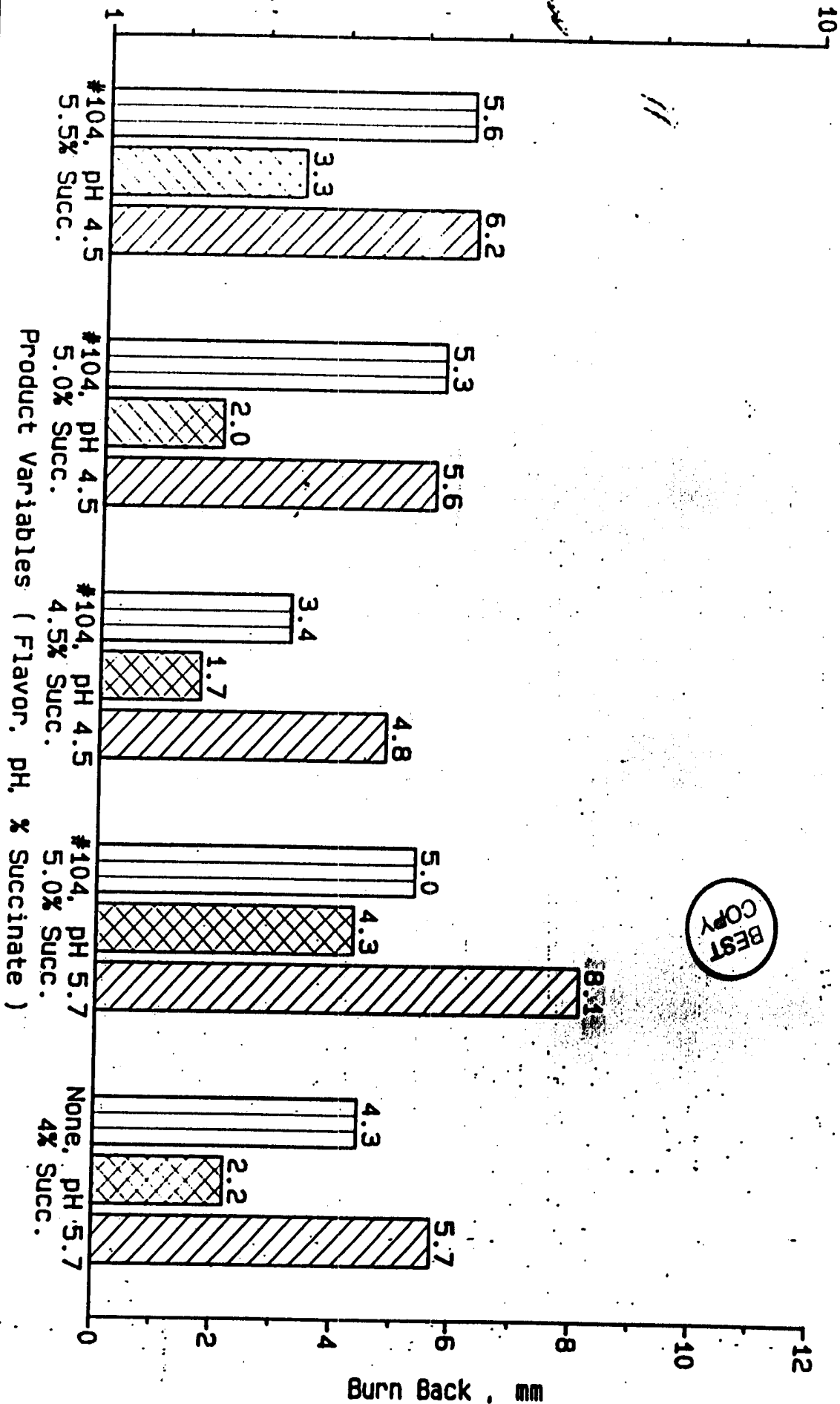
Min. Burn Back



Max. Burn Back



Intensity Scale (1-10 Is Low To High)



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EVALUATION OF BURN CHEMICAL ON THE OUTER WRAP PAPER ^{Keep H}



BURN BACK AND CHAR-LINE DATA: HUMAN-SMOKING

PAPER I.D.	BURN BACK (mm)	CHAR-LINE (mm)
1981-52-4	3.6-6.4 +/-1.5-1.0	1.0-2.5 +/-0.0-1.0
1981-43-8	3.8-7.1 +/-1.7-1.7	1.2-2.3 +/- .4-1.1
1981-97-1	3.9-7.9 +/-1.6-1.7	1.0-2.4 +/- .2-1.1
6.5%K ₂ SUC.		
1981-97-2	4.8-7.9 +/-1.3-1.6	.9-1.8 +/- .2-.7
7.1%K ₂ SUC.		

COMPONENTS: R-13 FUEL SOURCE-INSERTED 4mm SUBSTRATE-SP-5.
C-GLASS.100X BURLEY JACKET,PERFORATED MOUTH ENDPIECE

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ATTACHMENT VII & VIII

Q.D.A. Top Lines Comparing Lower pH Outer Wrap Paper And The Control Outer Wrap Paper

The Following Five Attributes Broke Out Significantly And One Trend Was Perceived.

<u>Attribute</u>	<u>Lower pH Vs. Control</u>	<u>Lower pH</u>	<u>Control</u>	<u>p</u>
Added Flavor	Less	17.78	19.73	0.0278
Conc. Of Smoke	Less	25.36	28.18	0.0245
Flavor Consistency	More	25.47	23.13	0.0483
Irritating Aftertaste	More	18.02	16.04	0.0695
Dirty Aftertaste	More	18.42	16.04	0.0077
Burning Tobacco Taste	More	15.31	14.02	0.10

Summary

The Positive Attributes For The Lower pH Outer Wrap Paper Are Less Added Flavor, More Flavor Consistency, And More Burning Tobacco Taste. The Negative Attributes For the Lower pH Outer Wrap Paper Are Less Concentration Of Smoke, More Dirty Aftertaste, And More Irritating Aftertaste.



