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EFFECTS OF COLD STORAGE ON G-19

Objective

To determine the best way to stack the boxes of G-19 in Carolina Cold Storage, and to determine the effects of cold storage of G-19 produced at 700°F sublimator temperature on filling capacity, moisture, sugar, and nicotine.

Summary

Tobaccoville export boxes (ACL cases) lined and packed with G-19 at 150 lbs/box and stacked six (6) high do not have stability problems.

Under cold storage conditions of 40°F and 60% relative humidity, the total sugar and nicotine contents do not change over a one year period. The moisture and corrected filling capacity drop initially (from 11.5% to 10.8% and from 804 cc/100g to 746 cc/100g, respectively), but after one month do not change.

Status

The long term (one year) test on the effects of cold storage on DIET tobacco is complete.

Keywords

Alternate expansion, DIET, G-19, expanded tobacco, G-13-23, TPD 966, cold storage, aging, total sugar (RC0319), nicotine (54-11-5), moisture (7732-18-5), filling capacity, stacking, ACL cases, boxes

Introduction

In order to build up inventory of G-19, it was necessary to store large quantities in cold storage. The G-19 was stored in boxes, which were stacked as many high as was practical from a stability standpoint. No major changes were expected in filling capacity, moisture, sugar, and nicotine, but they were monitored on a monthly basis to be sure.

Procedure

The tobacco used in the test was from TPD 966, expanded on April 21, 1992, at the Tobacoville DIET plant. The blend was a standard G-13-23 blend with 2% B-3 (glycerine). Target setpoints were: sublimator temperature 700°F, feedrate 5000 lb/hr, expected ΔT /thousand pounds 22°F to 25°F, and expected filling capacity 780. The test write-up for TPD 966, the process conditions, and the results are included in Appendix A. Twelve (12) cans of TPD 966 tobacco were packed in eighteen (18) Tobacoville export boxes (ACL cases of volume 20.6 ft³) lined with poly bags (tied off), at 150 pounds/box. Each of the cans was sampled before packing into the boxes for filling capacity and moisture.

The boxes were taken to Carolina Cold Storage on April 30, 1992. The conditions were 40°F at 60% relative humidity. The plan for the stacking portion of the test was to attempt to stack the boxes between six and ten high. After determining that the boxes could only be stacked six high, the eighteen boxes were stacked six high, five high, four high, and three high. For the second part of the test, the physical and chemical changes portion, sampling for filling capacity, moisture, sugar, and nicotine was to take place monthly for twelve months, on approximately the last working day of the month beginning on May 29, 1992, and ending on April 29, 1993.

The total sugar and nicotine analyses were performed by the Technical Support Tobacco Analysis Laboratory, and the moisture and filling capacities were run by Jane Casstevens in the Process Development Laboratory in Process Technology and Development. Filling capacities were corrected by the following equation:

$$CFC = FC e^{-0.06(M - M_{ref})}$$

where CFC = Corrected Filling Capacity, cc/100g @ 2.31 psi
FC = Raw Cylinder Filling Capacity, cc/100g @ 2.31 psi
M = Measured Moisture, %
M_{ref} = Reference (or Target) Moisture for Correction, %
(12 % was used for this study)

Results and Discussion

It was found that the boxes could not be stacked higher than six boxes without stability problems, with some minor leaning apparent even at six high. At six high, the top of the stack was very close to the trusses supporting the roof at Carolina Cold Storage, so six was determined to be the maximum practical stack height.

The results at the time of production for TPD 966 are included in Appendix A. The filling capacity, moisture, total sugar, and nicotine results from 4/29/92 through 4/29/93 are given in Appendix B. The data are summarized in Table 1 and are presented graphically in Figures 1 and 2.

As can be seen in Figure 1, there is no change in nicotine over time (average nicotine content of 1.95%). Total sugar varies from month to month, but this appears to be in a random manner. The possibility of variations in sugar content at different locations throughout the boxes was examined, with all samples submitted at the same time, but this yielded no statistical difference. The average total sugar content was 6.3%. Figure 1 also shows that moisture starts out at a high value of 11.5% and within a month stabilizes to about 10.8% at conditions of 40°F and 60% relative humidity.

From Figure 2, it can be seen that corrected filling capacity drops from the initial value of 804 cc/100g at time of production to an average of 746 cc/100g throughout the storage period. This can be explained to some extent by the fact that QA takes drop samples at the time of production and the later samples were "grab" samples from the boxes. It is to be expected that drop samples give better results than grab samples for physical analyses.

Conclusions

Tobacconville export boxes lined and packed with G-19 at 150 lbs/box and stacked six (6) boxes high do not have stability problems.

Under cold storage conditions of 40°F and 60% relative humidity, the total sugar and nicotine contents do not change over a one year period. The moisture and corrected filling capacity drop initially (from 11.5% to 10.8% and from 804 cc/100g to 746 cc/100g, respectively), but after one month do not change.

