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REVIEW

- AGL Loy Yang's new conveyors
- In discussion with Nepean's Miles Fuller
- Q&A with stockyard automation guru
- TUNRA on DEM's evolution
- New column: Ask an engineer

Brittle pasta moved without breakage or dust

Brittle pasta is handled gently and automatically with box tippers and tubular cable conveyors at a US food plant.



Open-Chute Box tipper empties a Gaylord into the large hopper from which pasta moves on a vibratory tray feeder into the smaller hopper and inlet adapter of the Flexi-Disc tubular cable conveyor.

To move brittle pasta from Gaylord containers to three packaging lines at high rates without product breakage or dust, Quality Pasta Company of Pennsylvania installed two Open-Chute Box Tipplers and three Flexi-Disc Tubular Cable Conveyor (TCC) circuits, in which low friction polymer discs attached to a stainless steel cable gently slide the pasta through smooth stainless steel tubing.

“The TCCs transport pasta with a breakage rate of less than 1%,” says Todd Kish, operations manager. “Consumers are knowledgeable about product quality and do not want to see breakage in the pasta they buy,” adding, “many competitors load pasta into hoppers with plastic shovels for discharge to conveying lines, which is labour intensive and increases breakage.”

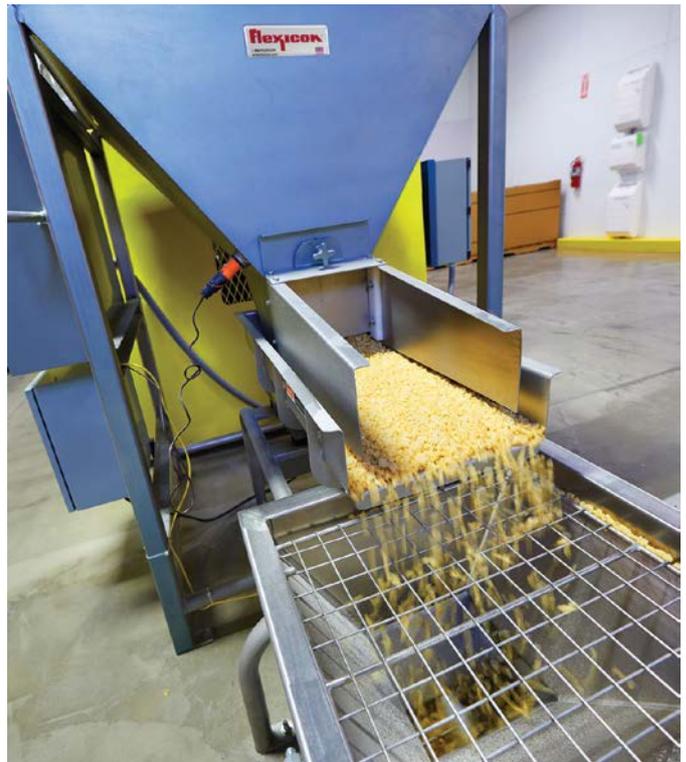
Since the TCC is an enclosed system, it also prevents the release of dust and other particulates into the sanitary packaging area.

How pasta moves from bulk boxes to retail packages

Pasta arrives in Gaylord containers – double or triple-wall corrugated bulk boxes – that weigh 363 to 590 kg. After quality assurance inspection and weighing of the containers, the material is stored until ready for packaging. Kish says the company schedules as much packaging of individual pasta types as possible each day to reduce product changeover and downtime.



Three tubular cable conveyor circuits and two automated box tippers move brittle pasta to three sanitary packaging lines at high rates without product breakage or dust.



Overall view (and overleaf) of third, tubular cable conveyor line shows the hopper and intake at the tensioning wheel end (left), the conveyor's horizontal and vertical 'S' shape, and discharge at the drive wheel end (right) into the cup packaging line.



The two Open-Chute box tippers from Flexicon automatically raise and tilt the Gaylords, which discharge pasta into 227 litre hoppers. Pasta discharges from the hoppers onto vibratory tray feeders that control the rate at which material flows into the inlet adapter of each Flexi-Disc conveyor, also from Flexicon.