ATTACHMENT IX

(PREFER)

INFORMAL SMOKING DATA

4/18/88

874 = CONTROL (850) #1788-182 -- 5.7 pH, 4% K2 SUCCINATE
 549 = TEST PAPER (202) #1891-52-4 -- 4.6 pH, 5.4% K2 SUCCINATE

PRODUCT PREFERENCE					ATTRIBUTE									
ENTER: SAMPLE CODE #					EASIER TO LIGHT		BEST TASTE		BEST STRENGTH		CONSIST DELIVERY		MORE PUFFS	
874	549	874	549		874	549	874	549	874	549	874	549	874	549
---	---	+++	+++		---	---	+++	+++	---	---	+++	+++	---	---
1	0	1			0	1	0	1	0	1	1	0	0	0
2	0	0			0	0	0	0	0	1	0	0	0	0
3	1	0			0	0	1	0	0	1	0	0	0	0
4	1	0			0	0	1	0	1	0	1	0	1	1
5	0	1			1	0	0	1	0	1	0	1	1	1
6	1	0			1	0	1	0	1	0	1	0	0	0
7	0	0			0	0	0	0	0	0	0	0	0	0
8	0	0			0	0	0	0	0	0	0	0	0	0
9														
10														
11														
12														
13														
14														
15														
SUM=	3	2	0	0	2	1	3	2	2	4	3	1	2	
% =	38	25	ERR	ERR	25	13	38	25	25	50	38	13	25	
% =	38		<---NO DIFF---		63		38		25		50		63	
TOTAL N =	8													

1 = Indicates preference



ATTACHMENT X

! MORE
! SATISF

549	874	549
+++	+++	+++
1	0	1
0	0	0
0	1	0
0	1	0
0	1	0
0	1	0
0	0	0
0	0	0

1	4	1
13	50	13
	38	





QUALIFICATION OF NEW OUTER WRAP PAPER
 SENSORY-INITIAL PUFFS

PAPER I.D.	BURNT PAPER	THROAT HARSHNESS 1	IMPACT
1768-182 #104 FL. NON-PERF.	3.4 +/- 1.8	3.3 +/- 2.2	4.6 +/- 1.5
1768-182 #104 FL. PERF.	3.5 +/- 1.9	4.1 +/- 1.6	4.6 +/- 1.6
1981-52-4 #104 FL. NON-PERF.	3.1 +/- 1.7	3.1 +/- 1.7	4.5 +/- 1.9
1981-52-4 #104 FL. PERF.	3.2 +/- 1.5	3.3 +/- 1.5	4.4 +/- 1.3

* 1-9 SCALE (1=LOW OR SLIGHTLY; 9=HIGH OR EXTREMELY)



QUALIFICATION OF NEW OUTER WRAP PAPER
SENSORY-LATER PUFFS

PAPER I.D.	TOB./CIG. TASTE	MOUTH SENSATION	OFF TASTE	THROAT HARSHNESS
1768-182 #104 FL. NON-PERF.	2.8 +/-1.0	3.5 +/-1.6	4.1 +/-1.4	3.5 +/-1.6
1768-182 #104 FL. PERF.	3.0 +/-1.4	4.1 +/-1.7	4.7 +/-1.7	3.9 +/-2.0
1981-52-4 #104 FL. NON-PERF.	3.2 +/-1.2	4.2 +/-2.3	4.1 +/-1.4	4.3 +/-2.7
1981-52-4 #104 FL. PERF.	3.1 +/-1.1	3.6 +/-1.6	2.8 +/-1.2	3.4 +/-2.0

* 1-9 SCALE (1=LOW OR SLIGHTLY; 9=HIGH OR EXTREMELY)

SENSTWO 3-22-88

DAY ONE	VARIABLE	SCORE (TOTAL)	SMKRS.	NON-SMKRS.
PRODUCT CONTROL	***** PH ADJUSTMENT	5.55 5.29	5.70 4.93	5.43 5.60
9		5.18	4.87	5.44

TOTAL POPULATION NSD (P=0.14)
PRODUCT*SMOKER SD (P=0.02)

AMONG SMOKERS, THE CONTROL HAD A SIGNIFICANTLY MORE ACCEPTABLE AROMA THAN PRODUCTS 8 AND 9. WITH NON-SMOKERS, THERE WAS NO SIGNIFICANT DIFFERENCE AMONG THE AROMA OF THE PRODUCTS.

DAY TWO	VARIABLE	SCORE (TOTAL)	SMKRS.	NON-SMKRS.
12	NEW 137 FLAVOR	5.50	NOT-	
11	REFORMULATED 104 FLV.	5.23	APPLICABLE	
10	104 FLV. W/O CHOC.	5.11		

TOTAL POPULATION SD (P=0.08).
PRODUCT*SMOKER NSD (P=0.40)

PRODUCT 12 HAD A SIGNIFICANTLY MORE ACCEPTABLE AROMA THAN PRODUCT 10. NO DIFFERENCES WERE PERCEIVED BETWEEN THE AROMAS OF PRODUCTS 12 AND 11 OR PRODUCTS 10 AND 11.

THERE WAS NO DIFFERENCE IN THE WAY SMOKERS AND NON-SMOKERS PERCEIVED THE AROMA OF THE PRODUCTS.

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