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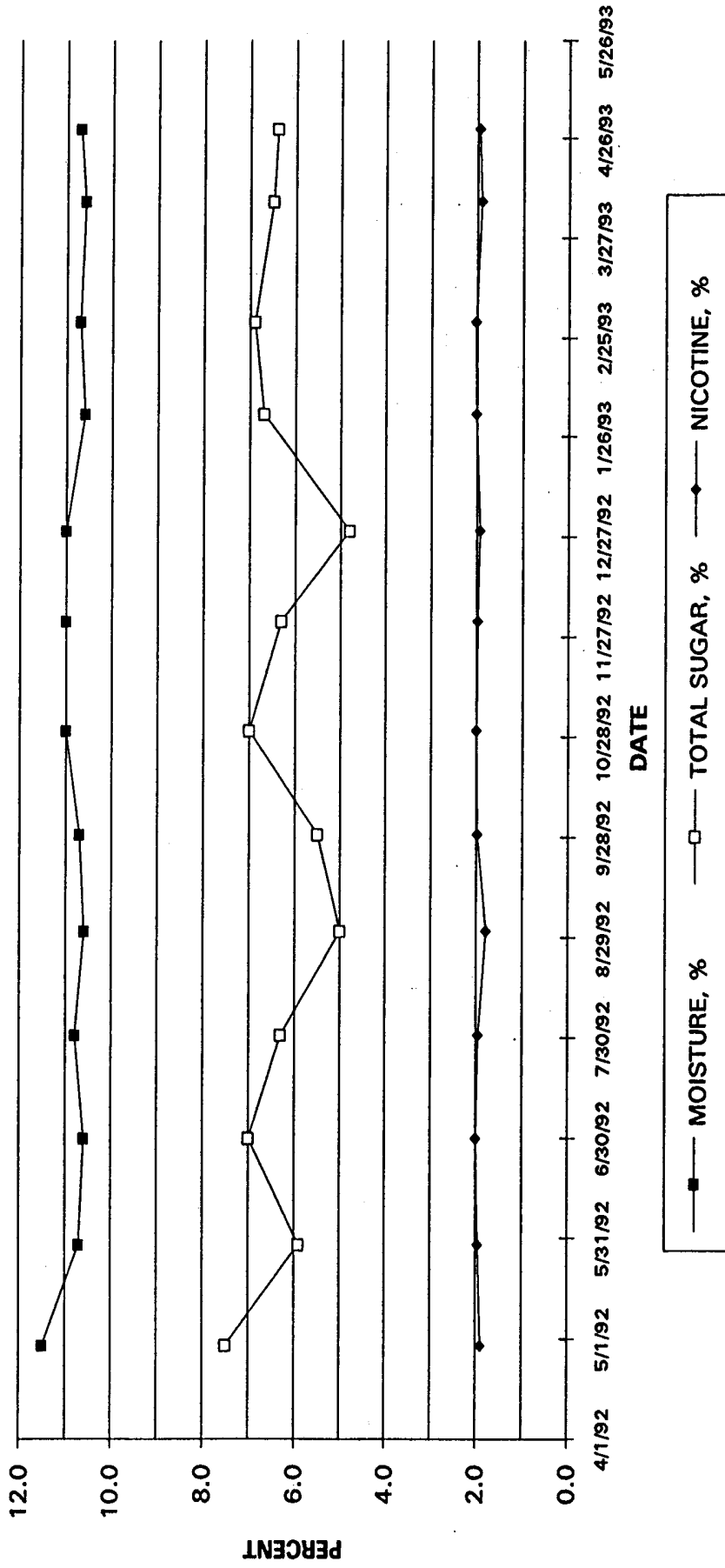
TABLE 1: SUMMARY OF CHEMICAL AND PHYSICAL CHANGES TO DIET TOBACCO IN ACL CASES W/ LINERS IN COLD STORAGE

DATE	MOISTURE, % (WET WEIGHT BASIS)		CORRECTED FILLING CAPACITY, cc/100g @ 2.31 psi		TOTAL SUGAR, %		NICOTINE, %	
	AVG	STD	AVG	STD	AVG	STD	AVG	STD
4/29/92*	11.5	.12	804	9.0	7.5	.2	1.90	.1
5/29/92	10.7	.10	731	4.1	5.9	.46	1.96	.035
6/30/92	10.6	.36	767	9.2	7.0	.16	2.00	.029
7/31/92	10.8	.23	756	13.3	6.3	1.3	1.96	.078
8/31/92	10.6	.22	695	31.1	5.0	.32	1.79	.067
9/29/92	10.7	.13	747	16.1	5.5	.38	1.98	.022
10/30/92	11.0	.05	715	6.3	7.0	1.05	2.00	.035
12/02/92	11.0	.04	749	10.5	6.3	.4	1.98	.072
12/29/92	11.0	.10	743	20.6	4.8	.27	1.93	.055
2/02/93	10.6	.06	769	15.6	6.7	.45	2.01	.036
3/02/93	10.7	.09	765	15.5	6.9	.45	2.03	.024
4/07/93	10.6	.24	766	16.6	6.5	.22	1.91	.029
4/29/93	10.7	.07	754	11.4	6.4	.4	1.96	.027
AVERAGE	10.8**		746**		6.3		1.95	

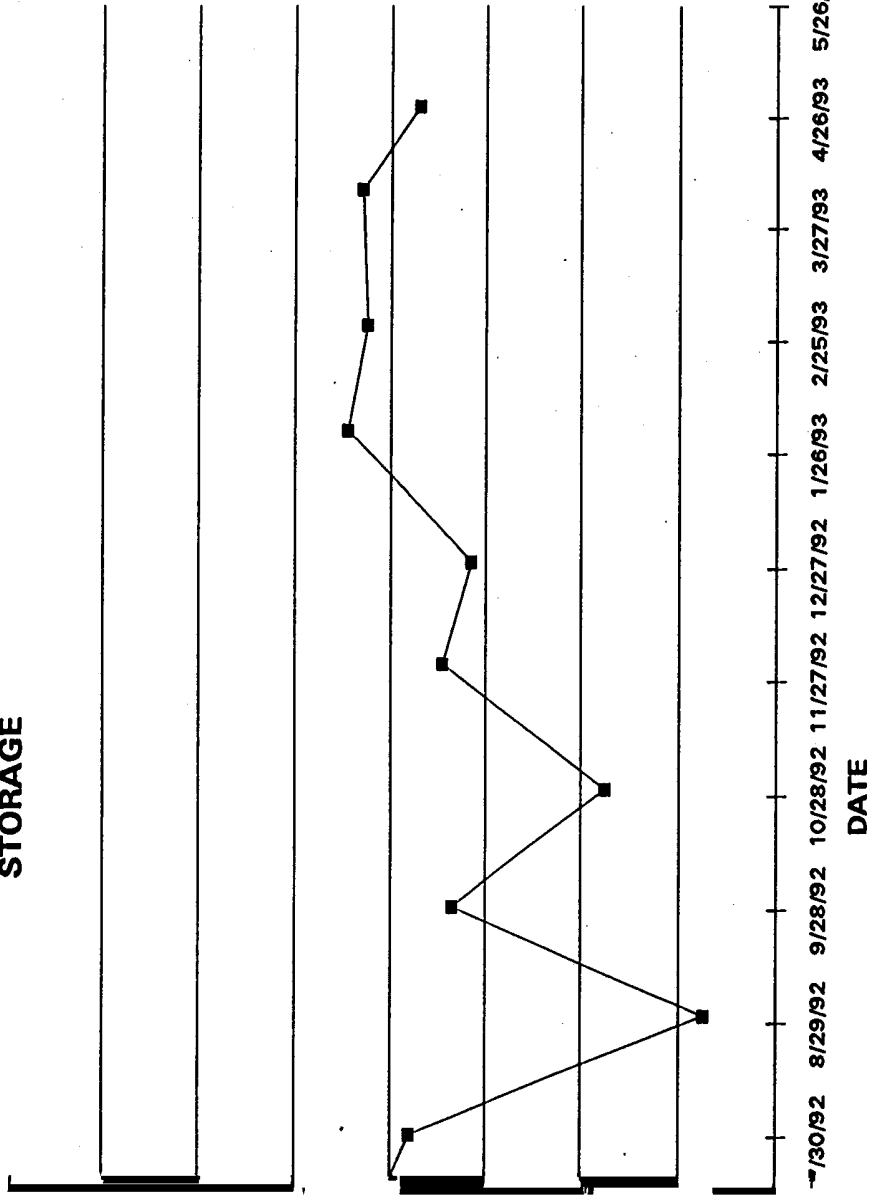
* Sugar and nicotine data from process run data on 4/21/92.

