The Use of a Beehive Deboner in Surimi Processing

ABSTRACT: The conventional surimi process includes two stages which have a potential for improvement in production efficiency. The first stage is pollock filleting. Even with the most efficient filleting machinery considerable flesh remains on the skeletal frames. The Beehive deboner was set up to recover usable meat from these frames. Results indicated 60% recovery, but the deboner was unable to remove kidney material which degraded the proteins. The second stage under investigation was the refining stage. Traditional refining machinery is difficult to clean, incapable of producing a clear separation, and incorporates air into the product. The Beehive machine was tested under a wide range of refining conditions to evaluate its applicability in the processing of surimi. Results indicate the Beehive deboner is easier to clean and separates red and white flesh up to 25% more effectively than the traditional refiner. However, the Beehive was not able to remove "black specks" and had a low capacity.

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I. Introduction

This series of tests was conducted during the months of February and March of 1986. The principle reason the tests were conducted was to determine if the Beehive machine was capable of recovering usable meat from pollock frames and of replacing the Fukoku refiner (FKC) in the manufacture of surimi.

At the present time pollock frames are sent to the reduction plant with a small amount of flesh remaining between and on the surface of the bones. This presented an opportunity to investigate the potential to recover this meat and add it into the surimi process.

The reason it was felt necessary to see if the FKC could be replaced was that the FKC has several perceived weaknesses. These are:

1. The machine is difficult to clear
2. The machine is incapable of making a clear separation. Therefore, a two-stage approach is normally used to produce a #2 grade
3. The FKC whips air into the product. This incorporation of air is both high and highly variable, making the pressing operation difficult to control.

II. The Beehive

A Beehive experimental deboner, model RSTC AUX 2" rotary meat machine, was utilized for this research effort. The Beehive machine works on an entirely different principle than the FKC. In the Beehive the material to be separated enters a hopper that measures approximately 2' X 18" X 1". In the bottom of this hopper are two interlocking screw conveyors that carry the material into the feed zone of a third screw conveyor that runs parallel to and below the conveyors in the hopper. This conveyor carries the material into the separation head.

The separation head consists of a truncated cone through which the material passes. The flites of the conveyor are milled down to conform to the reduction in diameter. The pitch of the screw is constant. The reduction in volume that occurs as the screw carries the material through the head is what effects the separation. Small, or mechanically weak material is forced out through the holes in the cone. Large, or mechanically strong material passes through the system as reject.

There are three main control variables that can be used to change the performance of the machine. These are speed, hole size in the screen, and choke setting. The first two variables are self explanatory. The choke restricts the flow of reject from the machine.

III. Test Description

Frame Mince

Frames from the Baader 182 pollock filleter were fed into the Beehive deboner. The deboner accepted the frames and minced the recoverable meat which was then analyzed.

Refiner

Because of the fact that the tests were run in an operating plant, it was not possible to get a direct comparison between the FKC and the Beehive; therefore, the Beehive was run in all its possible configurations.

Because of the fact that it is impossible to determine at this time all the uses for this data, all of the compiled data is attached. Each data sheet is divided into four sections: Test, Feed, Reject and Cake. Under the test sections the first line shows the origin of the feed. 418 signifies the Alfa Laval 418 decanter, BH signifies the Beehive machine, and the number immediately after the "BH" signifies the hole size used with the Beehive. "Choke" and "speed" signify the Beehive settings, "nominal recovery" shows the actual

recovery achieved in the test, and "solids" recovery is recovery adjusted for water content. "Temp in," "temp out" and "temp gain" are different capacity shows in lbs/hr, the rate at which the machine actually processed material during the test. "Hole size" shows the hole size used in the machine.

The "Feed" section shows a detailed description of the feed. "Solids content" is the dry solids in the feed stock. "Color" is presented in the Hunter system. "Contamination" is the average contamination in particles/10g. "Small" designates particles under 2mm. Large designates particles over 2mm. This allows for easy conversion to the Japanese contamination score.

The section labelled "Reject" describes the rejected product. In most cases it was not possible to measure contamination of the product. The section labelled "cake" describes the good product that passed through the screens, the "whiteness spread" shows the difference in whiteness between the cake and the reject. "Whiteness increase" shows the gain from the cake.

IV. Results and Discussion

Frame Mince

The Beehive deboner achieved 60% recovery from the frames, increasing overall recovery from round fish by 5%. The recovered meat had kidney material in it which stained the surimi it was made into and degraded the proteins. However, it is possible that, if the kidney material could be removed by some process, the recovered meat could be used in low-quality surimi. It may also be usable for animal feeds.

