

DEMO REPORT

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APPLICATION TEST REPORT

BY IEVEN, PIETER

DATE: 20 MAY 2019**MACHINE:** Optyx 3355**PRODUCT:** Frozen snacks**FUNCTION:** Shape & Color sorting**CUSTOMER:** Mora**CONTACT:** P. IEVEN / G.LENSSEN**SFDC ID#** 115965

Purpose:

This demo aimed to prove the suitability of a G6 Optyx sorter regarding sorting performance and the operator usability of the user interface (UI) for fried snacks. It was important to eject misshapen products to improve product quality.

Application Information:

Ball type

Product	Frozen balls	
Product color	balls	
Product size	40 x 40 mm	
Product weight	20 g	
Requested capacity (kg/h)	3600 kg / hr	

Defects:

Defects are mainly misshapen products such too small, too big or balls that are frozen together (for testing purposes, sticks were used to mimic this).

Burger type

Product	Frozen Burgers	
Product color	yellow	
Product size	90 x 80 mm	
Product weight	70 g	
Requested capacity (kg/h)	3600 kg / hr	

Defects:

Defects are mainly misshapen products such too small, too big and burgers that contain a bulge.



Figure 1: Burger type defects: misshapen

Nugget type

Product	Frozen nuggets	
Product color	White/yellow	
Product size	50-60 x 30-40 mm	
Product weight	18 g	
Requested capacity (kg/h)	3600 kg / hr	

Defects:

Defects are mainly misshapen products such too small, too big, nuggets that are frozen together and nuggets that contain a bulge. Other defects arise when nuggets that were frozen together are somehow separated in the line and batter gets off.



Figure 2: Nugget type defects: Misshapen (left) and no batter (right)

Stick type

Product	Frozen sticks	
Product color	Brown	
Product size	50-60 x 30 mm	
Product weight	18 g	
Requested capacity (kg/h)	3600 kg / hr	

Defects:

Defects are mainly misshapen products such too small, too big and sticks that are frozen. Other defects arise when sticks that were frozen together are somehow separated in the line and batter gets off.



Figure 3: Stick type defect: Misshapen (left) and damaged (right)

Equipment used:

Type	G6-Optyx 3355 (or 3755)	
Optical configuration	Top (and Bottom) RGB camera	
Infeed Width	60 cm	
Shaker information	Perforated decks with infeed chute	
Keyware	CANDY RDS 3.00 With modified NFT file to enlarge color defects to ensure proper ejection of a proper shaped product with a color defect.	

The Optyx is belt driven (2.44 mm/s) to speed-up and stabilize the product with an infeed chute to pre-accelerate the products to ensure product stability, for ball and stick type products a stabilization roll is essential. The scan rate used was 4000 to obtain square pixels what is indispensable for shape sorting.

Procedure:

Products are scanned by the sensors, RGB cameras, on the Optyx. First, the on belt TOP camera is scanning the product on the belt. This image is best used for rejection decisions based on shape as the product stability is best on belt and the perpendicular view of the sensor on the product represents best the realistic measurements. When product is released from the belt, the bottom cameras scans the product in air. The sensor is needed if product defects that can occur only on one side needs to be rejected. For shape only sorting, a single TOP camera will be sufficient.

With the Keyware used on the Optyx we can use several algorithms such as length, width and filling rate of the closest rectangle in which the product fits to make sorting decisions. For those algorithms we can set lower and upper limits than will serve as thresholds. These thresholds can be measured for a bunch of product and set as default values in the system. Operators can then slightly adjust those values during production if needed.

Test Runs:

Ball type

The focus on this test was only on shape. To mimic 2 attached balls, sticks were used. One test run was done with a batch of 8.3 kg (415 pieces) containing 15 defects, hence a defect load of 3.6 %. During this test all defects were removed with zero to negligible false reject.

	Weight (kg)	Piece count
<i>Infeed</i>	8.3	415
<i>Good product</i>		400
<i>Defects</i>		15

<i>Test</i>	False Accept			False Reject		
	Piece count	Weight (g)	Percentage (%)	Piece count	Weight (g)	Percentage (%)
<i>Run 1</i>	0	0	0	1	20	0.24
<i>Defect run 1</i>				0	0	0

Burger type

The focus on this test was only on shape. Two defects, burgers containing a bulge were found in the test product. To mimic other defects as too short or too thin, burgers were divided in half. One test run was done with a batch of 13 kg (186 pieces) containing 7 defects, hence a defect load of 3.9 %. During this test, all defects were removed with very low false reject. Reject is probably due to bad separation of the product on the belt. When two burgers lie against each other, this can be seen as one big burger, hence ejection.

	Weight (kg)	Piece count
<i>Infeed</i>	13	186
<i>Good product</i>		179
<i>Defects</i>		7

<i>Test</i>	False Accept			False Reject		
	Piece count	Weight (g)	Percentage (%)	Piece count	Weight (g)	Percentage (%)
<i>Run 1</i>	0	0	0	2	140	0.6
<i>Defect run 1</i>				0	0	0

Nugget type

The focus on this test was shape and color. All possible defects were available and were included in the test sample. Test runs were performed with batches of 6.0 kg (333 pieces) containing 15 defects, hence a defect load of 4.5 %. Rejection of all defects with no false accept. False reject was remarkable, however this can be lowered by finding the perfect set-point. A lot of fine-tuning is necessary to find the best threshold as the range between good and bad is small. When the total reject goes for a second run, false accept is lower. Hence, some false reject is due to a bad distribution of the product on the belt.

The reject of color defects was more difficult as the color differences of the defect and the good product were low.

	Weight (kg)	Piece count
<i>Infeed</i>	6.0	333
<i>Good product</i>		318
<i>Defects</i>		15

Test	False Accept			False Reject		
	Piece count	Weight (g)	Percentage (%)	Piece count	Weight (g)	Percentage (%)
Run 1	0	0	0	16	288	4.8
Defect run 1				6	108	1.8
Run 2	0	0	0	22	396	6.6
Defect run2				2	36	0.6

Stick type

The focus on this test was shape and color. All possible defects were available and were included in the test sample. Test runs were performed with batches of 7.3 kg (406 pieces) containing 15 defects, hence a defect load of 3.7 %. In a first run, some false accept occur due to an improper set of the threshold, this was adjusted and the second run did not contain any false accept anymore. False reject was low and when the total reject goes for a second run, no false accept seen. Hence, false reject is due to a bad distribution of the product on the belt.

	Weight (kg)	Piece count
Infeed	7.3	406
Good product		391
Defects		15

Test	False Accept			False Reject		
	Piece count	Weight (g)	Percentage (%)	Piece count	Weight (g)	Percentage (%)
Run 1	5	90	1.2	6	108	1.5
Defect run 1				0	0	0
Run 2	0	0	0	4	72	1.0
Defect run 2				0	0	0

Conclusion:

At the sorting experience center in Hasselt, the Optyx had been demonstrated to Mora for the detection of misshapen snacks. The tests has proven the usability of the UI as well as the sorting results, ejection of defects with an acceptable false reject. Most false reject was due to bad distribution of the product on the belt. This can still be optimized by the use of a different shaker before the Optyx. This shaker should be designed to optimize detouch of the product. Or by increasing the belt speed of the Optyx to 3.0 m/s if product stability is still proven.

A single Top camera will suffice for the rejection of misshapen snacks. To eject color defects as well, stick type of product, the use of a bottom camera is needed as color defects are only single sided.

We look forward to receive the feedback from you and your team and remain at your full disposal for any further questions.