** Averages excluding the initial processing run data of 4/21/92.

FIGURE 1: CHEMICAL CHANGES TO DIET TOBACCO IN COLD STORAGE



STORAGE CAPACITY CHANGES WITH TIME OF DIET TOBACCO IN COLD STORAGE



APPENDIX A: TPD 966 WRITE-UP, PROCESS CONDITIONS, RESULTS

DIET TESTS FOR WED. (4-15-92) AND THURS. (4-16-92)

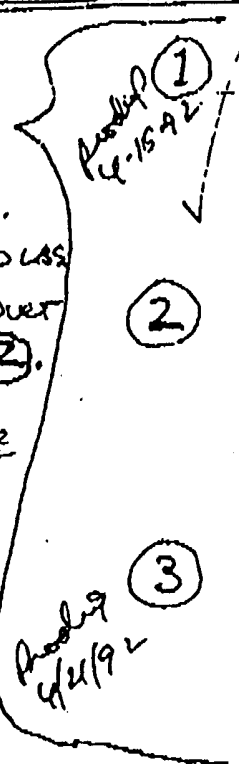
PRODUCE IN THIS ORDER.

MAKE APPROX. 3000-4000 LBS OF GOOD PRODUCT FOR ① AND ②.

MAKE BALANCE INTO ③.

SHIP 2000 LBS. OR ①, ②, ③ TO

BGTC
611-4, Dock 1
ATTN: S. JAKOB



High Feedrate/Higher Sublimator Temperature - **TPD-968**

- 920° sublimator temperature (expected filling capacity: 940)
- 6800 lb/hr feedrate
- 3000 lb/hr sublimator steam
- 650 lb/hr outlet air-lock water spray

Normal Feedrate/High Sublimator Temperature - **TPD-967**

- 870° sublimator temperature (expected filling capacity: 940)
- 5000 lb/hr feedrate
- 3000 lb/hr sublimator steam
- 500 lb/hr outlet air-lock water spray

"Control" - **TPD 966**

- 700° sublimator temperature (expected filling capacity: 780)
- 5000 lb/hr feedrate
- 5000 lb/hr sublimator steam
- outlet air-lock sprays - off

LABEL EACH CAN WITH TPD NO. AND WEIGHT.

HOLD BALANCE OF CASE AT TVL.

In addition, all three (3) test products will be produced using the following:

- Normal G-13-23 blend with 2% B-3 (glycerine)
- 20% (± 1.5) infeed moisture
- 30 cuts/inch
- 415 psi (± 10) impregnator pressure
- modified sublimator duct
- 36,000 cfm (± 1200) sublimator hot gas flow rate (88 DELTA P, ANNUAL READING)
- negative 2 inches H₂O (± 2) sublimator static pressure
- re-order drum - Zone 1 @ 100 pph (± 50) water
- Zone 2 @ 300 pph (± 150) water
- Zone 3 @ 450 pph (± 250) water
- (To be varied as necessary to maintain finished product moisture target of 12.0% ± 0.9)

We will fix the process at the conditions specified for each test, run until the product and process are stable, then pull the test products. Production is planned for next Wednesday (4-15) or Thursday (4-16); 25,000 lbs of infeed tobacco will be produced by Tobacoville Casing and Cutting on Wednesday (4-15). CONTROL ROOM OP. records of process conditions will be obtained approximately every 5 minutes. Prior to the tests, instrument calibrations will be confirmed.

* PROCESS SUMMARY, HOT END OBSERVED

* HOT END OBSERVATION - MAKE A LOG AND TAKE A READING OF SUGAR & NICOTINE EVERY 5 MINUTES.

XC: CONTROL RM. OP
HOT END OP.
QA LAB
SMPU,
WLY

Dale
4-13-92

XC: SARA DEWINE
5-1-92



RJR CONFIDENTIAL

InterOffice Memo

TO: R. L. Suber

FROM: Dale B. Poindexter

SUBJECT: DIET Products for Toxicology Testing

DATE: 4/27/92

Expanded tobacco products from the DIET Process have been produced for toxicology evaluations and a summary of the process and product test results are attached.

The process was brought up to stable conditions then the following quantities were produced:

- "Control" (700° F Sublimator) - 12,250 Lbs.
(Test No. TPD 966)
- "Normal Feedrate/High Temperature" - 3,292 Lbs.
(Test No. TPD 967)
- "High Feedrate/Higher Temperature" - 4,000 Lbs.
(Test No. TPD 968)

Two thousand Lbs. of each was shipped to Building No. 611-4, Attention Steve Jakob. The remaining quantities are being held in inventory in case more is needed.

The results were very much as expected. The sublimator heat transfer rate ($\Delta T/K$ Lbs.) representing the low, middle and upper ranges was 25.1, 27.6 and 30.7. Filling capacities were within 3 points of projected. Sugar and nicotine changes were within previously measured ranges, only the "Control" was to the high side on sugar change.

Please let me know if there are questions regarding this test or if further information is needed.

Thanks.

Dale B. Poindexter
Tobacco Process Engineering

DBP:jb (Poindexter/Toxtest)

xc: Distribution (attached)

RJR CONFIDENTIAL
DIET PRODUCTS FOR TOXICOLOGY TESTING -

The following products have been produced for R. L. Suber's toxicology evaluations. These three (3) test products represent three (3) levels of sublimator heat transfer per thousand pounds of feedrate ($\Delta T/K$. lbs); The tobacco was the G-13-23 Blend with 2% B-3 at 30 cuts/inch produced by the Tobacconville DIET Process using the modified sublimator duct.

	"Control" 700°F Sublimator Normal Feedrate	Normal Feedrate/ High Sublimator Temperature	High Feedrate/ Higher Sublimator Temperature
Target Sublimator Temp.	700°F	870°F	920°F
Target Feedrate	5000 lb/hr	5000 lb/hr	6800 lb/hr
Expected $\Delta T/K$. lbs	22-25	30-34	26-29
Expected Filling Capacity	780	940	940

<u>Process Conditions (Actual):</u>	<u>\bar{x}</u> (sd)	<u>\bar{x}</u> (sd)	<u>\bar{x}</u> (sd)
Infeed Moisture (%)	20.1 (0.2)	19.9 (0.3)	20.3 (0.1)
Sublimator Temp. (° F)	700 (1)	870 (1)	920 (5)
Feedrate (Lb/Hr-Output)	4973 (90)	4987 (133)	6723 (93)
$\Delta T/K$. lbs	25.1 (0.5)	30.7 (0.8)	27.6 (1.0)
Steam (Lb/Hr)	4995 (26)	3003 (22)	3000 (14)
Sublimator Gas Flow (CFM)	36,300 (120)	35,700 (500)	35,800 (0)
Outlet Airlock Water (Lb/Hr)	0	500 (3)	649 (3)
Tob. % MC After Sublimator	<1.0 (0)	2.1 (0.9)	2.5 (0.4)
Tob. Temp. After Sub. (° F)	274 (8)	227 (9)	208 (13)
Re-order Z1 (Lb/Hr)	85 (2)	105 (7)	117 (5)
Z2 (Lb/Hr)	251 (5)	273 (11)	371 (19)
Z3 (Lb/Hr)	397 (23)	315 (49)	494 (4)

