Bagel Manufacturer
Saves a Lot of Dough

Does High Quality Have To Mean High Costs?
Over the past decade, people have grown to love the bagel, an affordable, easy-to-eat snack that fits their fast-paced lifestyles. One manufacturer aspires to produce bagels that exceed customer standards, and they were willing to err on side of an overweight bagel than sacrifice customer satisfaction. However, this was affecting their profit margins. They needed a solution to keep profits high while maintaining excellent customer satisfaction.

Making for more than ten years, a key element of the long-term success of the Company has been their willingness to go the extra mile to meet their customers’ quality standards. For a decade, that extra mile was represented by additional portions of dough that ensured that the finished bagels were at the requested weight. This policy was good for customer satisfaction, but not as good for their production costs.

“It was critical for us to keep the bagels in the acceptable range because underweight or overweight bagels aren’t good-looking bagels,” said the engineering manager. “So, we had a situation where we needed to actively control our portioning process.” Complicating the Company’s challenge was the tendency of the dough to rise and become less dense during the portioning process; the same size dough piece portioned at the beginning of a batch weighs more than that portioned at the end of the batch.

“The divider is a continuous process; however the dough that feeds the divider is a batch process,” he said. “By and large, the individual batches are the same. Where we start

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seeing differences is in the fermentation of the dough. The beginning of the batch has little fermentation, thus we have very consistent dough pieces. However, more fermentation gives greater volume and regrettably less weight."

“The operators were constantly monitoring weights and making adjustments to the dough divider,” he said. “After they made an adjustment, the operator would then try to monitor the pieces to see if the adjustment had brought them back to the target weight. This was a very time-consuming process for our operators.”

Still another challenge was moving the bagel pieces along the production line. Raw dough is soft and sticky and tends to leave residue behind, especially when it is being transferred from one conveyor to another. Moreover, standard rejection mechanisms such as air jets, pushers, flippers, or deflectors do not work well on bagel dough.

Solving the Problem

The Company wanted better control of their process to reduce the amount of dough used per bagel. To do this, they needed a machine that could weigh bagel pieces and reject out-of-range portions, and also share data about portion weights with the divider so that the divider could adjust portion weight. This checkweighing system would need to transfer bagel dough from conveyor to conveyor, and reject out-of-range pieces, without leaving residue behind. Finally, all the machinery would have to be washdown-ready so they could continue to meet their strict hygiene standards.

“We presented our challenges to Jake Eggimann of R.L. Scott and Associates, our local METTLER TOLEDO Hi-Speed representative,” the engineering manager said. “He knew that this would have to be an engineered solution and immediately got Steve Tullio from Mettler Toledo Hi-Speed involved in the conceptual design of the machine.”

The METTLER TOLEDO Hi-Speed team first looked at the bagel production line. It begins with a hopper feeding dough down into a divider. The divider portions the dough; the dough pieces (each roughly the same size and shape as an egg roll) are dropped on four conveyor lines which spread apart as they run towards the bagel former. The bagel former rolls the dough pieces into the traditional bagel shape before they are frozen for shipment. Each conveyor lane runs at 75 bagels a minute; total system speed is 300 bagels per minute. The team also worked with ABI Ltd. (the bagel equipment manufacturer) to understand how bagels are formed, how the conveyors work together, and how the checkweigher could connect and share data with the divider.

Active Portion Control

A multi-lane Hi-Speed XS-Series checkweigher was integrated into the bagel production line between the divider’s discharge conveyors and the bagel former. It was connected electronically to the divider using open, modular architectural control (OMAC) standards for real-time communications. Now the divider can adjust portions based on the Hi-Speed checkweigher’s data. Overweight pieces on the checkweigher cause the divider to make the portions smaller and underweight portions cause the divider to make portions larger.

“One of the big keys for us was the ability to send feedback from the checkweigher to the dough divider, to keep the dough divider always in tune,” said the engineering manager. “The feedback from the Hi-
Speed checkweigher gives us the ability to maintain consistency throughout the entire batch regardless of fermentation. With this new system, with the divider and the Hi-Speed checkweigher constantly talking, we have been able to reduce giveaway, reduce rejected product, and increase our efficiency.

The operators control and monitor the four-lane line using a single touchscreen user interface. “The new METTLER TOLEDO Hi-Speed XS control gives us the ability to control all four lanes from a single operator interface. Our operators have had no trouble working through different setups for things like belt speed, reject timing, and weigh times on the touchscreen controls. And they can easily see each lane’s current weight and trends via a graph displayed on the touchscreen.”

**A Sticky Material Handling Problem**

With portion control conquered, the next problem to solve was handling the sticky material. “Handling raw dough is a challenge, not only transferring the piece between conveyors but also ensuring that non-conforming product can be completely rejected without leaving any dough behind on the belt,” the engineering manager said.

The Company and METTLER TOLEDO Hi-Speed used a positive “waterfall” transfer design that dropped the pieces of dough from the divider’s conveyors onto the multi-lane checkweigher’s conveyors and then onto the discharge conveyors to ensure the entire piece is transferred completely. Each of the four discharge lanes were equipped with a customized drop-through rejecter to allow over- or under-weight dough pieces to drop onto a separate reject conveyor.

“To make this project a success, we needed control of the process from the dough divider to the bagel former,” Eggimann said. “It was critical, for instance, for us to split the rejection mechanism from the load cells, to put them on separate platforms even though they were next to another. Putting them on two different platforms isolated the vibrations of the rejecting conveyors from the weighing process and ensured accuracy and smooth operation.”

**Washdown-Ready**

The new machines needed to meet the bakery’s strict standards for cleanliness, including being broken down on a daily basis for cleaning and sanitation. The Hi-Speed multi-lane checkweigher’s open design, all stainless construction, and conveyors with tool-free belt removal meets the Company’s need for easy inspection and maintenance, and exceeds the strict cleaning and hygiene requirements of U.S.D.A certification. It also meets the stringent IP-69K standard for high-pressure, high-temperature washdown (see sidebar).

**Engineering to Fit**

Finally, the entire system needed to fit into a small, predetermined footprint. METTLER TOLEDO Hi-Speed created drawings that showed how equipment would be placed to provide optimum product spacing, weighing, classification, rejecting, and discharge. “We would have regular conference calls to refine our solution,” said the engineering manager, “Jake would sit with us to make sure that our needs were communicated clearly to the engineers.”
“Multi-lane capacity allows us to lower production costs and increase production without adding new lines. METTLER TOLEDO Hi-Speed was able to meet our needs and create a multi-lane checkweighing solution that fits our production line requirements. This project was a big team effort, and Jake Eggimann with R.L. Scott and Associates and Steve Tullio from METTLER TOLEDO Hi-Speed were instrumental in its success.”

Lower Production Costs
The new Hi-Speed checkweigher enabled the Company to reduce the target weight range, minimizing out-of-spec product. This was enough to increase production significantly. “The project really turned out well. We can produce more bagels today than we ever could and we are significantly more efficient. We are now able to achieve the higher profits we desired and still maintain a high quality product, ultimately delivering excellent customer satisfaction.”

Sidebar
The Hi-Speed XS-series checkweigher meets and exceeds the US Department of Agriculture’s strict standards for cleanliness by meeting the stringent IP-69K standard for high-pressure, high-temperature wash down. IP-69K requires absolute ingress-resistance with 14-16 liters of 80 degree C water at 1,100 – 1,450 pounds per square inch (PSI) of pressure at 30-second cycles from multiple angles and defined distances. The XS checkweigher is also easy to inspect and maintain.