December 2nd, 2018

Stevenson Company Inc.

Spiral Chute Drop Test Report

Introduction

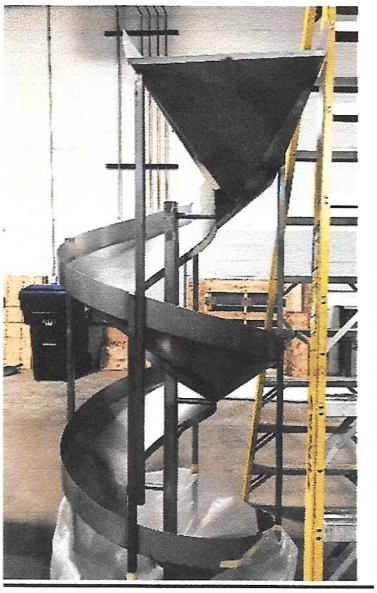
This study was conducted on November 15th, 2018 at the Stevenson Company Inc. manufacturing facility by Dr. Fadi Aramouni and Ms. McKenna Mills. The purpose of this study was to determine the breakage % of three standard products using Stevenson Company Inc.'s spiral chutes.

Materials and Methods

The spirals and products used for this study can be seen pictured below. The product was carefully counted and separated to ensure all product going through the chute was unbroken prior to beginning the study. Standard plant defects (i.e. folded chips, misprinted m&m's) were deemed acceptable for study accuracy, as long as no product pieces were missing.

Once carefully counted, the product is dropped into the spiral chute using a "bag and drop" method. This method is used to mimic industry chute methods used in many manufacturing facilities. The drop is timed until the last piece of product has gone down the chute. After product is collected, it is once again carefully counted to observe for any breaks or dings to the product. If any are found, the affected product is replaced with a new piece. Several trials are run on the same counted chips. This creates a stressed environment for the chips as they go through triplicate runs without breaking.

Spiral's:



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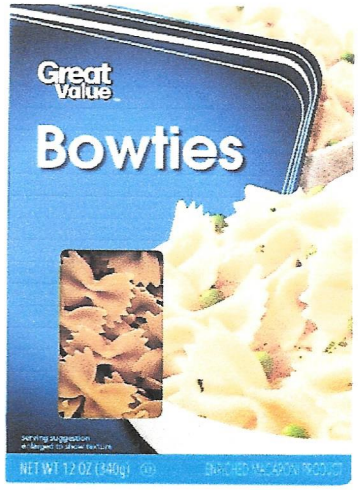
Products:

Product 1: Doritos Nacho Cheese

Product 2: Milk Chocolate M&M's



Product 3: Dried Bowtie Pasta

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Results

DORITO CHIPS	Time of Fall	Number broken Sample size: 100
Trial 1	5 seconds	1 broken
Trial 2	4 seconds	2 broken
Trial 3	5 seconds	1 broken

Average percentage of breaks: 1.3%

M&M's	Time of Fall	Number broken Sample size: 1300
Trial 1 (Larger chute)	5 seconds	27 broken
Trial 2	6 seconds	4 broken
Trial 3	6 seconds	6 broken

Average percentage of breaks: 0.95%

Bowtie Pasta	Time of Fall	Number broken Sample size: 300
Trial 1	5 seconds	5 broken
Trial 2	5 seconds	6 broken

Average percentage of breaks: 1.8%

Conclusions:

All product samples handled the stress tests through the chute remarkably well. As seen in the results above, broken samples did not exceed 2% of tested product. It can be noted that the Dorito bags received had the largest amounts of broken product already in retail bags. These were the hardest to sift through. The M&M's candy shell received the most damage, but this damage was significantly lowered by changing the chute. Stevenson Company Inc. creates handmade spiral chutes for every customer. It should be noted that the three chutes provided were not necessarily made for these specific products. Spirals made for a specific plant may lower the break percentage further.

The most common damage among the product was "tip breakage" with the chips and pasta. The M&M's suffered most from damage to their chocolate coating. In the future, it is recommended that a study is conducted at customer facilities to compare current industry methods of depositing product.

Disclosure: This study was performed at no cost as a part of the Kansas Value Added Food Lab program. Kansas State University does not endorse any particular method, company, or product.

Sincerely,

F.M. Aramouni

Dr. Fadi Aramouni

Professor of Food Science

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