Product Test Results

Filling Capacity (Adjusted) <i>DA Ratio (Before Bulker)</i>	783 (18)	<i>After Bulker</i> 795 (15)	942 (26)	938 (23)
% Moisture	12.0 (0.3)	11.7	11.6 (0.3)	11.5 (0.3)
% Fines (-14 Mesh)	21.3 (0.8)		21.9 (1.9)	28.7 (0.6)
% Sugar	7.5 (0.2)		7.0 (0.8)	7.2 (0.4)
Sugar Loss (% of Infeed)	26.6 (3.1)		31.3 (7.4)	30.1 (4.4)
% Nicotine	1.9 (0.1)		1.7 (0.1)	1.9 (0.1)
Nicotine Loss (% of Infeed)	32.2 (3.1)		40.6 (3.2)	31.4 (5.1)

QUALITY ASSURANCE DEPARTMENT - TOBACCO PROCESSING GROUP

DATE	YEAR			FLIGHT			CUT AT			BLIND			TEMP.	MEAN MOIST	SAMPLE SIZE	F.C. DIAL			TEMP.	GREEN											
	MO.	DAY	YEAR	7	8	9	10	11	12	13	14	15				16	17	18		19	20	21	22	23	24	25	26	27	28	29	30
04	29	72	72	DIET	8	0	0	0	0	0	0	19	77	1.14	0.50	0	83.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
													77	1.16			81.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
													77	1.13			81.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
													77	1.14			82.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
													77	1.13			83.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
													78	1.15			82.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
													76	1.17			83.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
													77	1.15			82.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
													76	1.14			83.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
													77	1.14			81.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
													77	1.14			82.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
													77	1.16			82.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

TIME	CAR NO.	W/ AT 2.5 PSI
12:45	007	810
1:00	029	800
1:20	020	789
1:35	019	799
1:45	032	807
1:55	031	808
2:05	008	816
2:15	030	806
2:24	001	802
2:35	005	788
2:45	018	811
2:52	017	814

Recheck of
 TPD 966
 (Mr. Jobby)
 12 Lane
 Mikel Jones
 Test TPD 916
 Produced - 4-21-92
 Bunch # 31
 Computer # 44
 Recheck Aug.
 Machine 115
 F.C. 804 (9)

APPENDIX B: STORAGE RESULTS

DIET Cold Storage Test
Samples taken 5/29/92
Boxes: T'ville export w/liner

MOISTURE

6	STACK TOP	11.2
5	STACK TOP	9.9
5	STACK 3RD	10.9
5	STACK BOTTOM	10.6
3	STACK BOTTOM	10.4
3	STACK TOP	10.9
6	STACK BOTTOM	10.8
6	STACK 4TH	10.9
4	STACK 2ND	10.9
4	STACK BOTTOM	<u>10.7</u>

AVG 10.7
STD .358

Collected
5/29/92

Cold Storage

150 lb
20.6 f3

7/1/16
Export
Boxes

DIET	F.C.	MOISTURE	CORRECTED F.C.
5 STACK 3RD	739.6	11.9	735.18
6 STACK BOTTOM	736.6	11.5	714.83
4 STACK 2ND	730.3	12.2	739.12
3 STACK BOTTOM	717.4	12.5	739.25
5 STACK BOTTOM	745.9	11.8	737.00
5 STACK TOP	725	12.2	733.75
6 STACK 4TH BOX	705.3	11.8	696.89
6 STACK 4TH MIDDLE	702.4	12.1	706.63
4 STACK BOTTOM	737.6	12.1	742.04
6 STACK 4TH PP	755.3	11.8	746.29
6 STACK TOP	746.6	11.8	737.69
3 STACK TOP	743.1	12	743.10
		AVG	730.98
		STD	4.07

DIET COLD STORAGE TEST
 TO DETERMINE CHANGES OVER TIME IN DIET TOBACCO IN COLD STORAGE
 (ACL CASES) TPD966
 5/29/92

Test Part		NICOTINE %				01,001	01,002
		Average	Std Dev	Count	95% CI		
3-STACK TOP	AN 15727 AA	2.00	0.007	2	1.93,2.06	1.99	2.00
3-STACK BOTTOM	AN 15727 AB	1.97	0.028	2	1.72,2.22	1.95	1.99
4-STACK 2ND	AN 15727 AC	1.97	0	2	1.97,1.97	1.97	1.97
4-STACK BOTTOM	AN 15727 AD	1.93	0.014	2	1.80,2.06	1.92	1.94
5-STACK TOP	AN 15727 AE	1.98	0.007	2	1.91,2.04	1.97	1.98
5-STACK 3RD	AN 15727 AF	2.00	0.014	2	1.87,2.13	2.01	1.99
5-STACK BOTTOM	AN 15727 AG	1.97	0.014	2	1.84,2.10	1.98	1.96
6-STACK TOP	AN 15727 AH	1.99	0	2	1.99,1.99	1.99	1.99
6-STACK 4TH	AN 15727 AI	1.94	0.014	2	1.81,2.07	1.95	1.93
6-STACK BOTTOM	AN 15727 AJ	1.89	0.007	2	1.83,1.96	1.90	1.89
-----						-----	-----
AVG		1.96				1.96	1.96
STD		0.035				0.034	0.035

		TOTAL SUGAR %				01,001	01,002
		Average	Std Dev	Count	95% CI		
3-STACK TOP	AN 15727 AA	6.5	0.07	2	5.8,7.1	6.5	6.4
3-STACK BOTTOM	AN 15727 AB	6.4	0.07	2	5.7,7.0	6.4	6.3
4-STACK 2ND	AN 15727 AC	6.3	0	2	6.3,6.3	6.3	6.3
4-STACK BOTTOM	AN 15727 AD	5.4	0	2	5.4,5.4	5.4	5.4
5-STACK TOP	AN 15727 AE	6.2	0.07	2	5.5,6.8	6.1	6.2
5-STACK 3RD	AN 15727 AF	6.2	0	2	6.2,6.2	6.2	6.2
5-STACK BOTTOM	AN 15727 AG	5.7	0	2	5.7,5.7	5.7	5.7
6-STACK TOP	AN 15727 AH	5.9	0.07	2	5.2,6.5	5.9	5.8
6-STACK 4TH	AN 15727 AI	5.7	0.07	2	5.0,6.3	5.6	5.7
6-STACK BOTTOM	AN 15727 AJ	5.1	0	2	5.1,5.1	5.1	5.1
-----						-----	-----
AVG		5.94				5.92	5.91
STD		0.460				0.461	0.438

COLD STORAGE 6-30-92

STACK 3
 MOISTURE
 1 10.8
 2 10

STACK 5

MOISTURE
 1 10.4
 2 10.7

*Avg of all 2
 10.55
 std .355*

STACK 4

AVG 10.4
 STD .566
 1 11
 2 10.6 *10.8283*

STACK 6

MOISTURE
10.55
 .212
 1 10.1
 2 10.8 *10.45495*

STACK 3 F.C. MOISTURE CORRECTED F.C.

