

# SOLIDS & BULK

HANDLING



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# Rising to the challenge

## A Flexicon bulk handling system improves production at Dawn Foods

Dawn Food Products are synonymous with quality bakery products. Though their first-born was the humble doughnut, during the past ninety years they have evolved into one of America's largest, family-run businesses and were the nation's first industrial bakery mix company. From its manufacturing and distribution centres around the world, the company supplies to the most modest of small, family bakeries to many of the giant, international chains. Within Europe, Dawn Foods in Evesham, Worcestershire continue the fine tradition of supplying the UK with original, US-based cake mixes and finished products.

At the Evesham facility, in the production of a recipe mix, the bulk raw materials (flour – sugar) are blown directly from a combination of five, outside-located, 40 tonne silos to one of two mixers sited in the Dry Mix Plant; one for chocolate-based product, the other, non-chocolate-based. The remaining minor ingredients, which are sourced in 25kg bags, are positioned by forklift onto a mezzanine floor where they are split and manually dumped indirectly into the mixer via an adjacent manual dump station. The measured amounts of the minor ingredients are PLC-controlled from load cell data from within the hopper and chosen according to recipe. One tonne batches of any recipe are metered by gain-in-weight technology through the transfer of data from load cells located under the mixer.

The finished mix is then earmarked for one of three destinations:

- External sales.
- A sister company in Holland.
- To the retail/wholesale market as finished shelf products.

Initially, the recipe is gravity-fed from the mixer and weighed into 25kg bags then stitched, labelled and dispatched for external sales or sent on pallets to Holland. In some circumstances, certain bakery outlets would require still smaller bag weights sympathetic to imperial measure preferences or as small as 3.5kg bags for smaller runs.

For the retail/wholesale trade, 25kg bags were manually gravity-fed through a sieve into 150kg-capacity mixing vessels for the addition of water to prepare a final mix to be sent to a depositor in readiness for oven baking in Dawn Foods' own in-house bakery. The finished products, e.g. muffins, chocolate cakes, etc., are dispatched to such blue chip rated customers as McDonalds and J. S. Sainsbury Ltd.

The burden to work with 25kg bags (40 bags per tonne represented a major task in terms of their production volume) was clearly an issue for review when dispatching to Holland where the use of a single bag bulk was preferred. In addition, the procedure to dispense the mix for the eventual oven process was slow and costly.

These issues were labour intensive, time consuming and hazardous, requiring the employ of seven operatives in total. The brief, therefore, was to install a more efficient system of



ABOVE: Flexicon's bulk bag discharge system made ready to transfer dry recipe into mixer vessels for the depositor line

bulk bag dispatch to Holland and improve the batch process for the depositor line.

It was decided to install a system to allow the mixer to be discharged into tote bins as well as the 25kg bag packing line, then using a transfer system to empty the tote bins into 1-tonne bulk bags. The filled bulk bags could then be dispatched to Holland or used internally on the in-house bakery line improving both processes simultaneously and:

- Improve aspects of Health & Safety in minimising the handling and disposal of 25kg bags.
- Reduce wastage by eliminating residues left in bags.
- Make more efficient use of manpower.
- Increase speed and efficiency.
- Improve quality control on the depositor line.

Dawn Foods consulted specialists Flexicon (Europe) to design, build, install and commission a bulk solids handling system to address the brief.

Prior to manufacture, trials were conducted with nominal products at Flexicon's Test Laboratory at the Herne Bay facility to



evaluate the performance characteristics of the raw materials. Both muffin powder and chocolate powder mixes had bulk densities of 650kg/m<sup>3</sup> and 560kg/m<sup>3</sup> respectively. They were semi-free-flowing, held an angle of repose between 45/60 degrees and represented both ends of the spectrum insofar as general performance characteristics were concerned.

After due consultation, Flexicon commissioned a bulk bag discharger and batch weighing system constructed with all contact parts in Stainless Steel Type 304 with a food quality finish that comprised:

- Type BFC bulk bag discharge frame with a cantilevered "I" beam with electrically operated hoist and Flexicon Flow-Flexer bulk bag flow activators.
- Spout-Lock™ and Tele-Tube™, bulk bag spout interface.
- 150L capacity "T" type receiving hopper with low-level sensor.
- 3 metre long Model 1450 Flexible Screw conveyor with Ultra-High Molecular Weight Polyethylene (UHMWPE) outer tubing and machine edged configuration spiral and a 1.5kw, geared drive unit.
- A second, custom 160L capacity weigh hopper with 3 ATEX approved, stainless steel, precision load cells for gain-in-weight control with a 200mm diameter pneumatic butterfly valve at the point of discharge.
- Control system with full function weighing indicator.

The new procedure has impacted from the point of discharge from the mixer in the Dry Mix Plant. While the procedure to bag and dispatch to external sales still remains, a dedicated tote bin is now filled from the mixer and transferred to a loading frame to sit above a waiting, 1-tonne FIBC into which the content is discharged. FIBCs (each equiv to 40 x 25kg bags) are then



Spout-Lock and Tele-Tube, bulk bag spout interface enabling a quick, dust-tight connection between the bag spout and receiving hopper



ABOVE: Control system with full function weighing indicator controlling discharge into the weigh hopper.

assigned for dispatch as bulk consignment to Holland or loaded into the Flexicon bulk bag frame for batch transfer into the process of depositing and baking.

With the aid of a fork lift truck, one operative positions the FIBC in front of the bulk bag frame and attaches the carry handles to a cruciform connected to an electrical hoist, enabling precise location of the FIBC onto the frame above the receiving hopper. The bulk bag/hopper interface consists of a manual Spout-Lock clamp ring positioned above a pneumatically actuated Tele-Tube telescoping tube. Together, the devices enable an operator to make a quick, dust-tight connection between the bag spout and hopper. By simple, push-button control the telescoping tube raises the Spout-Lock clamp ring assembly allowing the bag spout to be pulled through the ring enabling the operator to seal the clean side of the bag spout to the clean side of the telescoping tube. It then continues to lower until the bag spout is pulled taut. Once the spout is untied, the telescoping assembly exerts continual downward tension on the spout, elongating the bag as it empties into the receiving hopper, via a hopper screen to filter out foreign bodies, promoting flow and evacuation. The high-integrity, dust-tight seal between bag spout and clamp ring allows full-open discharge from the bag with no risk of dust inhalation by the operative. A low-level sensor informs the operator of the status of the product level in the FIBC.

Having in-put the set points on the control panel for the individual batch, the semi-free-flowing raw material is gravity-fed into the inlet of the 3m long Flexible screw conveyor, transferred upwards through 45° for transfer via a transition discharge adapter into the weigh hopper equipped with load cells for gain-in-weight control. Product flows quickly until it slows to trickle speed as the target weight set on the control panel is achieved. Material 'in flight' through the tube is accounted for in the gain-in-weight calculation. When the target weight is achieved the operator manually activates the pneumatically operated butterfly valve by pressing a button on the control panel to release the batch as material flow is simultaneously halted until another batch is called for. Downstream, water is then added to the batch for further mixing in readiness for the depositor and oven bake process.

This new procedure has reduced manpower from seven to four and has met all points of the brief in full.

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