Refiner

The Beehive machine is far easier to clean than the FKC. The Beehive is also far better at making the separation between red and white meat than the FKC. The Beehive achieved a 95% recovery rate in replacing the FKC. The highest recovery rate achieved by the FKC in surimi production is 75%. However, the Beehive is not effective at removing contamination. Even when the 4mm head was used, it was ineffective in removing the black specks of peritoneal lining.

Another problem with the Beehive is capacity. Only when the machine ran solid material such as fillets did capacity exceed 2,000 lbs/hr. It is thought that this is due to the fact that the feed hopper and screws are designed to handle solids such as chicken wings, and the clearance between the screws and the hopper is too great for material such as mince, unless the mince is pressed before running, in which case the machine is used as a strainer.

If these two problems can be solved, the Beehive could be used to replace the FKC. This could result in substantial improvements in recovery.

The most promising avenue of investigation on the capacity problem is using a positive displacement pump for feeding the machine, rather than hoppers and the screw arrangement now used. Beehive has built such a machine for apples, and it works quite well.

The best solution to the "black speck" problem is to ensure that they don't enter the system in the first place. The Baader-182 that produced the fillets used in these tests was badly out of adjustment at the time. A properly tuned machine will produce mince that contains almost no black specks. If these two problems can be solved, the Beehive would prove to be a superior machine for producing surimi.

TEST DATA TABLES

Units of Measure

Feed:	descriptive
Choke:	machine setting
Speed:	machine setting
Recovery:	rate
Temperature:	°C
Capacity:	lbs/hour
Hole size:	mm
Solids content:	rate
Color:	Hunter System
Contamination:	#/10g.

TEST#	1		
	FEED		FILLETS
	CHOKE		NA
	SPEED		NA
	NOMINAL RECOVERY		0.957
	SOLIDS RECOVERY		0.954649
	TEMP IN		2.5
	TEMP OUT		4.1
	TEMP GAIN		1.6
	CAPACITY		3000
	HOLE SIZE		5
FEED			
	SOLIDS CONTENT		NA
	COLOR(L)		NA
	(a)		NA
	(b)		NA
	NOMINAL CONTAMINATION	(SMALL)	NA
		(LARGE)	NA
	ACTUAL CONTAMINATION	(SMALL)	ERR
		(LARGE)	ERR
	CONTAMINATION SCORE		ERR
REJECT			
	SOLIDS CONTENT		0.1699
	COLOR(L)		46.3
	(a)		3.3
	(b)		7
	NOMINAL CONTAMINATION	(SMALL)	NA
		(LARGE)	NA
	ACTUAL CONTAMINATION	(SMALL)	0
		(LARGE)	0
	CONTAMINATION SCORE		0
CAKE			
	SOLIDS CONTENT		0.1607
			RAW COOKED
	COLOR(L)		49.4
	(a)		0.3
	(b)		9.1
	NOMINAL CONTAMINATION	(SMALL)	NA
		(LARGE)	NA
	ACTUAL CONTAMINATION	(SMALL)	0
		(LARGE)	0
	CONTAMINATION SCORE		0
	CONTAMINATION REDUCTION	% (SMALL)	ERR
		% (LARGE)	ERR
	WHITENESS INCREASE		NA
	WHITENESS SPREAD		3.1

TEST#	2		
	FEED		FILLETS
	CHOKE		8.19
	SPEED		10
	NOMINAL RECOVERY		0.947
	SOLIDS RECOVERY		0.939178
	TEMP IN		3.4
	TEMP OUT		7.3
	TEMP GAIN		3.9
	CAPACITY		1614
	HOLE SIZE		0.15
FEED			
	SOLIDS CONTENT		NA
	COLOR(L)		NA
	(a)		NA
	(b)		
	NOMINAL CONTAMINATION	(SMALL)	NA
		(LARGE)	NA
	ACTUAL CONTAMINATION	(SMALL)	ERR
		(LARGE)	ERR
	CONTAMINATION SCORE		ERR
REJECT			
	SOLIDS CONTENT		0.1819
	COLOR(L)		44.7
	(a)		4.2
	(b)		8.9
	NOMINAL CONTAMINATION	(SMALL)	NA
		(LARGE)	NA
	ACTUAL CONTAMINATION	(SMALL)	0
		(LARGE)	0
	CONTAMINATION SCORE		0
CAKE			
	SOLIDS CONTENT		0.1572
			RAW COOKED
	COLOR(L)		51.1
	(a)		2.5
	(b)		10.1
	NOMINAL CONTAMINATION	(SMALL)	NA
		(LARGE)	NA
	ACTUAL CONTAMINATION	(SMALL)	NA
		(LARGE)	NA
	CONTAMINATION SCORE		NA
	CONTAMINATION REDUCTION	% (SMALL)	ERR
		% (LARGE)	ERR
	WHITENESS INCREASE		NA
	WHITENESS SPREAD		6.4