1 770 12.2 779.30
 2 768.4 11.8 759.23

STACK 4

1 771.4 12.1 776.04
 2 731.4 12.6 758.21

STACK 5

1 764.2 12.2 773.43
 2 753.4 12.4 771.70

STACK 6

1 724.9 12.8 760.54
 2 720.9 12.8 756.35

*Avg 766.80
 std 9.17*

COLD STORAGE
 LITTLE BOX

6-18-92 1 743.9 12.2 752.88
 6-21-92 2 791.7 11.5 768.30

DIET LONG TERM STORAGE TEST 6/30/92
 TO DETERMINE CHANGES OVER TIME IN DIET TOBACCO IN COLD STORAGE
 (ACL CASES) TPD966

	Test Part	NICOTINE %		Count	95% CI	01,001	01,002
		Average	Std Dev				
3-STACK	AN 16346 AA	2.02	0	2	2.02,2.02	2.02	2.02
	AN 16346 AB	2.04	0	2	2.04,2.04	2.04	2.04
4-STACK	AN 16346 AC	1.96	0	2	1.96,1.96	1.96	1.96
	AN 16346 AD	2.03	0	2	2.03,2.03	2.03	2.03
5-STACK	AN 16346 AE	1.99	0.007	2	1.92,2.05	1.99	1.98
	AN 16346 AF	1.97	0.007	2	1.90,2.03	1.97	1.96
6-STACK	AN 16346 AG	1.98	0.007	2	1.91,2.04	1.98	1.97
	AN 16346 AH	2.01	0	2	2.01,2.01	2.01	2.01

	AVG	2.00				2.00	2.00
	STD	0.029				0.029	0.032

	Test Part	TOTAL SUGAR %		Count	95% CI	01,001	01,002
		Average	Std Dev				
3-STACK	AN 16346 AA	7.2	0	2	7.2,7.2	7.2	7.2
	AN 16346 AB	6.8	0.07	2	6.1,7.4	6.7	6.8
4-STACK	AN 16346 AC	6.8	0	2	6.8,6.8	6.8	6.8
	AN 16346 AD	7.1	0.07	2	6.4,7.7	7	7.1
5-STACK	AN 16346 AE	7	0.07	2	6.3,7.6	7	6.9
	AN 16346 AF	7	0	2	7.0,7.0	7	7
6-STACK	AN 16346 AG	7.2	0.07	2	6.5,7.8	7.2	7.1
	AN 16346 AH	6.9	0.07	2	6.2,7.5	6.8	6.9

	AVG	7.0				7.0	7.0
	STD	0.16				0.18	0.15

DIET LONG TERM COLD STORAGE TEST 6/30/92
 TO DETERMINE LONG TERM CHANGES OVER TIME OF DIET TOBACCO IN COLD STORAGE
 (ACL CASES) TPD966

	Test Part	NICOTINE %		Count	95% CI	01,001	01,002
		Average	Std Dev				
3--STACK	AN 16346 AA	2.02		0	2 2.02,2.02	2.02	2.02
	AN 16346 AB	2.04		0	2 2.04,2.04	2.04	2.04

		AVG	2.03			2.03	2.03
		STD	0.014			0.014	0.014
4--STACK	AN 16346 AC	1.96		0	2 1.96,1.96	1.96	1.96
	AN 16346 AD	2.03		0	2 2.03,2.03	2.03	2.03

		AVG	2.00			2.00	2.00
		STD	0.049			0.049	0.049
5--STACK	AN 16346 AE	1.99	0.007		2 1.92,2.05	1.99	1.98
	AN 16346 AF	1.97	0.007		2 1.90,2.03	1.97	1.96

		AVG	1.98			1.98	1.97
		STD	0.014			0.014	0.014
6--STACK	AN 16346 AG	1.98	0.007		2 1.91,2.04	1.98	1.97
	AN 16346 AH	2.01	0		2 2.01,2.01	2.01	2.01

		AVG	2.00			2.00	1.99
		STD	0.021			0.021	0.028

DIET LONG TERM COLD STORAGE TEST 6/30/92
 TO DETERMINE LONG TERM CHANGES OVER TIME OF DIET TOBACCO IN COLD STORAGE
 (ACL CASES) TPD966

	Test Part	TOTAL SUGAR %		Count	95% CI	01,001	01,002
		Average	Std Dev				
3--STACK	AN 16346 AA	7.2		0	2 7.2,7.2	7.2	7.2
	AN 16346 AB	6.8	0.07		2 6.1,7.4	6.7	6.8

		AVG	7.0			7.0	7.0
		STD	0.28			0.35	0.28
4--STACK	AN 16346 AC	6.8		0	2 6.8,6.8	6.8	6.8
	AN 16346 AD	7.1	0.07		2 6.4,7.7	7	7.1

		AVG	7.0			6.9	7.0
		STD	0.21			0.14	0.21
5--STACK	AN 16346 AE	7	0.07		2 6.3,7.6	7	6.9
	AN 16346 AF	7	0		2 7.0,7.0	7	7

		AVG	7.0			7.0	7.0
		STD	0.00			0.00	0.07
6--STACK	AN 16346 AG	7.2	0.07		2 6.5,7.8	7.2	7.1
	AN 16346 AH	6.9	0.07		2 6.2,7.5	6.8	6.9

		AVG	7.1			7.0	7.0
		STD	0.21			0.28	0.14

7-31-92

MOISTURE

STACK 3 11.2
 10.7

STACK 4 11
 10.6

STACK 5 10.5
 10.8

STACK 6 10.6
 10.8

AVG 10.8
STD 0.23

7-31-92

	F.C.	MOISTURE	CORRECTED F.C.
STACK 3	820.00	11.00	772.25
	730.40	12.30	743.67
		AVG	757.96
		STD	20.21
STACK 4	810.60	11.00	763.39
	729.20	12.30	742.44
		AVG	752.92
		STD	14.81
STACK 5	775.80	11.90	771.16
	755.80	11.90	751.28
		AVG	761.22
		STD	14.06
STACK 6	758.40	12.10	762.96
	757.20	11.60	739.24
		AVG	751.10
		STD	16.77
		AVG	755.80
		n=8	
		STD	13.286

