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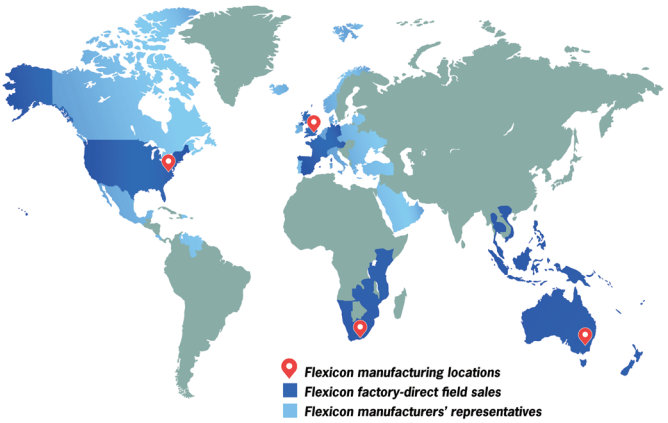

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Flexible screw conveyors save maintenance and sanitation costs for a peanut processor

MARKHAM, ONT — Nutco Inc. is hardly a household name, yet the company's peanut butter and roasted split peanuts are widely distributed throughout North America. Located in this small town north of Toronto, Nutco is one of Canada's largest peanut processors and Canada's biggest supplier of organic peanut butter to the U.S., and specializes in packaging most of its production for sale under private labels. Nutco also supplies peanut butter in bulk to confectioners and bakers.

This fall (2009) the company is designated to be elevated to Level II status for quality and food safety under the international standard SQF 2000 (Level III is the highest level). The award, a significant achievement, is the result of a vigorous audit and recognizes the company's efforts to improve its operations over a period of years.

Several years ago, for example, Nutco installed two bulk bag unloading systems for incoming peanuts and two flexible screw conveyors to transport peanuts and peanut fines within the plant. Besides improving efficiency, the equipment reduced manual handling and improved plant sanitation, says John Worrell, plant manager. "The flexible screw conveyors haven't needed any maintenance," he says, "and they require very little sanitation to speak of because they are completely enclosed."

Based on its experience with the conveyors, the company now plans to substitute a flexible screw conveyor for a bucket elevator that delivers the peanuts to a hopper, from which most of the feed goes for peanut butter production.

The production process

In Nutco's operation, shelled peanuts are roasted, then the skins are removed in a process called blanching. About 80% of the volume goes through an attrition mill that grinds the peanuts into paste for peanut butter. The rest of the peanuts are either packaged as roasted, blanched split peanuts for retail or put through a granulator to obtain chopped peanuts. These are used for crunchy peanut butter or vacuum-packed for wholesale distribution.

Nutco receives shelled peanuts in 1,984–2,645 lb (900–1,200 kg) bulk bags. Samples from each bag are laboratory-tested for mold, then the bags are stored in a cooler until they are needed for processing. At that point each bag is hung on a bag-lifting frame by four loops located at the top of the bag, and each frame is forklift loaded onto a bulk bag discharger.

Bags are unloaded into an 8 cu ft (226 l) floor hopper, from which the peanuts are transported by a flexible screw conveyor to a 10 cu ft (283 l) surge hopper that feeds the process line. The bulk bag unloading stations, hoppers and flexible screw conveyors were all supplied by Flexicon Corp., Bethlehem, Pa.

Two bulk bag unloaders, each with a 25 ft (7.6 m) long flexible screw conveyor, maintain a continuous flow of shelled peanuts to the gas-fired roaster in background. The fully enclosed system enhances plant sanitation and reduces manual handling.

Operator forklift-loads bag-lifting frame onto the bulk bag unloader.

Peanuts are discharged from the bulk bag into the receiving hopper through a manually operated 12 in. (305 mm) dia iris valve attached to the bag spout.

Worrell explains that two bulk bag unloaders are used in order to maintain a continuous flow of product to the gas-fired roaster, through which the peanuts pass on a conveyor. While a bag is being unloaded at one station, an empty bag can be replaced with a full bag at the other.