TEST#	3		
	FEED		695 MINCE
	CHOKE		7.81
	SPEED		10
	NOMINAL RECOVERY		0.976
	SOLIDS RECOVERY		0.969274
	TEMP IN		4.5
	TEMP OUT		5.5
	TEMP GAIN		1
	CAPACITY		1375
	HOLE SIZE		0.15
FEED			
	SOLIDS CONTENT		0.1426
	COLOR(L)		49.4
	(a)		3.4
	(b)		9.2
	NOMINAL CONTAMINATION	(SMALL)	NA
		(LARGE)	NA
	ACTUAL CONTAMINATION	(SMALL)	NA
		(LARGE)	NA
	CONTAMINATION SCORE		NA
REJECT			
	SOLIDS CONTENT		0.1846
	COLOR(L)		42.7
	(a)		4
	(b)		8.9
	NOMINAL CONTAMINATION	(SMALL)	NA
		(LARGE)	NA
	ACTUAL CONTAMINATION	(SMALL)	NA
		(LARGE)	NA
	CONTAMINATION SCORE		NA
CAKE			
	SOLIDS CONTENT		0.1432
			RAW COOKED
	COLOR(L)		52.1
	(a)		3.3
	(b)		10.8
	NOMINAL CONTAMINATION	(SMALL)	3.6
		(LARGE)	1
	ACTUAL CONTAMINATION	(SMALL)	4.148044
		(LARGE)	1.152234
	CONTAMINATION SCORE		2.534916
	CONTAMINATION REDUCTION %	(SMALL)	ERR
		% (LARGE)	ERR
	WHITENESS INCREASE		2.7
	WHITENESS SPREAD		9.4

TEST#	4	
	FEED	SCREEN MINCE
	CHOKE	7.23
	SPEED	10
	NOMINAL RECOVERY	0.8966
	SOLIDS RECOVERY	0.904817
	TEMP IN	6.2
	TEMP OUT	7.2
	TEMP GAIN	1
	CAPACITY	1548
	HOLE SIZE	0.15
FEED		
	SOLIDS CONTENT	0.133
	COLOR(L)	56.8
	(a)	3.2
	(b)	10.4
	NOMINAL CONTAMINATION (SMALL)	NA
	(LARGE)	NA
	ACTUAL CONTAMINATION (SMALL)	NA
	(LARGE)	NA
	CONTAMINATION SCORE	NA
REJECT		
	SOLIDS CONTENT	0.1402
	COLOR(L)	50.3
	(a)	3
	(b)	9.6
	NOMINAL CONTAMINATION (SMALL)	NA
	(LARGE)	NA
	ACTUAL CONTAMINATION (SMALL)	NA
	(LARGE)	NA
	CONTAMINATION SCORE	NA
CAKE		
	SOLIDS CONTENT	0.1537
		RAW COOKED
	COLOR(L)	59.8
	(a)	2.7
	(b)	11.2
	NOMINAL CONTAMINATION (SMALL)	5.9
	(LARGE)	1.33
	ACTUAL CONTAMINATION (SMALL)	6.333767
	(LARGE)	1.427781
	CONTAMINATION SCORE	3.539037
	CONTAMINATION REDUCTION % (SMALL)	ERR
	% (LARGE)	ERR
	WHITENESS INCREASE	3
	WHITENESS SPREAD	9.5

TEST#	5	
	FEED	HX-200 PRESS
	CHOKE	7.62
	SPEED	10
	NOMINAL RECOVERY	0.9489
	SOLIDS RECOVERY	0.947272
	TEMP IN	10.8
	TEMP OUT	11.7
	TEMP GAIN	0.9
	CAPACITY	3288
	HOLE SIZE	0.15
FEED		
	SOLIDS CONTENT	0.1935
	COLOR(L)	49.7
	(a)	0.6
	(b)	9.6
	NOMINAL CONTAMINATION (SMALL)	15.6
	(LARGE)	1.33
	ACTUAL CONTAMINATION (SMALL)	13.30232
	(LARGE)	1.134108
	CONTAMINATION SCORE	5.568217
REJECT		
	SOLIDS CONTENT	0.1998
	COLOR(L)	51.5
	(a)	0.7
	(b)	10.1
	NOMINAL CONTAMINATION (SMALL)	46
	(LARGE)	3.33
	ACTUAL CONTAMINATION (SMALL)	37.98798
	(LARGE)	2.75
	CONTAMINATION SCORE	15.41266
CAKE		
	SOLIDS CONTENT	0.1933
		RAW COOKED
	COLOR(L)	52.3
	(a)	-0.1
	(b)	10.5
	NOMINAL CONTAMINATION (SMALL)	9.6
	(LARGE)	2
	ACTUAL CONTAMINATION (SMALL)	8.194516
	(LARGE)	1.707190
	CONTAMINATION SCORE	4.438696
	CONTAMINATION REDUCTION % (SMALL)	38.39786
	% (LARGE)	-50.5315
	WHITENESS INCREASE	2.6
	WHITENESS SPREAD	0.8