DIET STACK TEST 7/31/92
TO DETERMINE LONG TERM CHANGES OVER TIME IN COLD STORAGE
(ACL CASES) TPD966

	Test Part	NICOTINE %	TOTAL SUGAR %
3-STACK	AN18842AA	2.02	8.0
	AN18842AB	2.06	7.3
4-STACK	AN18842AC	1.91	6.5
	AN18842AD	2.05	7.7
5-STACK	AN18842AE	1.92	5.4
	AN18842AF	1.94	5.4
6-STACK	AN18842AG	1.92	5.0
	AN18842AH	1.84	4.7
		<hr/>	<hr/>
		1.96	6.3
		0.078	1.30

	MOISTURE
STACK 3	10.40 10.60
STACK 4	10.50 10.60
STACK 5	10.70 10.10
STACK 6	10.80 10.70
	<hr/>
AVG	10.55
STD	.220

8-31-92

CORRECTED
F.C.

F.C. MOISTURE

STACK 3

715.60 11.80
727.80 11.30

707.06
697.87

AVG
STD

702.46
6.50

STACK 4

731.80 11.90
741.00 11.90

727.42
736.57

AVG
STD

731.99
6.47

STACK 5

696.60 11.70
720.40 11.60

684.17
703.32

AVG
STD

693.74
13.54

STACK 6

703.90 11.00
726.10 10.00

662.91
643.99

AVG
STD

653.45
13.38

Grand Avg
std

695.41
31.052

12/2/92

DIET STACK TEST 08/31/92
TO DETERMINE LONG TERM CHANGES OVER TIME IN COLD STORAGE
(ACL CASES)

	Test Part	NICOTINE Average	TOTAL SUGAR % Average
3-STACK	AN 17286 AA	1.81	5.5
	AN 17286 AB	1.72	4.5
4-STACK	AN 17286 AC	1.75	4.8
	AN 17286 AD	1.80	5.0
5-STACK	AN 17286 AE	1.72	4.7
	AN 17286 AF	1.74	5.2
6-STACK	AN 17286 AG	1.91	5.2
	AN 17286 AH	1.84	5.1
	AVG	1.79	5.0
	STD	0.067	0.32

S.W. DEVINE, AN17286.WK1
9/13/92

DIET STACK TEST 8/31/92
TO DETERMINE LONG TERM CHANGES OVER TIME IN COLD STORAGE
(ACL CASES)

	Test Part	NICOTINE %			95% CI	01,001
		Average	Std Dev	Count		
3-STACK	AN 17286 AA	1.81	N/A		1 N/A,N/A	1.81
	AN 17286 AB	<u>1.72</u>	N/A		1 N/A,N/A	1.72
	AVG	1.77				
	STD	0.064				
4-STACK	AN 17286 AC	1.75	N/A		1 N/A,N/A	1.75
	AN 17286 AD	<u>1.8</u>	N/A		1 N/A,N/A	1.8
	AVG	1.78				
	STD	0.035				
5-STACK	AN 17286 AE	1.72	N/A		1 N/A,N/A	1.72
	AN 17286 AF	<u>1.74</u>	N/A		1 N/A,N/A	1.74
	AVG	1.73				
	STD	0.014				
6-STACK	AN 17286 AG	1.91	N/A		1 N/A,N/A	1.91
	AN 17286 AH	<u>1.84</u>	N/A		1 N/A,N/A	1.84
	AVG	1.88				
	STD	0.049				

	Test Part	TOTAL SUGAR %			95% CI	01,001
		Average	Std Dev	Count		
3-STACK	AN 17286 AA	5.5	N/A		1 N/A,N/A	5.5
	AN 17286 AB	<u>4.5</u>	N/A		1 N/A,N/A	4.5
	AVG	5.0				
	STD	0.71				
4-STACK	AN 17286 AC	4.8	N/A		1 N/A,N/A	4.8
	AN 17286 AD	<u>5</u>	N/A		1 N/A,N/A	5
	AVG	4.9				
	STD	0.14				
5-STACK	AN 17286 AE	4.7	N/A		1 N/A,N/A	4.7
	AN 17286 AF	<u>5.2</u>	N/A		1 N/A,N/A	5.2
	AVG	5.0				
	STD	0.35				
6-STACK	AN 17286 AG	5.2	N/A		1 N/A,N/A	5.2
	AN 17286 AH	<u>5.1</u>	N/A		1 N/A,N/A	5.1
	AVG	5.2				
	STD	0.07				

9-29-92

COLD STORAGE

MOISTURE

STACK 3 10.70
 10.60

STACK 4 10.90
 10.80

STACK 5 10.60
 10.50

STACK 6 10.70
 10.60

AVG 10.68
STD 0.128

9-29-92

COLD STORAGE

	F.C.	MOISTURE	CORRECTED F.C.
STACK 3	746.80	11.60	729.09
	768.80	11.60	750.57
		AVG	739.83
		STD	15.19
STACK 4	751.90	11.60	734.07
	748.60	11.70	735.25
		AVG	734.66
		STD	0.83
STACK 5	771.00	11.50	748.21
	786.50	11.80	777.12
		AVG	762.67
		STD	20.44
STACK 6	785.10	11.50	761.90
	758.60	11.60	740.61
		AVG	751.25
		STD	15.05
	Grand Avg	747.10	
	std	16.081	

DIET STACK TEST 9/29/92
TO DETERMINE LONG TERM CHANGES OVER TIME IN COLD STORAGE
(ACL CASES) TPD966

	Test Part	NICOTINE %		Count	95% CI	01,001
		Average	Std Dev			
3-STACK	AN 17823 AA	1.97	N/A	1	N/A,N/A	1.97
	AN 17823 AB	2	N/A	1	N/A,N/A	2
4-STACK	AN 17823 AC	2.03	N/A	1	N/A,N/A	2.03
	AN 17823 AD	1.97	N/A	1	N/A,N/A	1.97
5-STACK	AN 17823 AE	1.97	N/A	1	N/A,N/A	1.97
	AN 17823 AF	1.98	N/A	1	N/A,N/A	1.98
6-STACK	AN 17823 AG	1.97	N/A	1	N/A,N/A	1.97
	AN 17823 AH	1.97	N/A	1	N/A,N/A	1.97
	AVG	1.98				
	STD	0.022				