Bags are unloaded through a manually operated, 12 in. (305 mm) dia iris valve that is pulled over the bag spout. At the lower end, the valve is sealed to an interface chute in the hopper cover via a dust-tight snap action door. This arrangement minimizes dust as well as controls the flow of material. As a bag empties, periscoping extension arms automatically raise the top of the bag, stretching it into a cone shape, thereby promoting complete discharge.

The flexible screw conveyor consists of a rotating, stainless steel spiral screw, housed in a 25 ft (7.6 m) long polymer tube of 4.5 in. (115 mm) O.D. The rotating screw draws in peanuts from the hopper and transports them at a 45° incline to the top of the surge hopper.

A 5 hp (4 kW) electric motor rotates the screw at a variable speed. The motor is located at the top end of the conveyor, above the discharge point, precluding product from contacting the gearbox seals. The stainless steel screw profile not only efficiently moves the peanuts at the required rate, but has been designed to minimize grinding and other damage to the product.

Each 25 ft (7.6) long flexible screw conveyor consists of a rotating, stainless steel spiral screw, housed in a 4.5 in. (115mm) O.D. polymer tube.

Bulk bags save labor

Prior to the installation of the Flexicon equipment, peanuts were received in 110 lb (50 kg) burlap bags. These were loaded onto skids and raised by a forklift onto a mezzanine, where they were lifted two at a time by a jib crane and dumped into the surge hopper.

The bulk bag system has improved efficiency and saved more than $100,000/yr in labor costs, says Worrell. “Previously, it would take two or three workers to unload the 50 kilo bags and load them onto the skids,” he says. “Now, it takes one operator with a fork truck.”

From the surge hopper, the peanuts drop onto a 10 cu ft (283 l) gravity separator, a perforated table that uses a combination of vibration with upflowing air to remove dirt, stones and other debris. The peanuts then move by conveyor through the roaster and the blancher, where the skins are removed and the nuts are split by pressing and rolling them between two converging conveyors. The skins are vacuumed from the line and the product is given a final cleanup by an electro-optical sorting machine that rejects peanuts considered too dark, along with any extraneous material.

After passing through the sorter the peanuts fall into a bucket elevator, which discharges into a hopper that feeds the attrition mill for making peanut butter. Milling is followed by the addition of ingredients, such as salt and sugar, plus several more process and purification steps to obtain the final product.

About 80% of the peanuts is used for making peanut butter, as noted earlier. The other 20% is removed from the hopper through a separate port

to be sold as split peanuts or processed into chopped peanuts to be used in the production of crunchy peanut butter.

In the latter case, the peanuts pass through a granulator, then over a vibrating screen that removes the fines. Chopped peanuts pass over the screen and are conveyed by a bucket elevator to the peanut butter operation.

Fines drop through the screen into a 1 cu ft (28.3 l) hopper. From there the material is moved by a flexible screw conveyor to the bucket elevator that feeds the attrition mill. In this case the flexible screw conveyor measures 30 ft (9 m) long, with an O.D. of 3.5 in. (90 mm), and with a spiral profile screw designed for moving the fines.

Previously the fines were dropped into a drum set on a truck that was pushed away manually when the drum was full. “Now we have an automated process, with no manual handling,” says Worrell. “Before, we had to have someone there all the time, so we are probably saving $20,000/yr in labor costs.”

Next, Nutco plans to install a flexible screw conveyor in place of the bucket elevator that serves the attrition mill. “That bucket elevator is messy and has to be cleaned and sanitized weekly,” says Worrell. “It also requires a great deal of maintenance because of the chains that drive the buckets. We replace about 75 buckets every year, at a cost of $50/bucket. Even though it’s a sanitary design it tends to drop peanuts on the floor. Peanut meal and dust stick to the buckets.” Worrell estimates that a flexible screw conveyor will have about a three-year payback, based on savings in maintenance and sanitation.

Each flexible screw conveyor empties peanuts (through a discharge adapter and flexible downspout) into a surge hopper from which they are conveyed to the roaster.

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