TEST#	6		
	FEED		SCREEN MINCE
	CHOKE		7.92
	SPEED		10
	NOMINAL RECOVERY		0.9518
	SOLIDS RECOVERY		0.950495
	TEMP IN		3.8
	TEMP OUT		4.6
	TEMP GAIN		0.8
	CAPACITY		1494
	HOLE SIZE		0.15
FEED			
	SOLIDS CONTENT		0.1172
	COLOR(L)		57.4
	(a)		1.3
	(b)		9.7
	NOMINAL CONTAMINATION	(SMALL)	NA
		(LARGE)	NA
	ACTUAL CONTAMINATION	(SMALL)	NA
		(LARGE)	NA
	CONTAMINATION SCORE		NA
REJECT			
	SOLIDS CONTENT		0.1192
	COLOR(L)		48
	(a)		3.2
	(b)		8.8
	NOMINAL CONTAMINATION	(SMALL)	NA
		(LARGE)	NA
	ACTUAL CONTAMINATION	(SMALL)	NA
		(LARGE)	NA
	CONTAMINATION SCORE		NA
CAKE			
	SOLIDS CONTENT		0.1159
			RAW COOKED
	COLOR(L)		58.9
	(a)		0.1
	(b)		7
	NOMINAL CONTAMINATION	(SMALL)	19.6
		(LARGE)	1
	ACTUAL CONTAMINATION	(SMALL)	27.90336
		(LARGE)	1.423641
	CONTAMINATION SCORE		10.72476
	CONTAMINATION REDUCTION	% (SMALL)	ERR
		% (LARGE)	ERR
	WHITENESS INCREASE		1.5
	WHITENESS SPREAD		10.9

TEST#	7		
	FEED		TEST 6 CAKE
	CHOKE		8.15
	SPEED		10
	NOMINAL RECOVERY		0.7596
	SOLIDS RECOVERY		0.729950
	TEMP IN		3.4
	TEMP OUT		6
	TEMP GAIN		2.6
	CAPACITY		1060
	HOLE SIZE		0.8
FEED			
	SOLIDS CONTENT		0.1159
	COLOR(L)		58.9
	(a)		0.1
	(b)		7
	NOMINAL CONTAMINATION	(SMALL)	19.6
		(LARGE)	1
	ACTUAL CONTAMINATION	(SMALL)	27.90336
		(LARGE)	1.423641
	CONTAMINATION SCORE		10.72476
REJECT			
	SOLIDS CONTENT		0.1273
	COLOR(L)		56.9
	(a)		0.3
	(b)		10.4
	NOMINAL CONTAMINATION	(SMALL)	19
		(LARGE)	1.33
	ACTUAL CONTAMINATION	(SMALL)	24.62686
		(LARGE)	1.723880
	CONTAMINATION SCORE		9.932835
CAKE			
	SOLIDS CONTENT		0.1089
			RAW COOKED
	COLOR(L)		59
	(a)		0.4
	(b)		10.5
	NOMINAL CONTAMINATION	(SMALL)	16.6
		(LARGE)	0.33
	ACTUAL CONTAMINATION	(SMALL)	25.15151
		(LARGE)	0.5
	CONTAMINATION SCORE		8.883838
	CONTAMINATION REDUCTION %	(SMALL)	9.862071
		% (LARGE)	64.87878
	WHITENESS INCREASE		0.1
	WHITENESS SPREAD		2.1