	Test Part	TOTAL SUGAR %		Count	95% CI	01,001
		Average	Std Dev			
3-STACK	AN 17823 AA	5	N/A	1	N/A,N/A	5
	AN 17823 AB	6.1	N/A	1	N/A,N/A	6.1
4-STACK	AN 17823 AC	5.9	N/A	1	N/A,N/A	5.9
	AN 17823 AD	5.5	N/A	1	N/A,N/A	5.5
5-STACK	AN 17823 AE	5.4	N/A	1	N/A,N/A	5.4
	AN 17823 AF	5.6	N/A	1	N/A,N/A	5.6
6-STACK	AN 17823 AG	5.1	N/A	1	N/A,N/A	5.1
	AN 17823 AH	5.2	N/A	1	N/A,N/A	5.2
	AVG	5.5				
	STD	0.38				

S.W. DEVINE, AN17823.XLS
10/13/92

DIET STACK TEST 9/29/92
TO DETERMINE LONG TERM CHANGES OVER TIME IN COLD STORAGE
(ACL CASES) TPD966

	Test Part	NICOTINE %		Count	95% CI	01,001
		Average	Std Dev			
3-STACK	AN 17823 AA	1.97	N/A	1	N/A,N/A	1.97
	AN 17823 AB	<u>2</u>	N/A	1	N/A,N/A	2
	AVG	1.99				
	STD	0.021				
4-STACK	AN 17823 AC	2.03	N/A	1	N/A,N/A	2.03
	AN 17823 AD	<u>1.97</u>	N/A	1	N/A,N/A	1.97
	AVG	2.00				
	STD	0.042				
5-STACK	AN 17823 AE	1.97	N/A	1	N/A,N/A	1.97
	AN 17823 AF	<u>1.98</u>	N/A	1	N/A,N/A	1.98
	AVG	1.98				
	STD	0.007				
6-STACK	AN 17823 AG	1.97	N/A	1	N/A,N/A	1.97
	AN 17823 AH	<u>1.97</u>	N/A	1	N/A,N/A	1.97
	AVG	1.97				
	STD	0.000				

	Test Part	TOTAL SUGAR %		Count	95% CI	01,001
		Average	Std Dev			
3-STACK	AN 17823 AA	5	N/A	1	N/A,N/A	5
	AN 17823 AB	<u>6.1</u>	N/A	1	N/A,N/A	6.1
	AVG	5.6				
	STD	0.78				
4-STACK	AN 17823 AC	5.9	N/A	1	N/A,N/A	5.9
	AN 17823 AD	<u>5.5</u>	N/A	1	N/A,N/A	5.5
	AVG	5.7				
	STD	0.28				
5-STACK	AN 17823 AE	5.4	N/A	1	N/A,N/A	5.4
	AN 17823 AF	<u>5.6</u>	N/A	1	N/A,N/A	5.6
	AVG	5.5				
	STD	0.14				
6-STACK	AN 17823 AG	5.1	N/A	1	N/A,N/A	5.1
	AN 17823 AH	<u>5.2</u>	N/A	1	N/A,N/A	5.2
	AVG	5.2				
	STD	0.07				

COLD STORAGE

10-30=-92

STACK 3 MOISTURE

11.10

11.00

STACK 4 11.00

11.00

STACK 5 11.00

11.00

STACK 6 10.90

11.00

AVG

11.0

STD

.053

COLD STORAGE

10-30-92

CORRECTED
F.C.

F.C. MOISTURE

	F.C.	MOISTURE		CORRECTED F.C.
STACK 3	711.50	12.20		720.09
	693.40	12.20		701.77
			AVG	710.93
			STD	12.95
STACK 4	703.60	12.30		716.38
	697.60	12.40		714.54
			AVG	715.46
			STD	1.30
STACK 5	706.10	12.30		718.92
	718.00	12.10		722.32
			AVG	720.62
			STD	2.40
STACK 6	709.20	12.10		713.47
	708.80	12.10		713.07
			AVG	713.27
			STD	0.28
			Grand Avg	715.07
			Std	6.302

DIET STACK TEST 10/30/92
TO DETERMINE LONG TERM CHANGES OVER TIME IN COLD STORAGE
(ACL CASES) TPD966

	Test Part	NICOTINE %	TOTAL SUGAR %
3-STACK	AN18841AA	1.95	5.6
	AN18841AB	2.00	7.4
4-STACK	AN18841AC	2.00	8.4
	AN18841AD	2.00	6.3
5-STACK	AN18841AE	2.02	8.2
	AN18841AF	1.97	5.8
6-STACK	AN18841AG	2.07	7.5
	AN18841AH	2.01	6.9
	AVG	2.00	7.01
	STD	0.035	1.05

COLD STORAGE

12-2-92

MOISTURE

STACK 3 11.00
 11.00

STACK 4 11.10
 11.00

STACK 5 11.00
 11.00

STACK 6 11.00
 11.00

AVG 11.01
STD .035

SNTEMP.XLS
7/24/93 2:00 PM

DIET STACK TEST
TO DETERMINE LONG TERM CHANGES OVER TIME IN COLD STORAGE
(ACL CASES)
12/2/92
TPD966

	F.C.	MOISTURE	CORRECTED F.C.
3-STACK	757.9	11.6	739.93
	762.4	11.5	739.87
4-STACK	782.3	11.6	763.75
	768.1	11.5	745.40
5-STACK	764.2	11.5	741.61
	775.6	11.7	761.76
6-STACK	775.3	11.6	756.91
	761.8	11.5	739.29
			<hr/>
			748.57
			10.482

COLD STORAGE

12-2-92

	F.C.	MOISTURE	CORRECTED F.C.
STACK 3	757.90	11.60	739.93
	762.40	11.50	739.87
		AVG	739.90
		STD	0.04
STACK 4	782.30	11.60	763.75
	768.10	11.50	745.40
		AVG	754.57
		STD	12.97
STACK 5	764.20	11.50	741.61
	775.60	11.70	761.76
		AVG	751.69
		STD	14.25
STACK 6	775.30	11.60	756.91
	761.80	11.50	739.29
		AVG	748.10
		STD	12.47

DIET STACK TEST
TO DETERMINE LONG TERM CHANGES OVER TIME IN COLD STORAGE
(ACL CASES)

12/2/92
TPD966

	Test Part	NICOTINE %	TOTAL SUGAR %
3-STACK	AN18843AA	1.82	6.1
	AN18843AB	1.95	6.1
4-STACK	AN18843AC	2.03	6.9
	AN18843AD	2.02	6.8
5-STACK	AN18843AE	1.97	5.9
	AN18843AF	1.99	5.9
6-STACK	AN18843AG	2.01	6.2
	AN18843AH	2.05	6.6
		<hr/>	<hr/>
		1.98	6.3
		0.072	0.40