TEST#	7.1	TEST 7 CAKE	
	FEED	8.92	
	CHOKE	10	
	SPEED	0.9358	
	NOMINAL RECOVERY	0.928128	
	SOLIDS RECOVERY	6.5	
	TEMP IN	6.7	
	TEMP OUT	0.2	
	TEMP GAIN	1123	
	CAPACITY	0.8	
	HOLE SIZE		
FEED			
	SOLIDS CONTENT	0.1089	
	COLOR(L)	59	
	(a)	1.4	
	(b)	10.5	
	NOMINAL CONTAMINATION (SMALL)	16.6	
	(LARGE)	0.33	
	ACTUAL CONTAMINATION (SMALL)	25.15151	
	(LARGE)	0.5	
	CONTAMINATION SCORE	8.883838	
REJECT			
	SOLIDS CONTENT	0.1166	
	COLOR(L)	57.8	
	(a)	0.5	
	(b)	10.3	
	NOMINAL CONTAMINATION (SMALL)	11.66	
	(LARGE)	1.33	
	ACTUAL CONTAMINATION (SMALL)	16.5	
	(LARGE)	1.882075	
	CONTAMINATION SCORE	7.382075	
CAKE			
	SOLIDS CONTENT	0.1033	
		RAW	COOKED
	COLOR(L)	59.1	
	(a)	0.9	
	(b)	10.4	
	NOMINAL CONTAMINATION (SMALL)	21.6	
	(LARGE)	0	
	ACTUAL CONTAMINATION (SMALL)	34.50145	
	(LARGE)	0	
	CONTAMINATION SCORE	11.50048	
	CONTAMINATION REDUCTION % (SMALL)	-37.1744	
	% (LARGE)	100	
	WHITENESS INCREASE	0.1	
	WHITENESS SPREAD	1.3	

TEST#	8		
	FEED		SCREEN MINCE
	CHOKE		8.96
	SPEED		10
	NOMINAL RECOVERY		0.897
	SOLIDS RECOVERY		0.874870
	TEMP IN		3.6
	TEMP OUT		5.1
	TEMP GAIN		1.5
	CAPACITY		936
	HOLE SIZE		0.8
FEED			
	SOLIDS CONTENT		0.1188
	COLOR(L)		57.1
	(a)		1.6
	(b)		9.6
	NOMINAL CONTAMINATION	(SMALL)	NA
		(LARGE)	NA
	ACTUAL CONTAMINATION	(SMALL)	NA
		(LARGE)	NA
	CONTAMINATION SCORE		NA
REJECT			
	SOLIDS CONTENT		0.141
	COLOR(L)		50.1
	(a)		3.1
	(b)		9.6
	NOMINAL CONTAMINATION	(SMALL)	7
		(LARGE)	0.66
	ACTUAL CONTAMINATION	(SMALL)	8.191489
		(LARGE)	0.772340
	CONTAMINATION SCORE		3.502836
CAKE			
	SOLIDS CONTENT		0.1132
			RAW COOKED
	COLOR(L)		60.5 69.9
	(a)		0 -2.4
	(b)		10.6 10.4
	NOMINAL CONTAMINATION	(SMALL)	10.66
		(LARGE)	0
	ACTUAL CONTAMINATION	(SMALL)	15.53798
		(LARGE)	0
	CONTAMINATION SCORE		5.179328
	CONTAMINATION REDUCTION %	(SMALL)	ERR
		% (LARGE)	ERR
	WHITENESS INCREASE		3.4
	WHITENESS SPREAD		10.4

TEST#	9		
	FEED		695 MINCE
	CHOKE		8.96
	SPEED		10
	NOMINAL RECOVERY		0.8826
	SOLIDS RECOVERY		0.885046
	TEMP IN		3.6
	TEMP OUT		5.1
	TEMP GAIN		1.5
	CAPACITY		1023
	HOLE SIZE		0.8
FEED			
	SOLIDS CONTENT		0.1429
	COLOR(L)		54.2
	(a)		2.1
	(b)		9.3
	NOMINAL CONTAMINATION	(SMALL)	NA
		(LARGE)	NA
	ACTUAL CONTAMINATION	(SMALL)	NA
		(LARGE)	NA
	CONTAMINATION SCORE		NA
REJECT			
	SOLIDS CONTENT		0.141
	COLOR(L)		49
	(a)		3.2
	(b)		9.3
	NOMINAL CONTAMINATION	(SMALL)	NA
		(LARGE)	NA
	ACTUAL CONTAMINATION	(SMALL)	NA
		(LARGE)	NA
	CONTAMINATION SCORE		NA
CAKE			
	SOLIDS CONTENT		0.1444
			RAW COOKED
	COLOR(L)		55.9
	(a)		1.8
	(b)		10.8
	NOMINAL CONTAMINATION	(SMALL)	11.66
		(LARGE)	0
	ACTUAL CONTAMINATION	(SMALL)	13.32340
		(LARGE)	0
	CONTAMINATION SCORE		4.441135
	CONTAMINATION REDUCTION %	(SMALL)	ERR
		% (LARGE)	ERR
	WHITENESS INCREASE		1.7
	WHITENESS SPREAD		6.9

TEST#	10	
	FEED	FILLETS
	CHOKE	8.96
	SPEED	5
	NOMINAL RECOVERY	0.909
	SOLIDS RECOVERY	0.878700
	TEMP IN	2.4
	TEMP OUT	4
	TEMP GAIN	1.6
	CAPACITY	924
	HOLE SIZE	0.8
FEED		
	SOLIDS CONTENT	NA
	COLOR(L)	NA
	(a)	NA
	(b)	NA
	NOMINAL CONTAMINATION (SMALL)	NA
	(LARGE)	NA
	ACTUAL CONTAMINATION (SMALL)	NA
	(LARGE)	NA
	CONTAMINATION SCORE	NA
REJECT		
	SOLIDS CONTENT	0.1583
	COLOR(L)	47.5
	(a)	2.8
	(b)	7.7
	NOMINAL CONTAMINATION (SMALL)	NA
	(LARGE)	NA
	ACTUAL CONTAMINATION (SMALL)	NA
	(LARGE)	NA
	CONTAMINATION SCORE	NA
CAKE		
	SOLIDS CONTENT	0.1148
		RAW COOKED
	COLOR(L)	54.4
	(a)	1.2
	(b)	9.6
	NOMINAL CONTAMINATION (SMALL)	15.33
	(LARGE)	0
	ACTUAL CONTAMINATION (SMALL)	22.03353
	(LARGE)	0
	CONTAMINATION SCORE	7.344512
	CONTAMINATION REDUCTION % (SMALL)	ERR
	% (LARGE)	ERR
	WHITENESS INCREASE	NA
	WHITENESS SPREAD	6.9

TEST#	11	
	FEED	HX-200 PRESS
	CHOKE	8.96
	SPEED	10
	NOMINAL RECOVERY	0.6123
	SOLIDS RECOVERY	0.605050
	TEMP IN	9.8
	TEMP OUT	10.4
	TEMP GAIN	0.6
	CAPACITY	1251
	HOLE SIZE	0.8
FEED		
	SOLIDS CONTENT	0.2063
	COLOR(L)	50.1
	(a)	1.9
	(b)	10.4
	NOMINAL CONTAMINATION (SMALL)	9.3
	(LARGE)	2
	ACTUAL CONTAMINATION (SMALL)	7.438196
	(LARGE)	1.599612
	CONTAMINATION SCORE	4.079011
REJECT		
	SOLIDS CONTENT	0.1968
	COLOR(L)	54.7
	(a)	1
	(b)	11.1
	NOMINAL CONTAMINATION (SMALL)	12.66
	(LARGE)	2
	ACTUAL CONTAMINATION (SMALL)	10.61432
	(LARGE)	1.676829
	CONTAMINATION SCORE	5.214939
CAKE		
	SOLIDS CONTENT	0.1909
		RAW COOKED
	COLOR(L)	53
	(a)	1.2
	(b)	1.1
	NOMINAL CONTAMINATION (SMALL)	14.66
	(LARGE)	0
	ACTUAL CONTAMINATION (SMALL)	12.67103
	(LARGE)	0
	CONTAMINATION SCORE	4.223677
	CONTAMINATION REDUCTION % (SMALL)	-70.3508
	% (LARGE)	100
	WHITENESS INCREASE	2.9
	WHITENESS SPREAD	-1.7

TEST#	12		
	FEED		FILLETS
	CHOKE		7.55
	SPEED		10
	NOMINAL RECOVERY		0.9833
	SOLIDS RECOVERY		0.983240
	TEMP IN		3.8
	TEMP OUT		5
	TEMP GAIN		1.2
	CAPACITY		2888
	HOLE SIZE		0.15
FEED			
	SOLIDS CONTENT		NA
	COLOR(L)		NA
	(a)		NA
	(b)		NA
	NOMINAL CONTAMINATION	(SMALL)	NA
		(LARGE)	NA
	ACTUAL CONTAMINATION	(SMALL)	NA
		(LARGE)	NA
	CONTAMINATION SCORE		NA
REJECT			
	SOLIDS CONTENT		0.1653
	COLOR(L)		43.4
	(a)		4.2
	(b)		8.1
	NOMINAL CONTAMINATION	(SMALL)	NA
		(LARGE)	NA
	ACTUAL CONTAMINATION	(SMALL)	NA
		(LARGE)	NA
	CONTAMINATION SCORE		NA
CAKE			
	SOLIDS CONTENT		0.1647
			RAW COOKED
	COLOR(L)		49.9
	(a)		2
	(b)		9
	NOMINAL CONTAMINATION	(SMALL)	11
		(LARGE)	1.33
	ACTUAL CONTAMINATION	(SMALL)	11.02003
		(LARGE)	1.332422
	CONTAMINATION SCORE		5.005768
	CONTAMINATION REDUCTION	% (SMALL)	ERR
		% (LARGE)	ERR
	WHITENESS INCREASE		NA
	WHITENESS SPREAD		6.5