COLD STORAGE

12-29-92

MOISTURE

STACK 3	11.10
	11.20
STACK 4	10.90
	11.00
STACK 5	11.00
	10.90
STACK 6	11.00
	11.00

AVG 11.0
STD .10

COLD STORAGE

12-29-92

	F.C.	MOISTURE	CORRECTED F.C.
--	------	----------	----------------

STACK 3	764.60	11.70	750.96
	763.90	11.80	754.79
		AVG	752.87
STACK 4	770.10	11.50	747.34
	801.00	11.60	782.00
		AVG	764.67
STACK 5	729.60	11.90	725.24
	748.90	11.70	735.54
		AVG	730.39
STACK 6	725.50	11.80	716.85
	738.90	11.80	730.09
		AVG	723.47

Overall AVG 742.85
STD 20.576

DIET STACK TEST
TO DETERMINE LONG TERM CHANGES OVER TIME IN COLD STORAGE
(ACL CASES)

12/29/92
TPD966

Test Part	NICOTINE %	TOTAL SUGAR %
3-STACK	1.86	4.4
	1.90	4.9
4-STACK	1.88	4.6
	1.95	4.9
5-STACK	2.04	4.6
	1.95	5.2
6-STACK	1.92	4.9
	<u>1.94</u>	<u>5.1</u>
	1.93	4.8
	0.055	0.27

COLD STORAGE 2-2-93

MOISTURE

STACK 3	10.60
STACK 4	10.60
STACK 5	10.50
STACK 6	10.50

FC's
next page

AVG 10.55
.0577

COLD STORAGE 3-2-93

MOISTURE

STACK 3	10.90
STACK 3	10.60
STACK 4	10.70
STACK 4	10.70
STACK 5	10.70
STACK 5	10.70
STACK 6	10.80
STACK 6	10.70

AVG 10.735
STD 0.0886

COLD STORAGE 3-2-93

F.C.

MOISTURE

CORRECTED

F.C.

STACK 3	783.80	11.60	765.21
STACK 3	787.20	12.00	787.20
STACK 4	780.10	11.50	757.04
STACK 4	779.20	11.80	769.91
STACK 5	775.20	11.70	761.37
STACK 5	794.20	11.80	784.73
STACK 6	762.40	11.60	744.32
STACK 6	752.70	11.90	748.20

AVG 764.75
STD 15.548

	COLD STORAGE	2-2-93	
	F.C.	MOISTURE	CORRECTED F.C.
STACK 3	801.70	12.00	801.70
STACK 3	768.70	12.20	777.98
STACK 4	762.50	12.10	767.09
STACK 4	762.50	12.00	762.50
STACK 5	741.10	12.40	759.10
STACK 5	731.30	12.40	749.06
STACK 6	755.50	12.30	769.22
STACK 6	764.30	12.00	764.30

AVG 768.87
 STD 15.645

DIET STACK TEST
TO DETERMINE LONG TERM CHANGES OVER TIME IN COLD STORAGE
(ACL CASES)

2/2/93
TPD966

	Test Part	NICOTINE %	TOTAL SUGAR %
3-STACK	AN19647AA	1.97	10.8
	AN19647AB	1.96	10.8
4-STACK	AN19647AC	2.04	11.2
	AN19647AD	2.04	11.2
5-STACK	AN19647AE	1.97	10.8
	AN19647AF	2.00	11.0
6-STACK	AN19647AG	2.02	11.1
	AN19647AH	2.05	11.4
		<hr/>	<hr/>
		2.01	11.0
		0.036	0.23

DIET STACK TEST
TO DETERMINE LONG TERM CHANGES OVER TIME IN COLD STORAGE
(ACL CASES)

3/2/93
TPD966

	Test Part	NICOTINE %	TOTAL SUGAR %
3-STACK	AN19647AI	2.03	11.1
	AN19647AJ	2.02	11.1
4-STACK	AN19647AK	2.04	11.2
	AN19647AL	2.04	11.2
5-STACK	AN19647AM	2.04	11.2
	AN19647AN	2.04	11.1
6-STACK	AN19647AO	2.03	11.2
	AN19647AP	1.97	10.8
		<u>2.03</u>	<u>11.1</u>
	0.024	0.14	

COLD STORAGE

3-2-93 ? NO DATE

→ 4/07/93

F.C.

MOISTURE

CORRECTED

F.C.

CASE	F.C.	MOISTURE	CORRECTED F.C.
CASE 1	791.90	11.20	754.79
	796.40	11.20	759.08
CASE 3	789.80	11.20	752.79
	787.10	11.20	750.21
CASE 9	795.70	11.10	753.87
	829.20	11.20	790.34
CASE 11	805.60	11.50	781.79
	808.70	11.50	784.80

AVG 765.96
 STD 16.646

CASE	MOISTURE
CASE 3	10.30
CASE 1	10.80
CASE 9	10.40
CASE 11	10.70

AVG 10.55
 STD .238

DIET STACK TEST
TO DETERMINE LONG TERM CHANGES OVER TIME IN COLD STORAGE
(ACL CASES)

4/7/93
TPD966

	Test Part	NICOTINE %	TOTAL SUGAR %
3-STACK	AN20180AC	1.9	6.4
	AN20180AD	1.9	6.2
4-STACK	AN20180AA	1.88	6.7
	AN20180AB	1.92	6.5
5-STACK	AN20180AG	1.94	6.6
	AN20180AH	1.92	6.8
6-STACK	AN20180AE	1.93	6.6
	AN20180AF	1.85	6.2
		<hr/>	<hr/>
		1.91	6.5
		0.029	0.22

COLD STORAGE DIET 4-29-93

	MOISTURE
STACK 3	10.70
	10.70
STACK 4	10.60
	10.70
STACK 5	10.60
	10.60
STACK 6	10.70
	10.80

AVG 10.675
STD 0.0707

DIET 4-29-93

	F.C.	MOISTURE	CORRECTED F.C.
STACK 3	779.90	11.40	752.32
	795.90	11.50	772.38
STACK 4	770.50	11.40	743.26
	778.20	11.50	755.20
STACK 5	759.40	11.50	736.96
	769.60	11.50	746.85
STACK 6	782.70	11.50	759.57
	790.70	11.40	762.74

AVG 753.66
STD 11.373

DIET STACK TEST
TO DETERMINE LONG TERM CHANGES OVER TIME IN COLD STORAGE
(ACL CASES)

4/29/93
TPD966

	Test Part	NICOTINE %	TOTAL SUGAR %
3-STACK	AN20370AA	1.96	6.2
	AN20370AB	1.99	6.8
4-STACK	AN20370AC	1.98	7.1
	AN20370AD	1.92	5.8
5-STACK	AN20370AE	2.00	6.3
	AN20370AF	1.95	6.4
6-STACK	AN20370AG	1.94	6.4
	AN20370AH	1.97	6.2
		<hr/>	<hr/>
		1.96	6.4
		0.027	0.40