TEST#	13		
	FEED		418 MINCE
	CHOKE		8.96
	SPEED		10
	NOMINAL RECOVERY		0.8998
	SOLIDS RECOVERY		0.882611
	TEMP IN		5.4
	TEMP OUT		6.2
	TEMP GAIN		0.8
	CAPACITY		983
	HOLE SIZE		0.8
FEED			
	SOLIDS CONTENT		0.1303
	COLOR(L)		54
	(a)		2.8
	(b)		11.1
	NOMINAL CONTAMINATION	(SMALL)	NA
		(LARGE)	NA
	ACTUAL CONTAMINATION	(SMALL)	NA
		(LARGE)	NA
	CONTAMINATION SCORE		NA
			NA
REJECT			
	SOLIDS CONTENT		0.1481
	COLOR(L)		47.4
	(a)		2.8
	(b)		9.2
	NOMINAL CONTAMINATION	(SMALL)	NA
		(LARGE)	NA
	ACTUAL CONTAMINATION	(SMALL)	NA
		(LARGE)	NA
	CONTAMINATION SCORE		NA
CAKE			
	SOLIDS CONTENT		0.124
			RAW COOKED
	COLOR(L)		55.8 64.9
	(a)		1.7 -2
	(b)		11.5 9.2
	NOMINAL CONTAMINATION	(SMALL)	17
		(LARGE)	0
	ACTUAL CONTAMINATION	(SMALL)	22.62096
		(LARGE)	0
	CONTAMINATION SCORE		7.540322
	CONTAMINATION REDUCTION %	(SMALL)	ERR
		% (LARGE)	ERR
	WHITENESS INCREASE		1.8
	WHITENESS SPREAD		8.4

TEST#	14		
	FEED		695 MINCE
	CHOKE		8.96
	SPEED		10
	NOMINAL RECOVERY		0.9025
	SOLIDS RECOVERY		0.896188
	TEMP IN		2.9
	TEMP OUT		3.2
	TEMP GAIN		0.3
	CAPACITY		1077
	HOLE SIZE		0.8
FEED			
	SOLIDS CONTENT		0.143
	COLOR(L)		50.2
	(a)		20.7
	(b)		9.2
	NOMINAL CONTAMINATION	(SMALL)	NA
		(LARGE)	NA
	ACTUAL CONTAMINATION	(SMALL)	NA
		(LARGE)	NA
	CONTAMINATION SCORE		NA
REJECT			
	SOLIDS CONTENT		NA
	COLOR(L)		NA
	(a)		NA
	(b)		NA
	NOMINAL CONTAMINATION	(SMALL)	NA
		(LARGE)	NA
	ACTUAL CONTAMINATION	(SMALL)	NA
		(LARGE)	NA
	CONTAMINATION SCORE		NA
CAKE			
	SOLIDS CONTENT		0.142
			RAW COOKED
	COLOR(L)		50.3
	(a)		3.7
	(b)		9
	NOMINAL CONTAMINATION	(SMALL)	16.3
		(LARGE)	0
	ACTUAL CONTAMINATION	(SMALL)	18.94014
		(LARGE)	0
	CONTAMINATION SCORE		6.313380
	CONTAMINATION REDUCTION	% (SMALL)	ERR
		% (LARGE)	ERR
	WHITENESS INCREASE		0.1
	WHITENESS SPREAD		NA

TEST#	14.1		
	FEED		418-BH.8-695
	CHOKE		8.85
	SPEED		10
	NOMINAL RECOVERY		0.9892
	SOLIDS RECOVERY		0.917579
	TEMP IN		6.1
	TEMP OUT		7.1
	TEMP GAIN		1
	CAPACITY		1174
	HOLE SIZE		0.8
FEED			
	SOLIDS CONTENT		0.1174
	COLOR(L)		56.3
	(a)		1.3
	(b)		10.7
	NOMINAL CONTAMINATION	(SMALL)	16.3
		(LARGE)	0
	ACTUAL CONTAMINATION	(SMALL)	22.90885
		(LARGE)	0
	CONTAMINATION SCORE		7.636286
REJECT			
	SOLIDS CONTENT		NA
	COLOR(L)		NA
	(a)		NA
	(b)		NA
	NOMINAL CONTAMINATION	(SMALL)	NA
		(LARGE)	NA
	ACTUAL CONTAMINATION	(SMALL)	NA
		(LARGE)	NA
	CONTAMINATION SCORE		NA
CAKE			
	SOLIDS CONTENT		0.1089
			RAW COOKED
	COLOR(L)		57 67.2
	(a)		1.2 -2.7
	(b)		10.4 9.2
	NOMINAL CONTAMINATION	(SMALL)	30.66
		(LARGE)	0
	ACTUAL CONTAMINATION	(SMALL)	46.45454
		(LARGE)	0
	CONTAMINATION SCORE		15.48484
	CONTAMINATION REDUCTION	% (SMALL)	-102.779
		% (LARGE)	ERR
	WHITENESS INCREASE		0.7
	WHITENESS SPREAD		NA

TEST#	15	FILLETS
	FEED	8.03
	CHOKE	4
	SPEED	0.9533
	NOMINAL RECOVERY	ERR
	SOLIDS RECOVERY	2.5
	TEMP IN	3.1
	TEMP OUT	0.6
	TEMP GAIN	2247
	CAPACITY	0.15
	HOLE SIZE	
FEED		
	SOLIDS CONTENT	NA
	COLOR(L)	NA
	(a)	NA
	(b)	NA
	NOMINAL CONTAMINATION (SMALL)	NA
	(LARGE)	NA
	ACTUAL CONTAMINATION (SMALL)	NA
	(LARGE)	NA
	CONTAMINATION SCORE	NA
REJECT		
	SOLIDS CONTENT	0.1736
	COLOR(L)	42.9
	(a)	3
	(b)	6.5
	NOMINAL CONTAMINATION (SMALL)	NA
	(LARGE)	NA
	ACTUAL CONTAMINATION (SMALL)	NA
	(LARGE)	NA
	CONTAMINATION SCORE	NA
CAKE		
	SOLIDS CONTENT	0.1576
		RAW COOKED
	COLOR(L)	48.4
	(a)	2.6
	(b)	8.7
	NOMINAL CONTAMINATION (SMALL)	24.33
	(LARGE)	2.66
	ACTUAL CONTAMINATION (SMALL)	25.47239
	(LARGE)	2.784898
	CONTAMINATION SCORE	11.27569
	CONTAMINATION REDUCTION % (SMALL)	ERR
	% (LARGE)	ERR
	WHITENESS INCREASE	NA
	WHITENESS SPREAD	NA

COMMENT :ACTUAL RECOVERY WAS MUCH HIGHER THAN INDICATED

TEST#	15.1		418-BH1.5
	FEED		8.88
	CHOKE		4
	SPEED		0.983
	NOMINAL RECOVERY		0.985692
	SOLIDS RECOVERY		4.9
	TEMP IN		6
	TEMP OUT		1.1
	TEMP GAIN		847
	CAPACITY		0.8
	HOLE SIZE		
FEED			
	SOLIDS CONTENT		0.1308
	COLOR(L)		54.3
	(a)		2.2
	(b)		9.7
	NOMINAL CONTAMINATION	(SMALL)	23
		(LARGE)	1.66
	ACTUAL CONTAMINATION	(SMALL)	29.01376
		(LARGE)	2.094036
	CONTAMINATION SCORE		11.76529
REJECT			
	SOLIDS CONTENT		0.128
	COLOR(L)		53.5
	(a)		0.6
	(b)		9
	NOMINAL CONTAMINATION	(SMALL)	NA
		(LARGE)	NA
	ACTUAL CONTAMINATION	(SMALL)	NA
		(LARGE)	NA
	CONTAMINATION SCORE		NA
CAKE			
	SOLIDS CONTENT		0.1525
			RAW COOKED
	COLOR(L)		54.3
	(a)		2.8
	(b)		10.9
	NOMINAL CONTAMINATION	(SMALL)	11.33
		(LARGE)	0.33
	ACTUAL CONTAMINATION	(SMALL)	12.25868
		(LARGE)	0.357049
	CONTAMINATION SCORE		4.443278
	CONTAMINATION REDUCTION %	(SMALL)	57.74870
		% (LARGE)	82.94923
	WHITENESS INCREASE		0
	WHITENESS SPREAD		0.8