A proximity level switch connected to an indicator light in the PLC control panel alerts operators to low material levels in the large hopper.

One box tipper additionally serves the cup pasta line. “The cup pasta is fragile and we only package 907 kg of the product per day,” says Kish. Using two tippers for three lines also leaves more floor space for operation, he adds.

“The system supplies ample product to our cartoning lines without much maintenance or difficulty,” Kish says.

Each 102 mm diameter TCC circuit runs in an “S” shape starting horizontally, rising 2.4 m vertically, and continuing 0.6 m horizontally, ending at a drive wheel discharge housing from which material flows through a metal detector and into a packaging machine hopper. The vertical leg includes two 0.9 m transparent sections for operators to visually monitor performance of the system.

The cable-disc assembly’s direction of travel is reversed at the discharge end of the circuit by the drive wheel, and at the intake end of the circuit by a tensioning wheel that keeps the cable taut throughout the system.

Because the tubular cable conveyors fully evacuate material, cleaning and product changeover can be accomplished in 15 to 20 minutes, says Kish. During changeovers, workers clean the TCC lines with antibacterial swabs and flexible sponges.



A clear section of vertical tubing permits visual monitoring of system performance and product quality during transport.



Tubular cable conveyor curves to vertical and discharges at the drive wheel end into the cup packaging line.



Portable "cheeser" line includes a 156 litre hopper and 4.6 m long Flexicon screw conveyor for packet packaging of cheese powder.

Portable flexible screw conveyor transports cheese powder

Quality Pasta also employs a portable, castor-mounted 4.6 m-long, 114 mm-diameter flexible screw conveyor from Flexicon with a 156 litre capacity hopper to transport powdered cheese for packet packaging and inclusion in some product boxes. The hopper includes a tray support for manually emptying bags and



Quality Pasta products include high protein macaroni and cheese, shells and cheese, and microwaveable macaroni and cheese.

is designed for poorly flowing materials. Between the conveyor discharge and packaging machine, material passes through a metal detector.

The inner screw of the conveyor is the only moving part contacting the powdered cheese, and is driven above the point at which it exits the conveyor, preventing material contact with bearings or seals. The spiral is specially designed to move non-free-flowing materials such as cheese powder.

Portability is important for the "cheeser" line sanitary conveyor, Kish explains, because it is removed from the cheese room for regular cleaning of the inner spiral, as well as for kosher cleaning.

The company sells seven branded pasta products, in noodle, shell and macaroni form. Offerings include high protein macaroni and cheese, and shells and cheese lines, and a microwaveable macaroni and cheese cup. Kish says 95 percent of products are sold to retailers and the balance to institutional users.

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DRY ORE PROCESSING

Minerals processing maestro tunes up waterless technologies

Veteran minerals technologist Chris Kelsey, inventor of the Kelsey Jig, is advancing a super-fine crusher and dry magnetic separator which hint at a future of waterless ore processing.

Kelsey has been working on fine crushing since 1997. In 2014 he finally hit on the right combination of technologies with the Super-Fine Crusher which crushes minerals from 10mm down to 10 microns, eliminating the need for re-processing. A patent for the technology has been granted in Australia.

Armed with the ability to crush magnetite ore to such a small size, Kelsey and his company IMP Technologies (IMPTEC) began work on a dry magnetic separator to go with it. This work resulted in development of the Cyclomag, which uses rare earth magnets to pull magnetic material out of an airflow, while tailings are

separated and collected at the other end of the machine.

In contrast to traditional beneficiation processes which use large volumes of water, the Cyclomag is waterless. Kelsey makes some bold performance claims based on results from a modest demonstration unit handling up to 400kgs per hour. He says it can deliver ore with an increased iron (Fe) content of up to 70% after a single pass.

The pairing of the Super-Fine crusher and the Cyclomag might one day usher in a new era of waterless processing, a real boon to mining areas in South Australia, Western Australia and Chile's Atacama

Desert where water is in scarce supply.

Kelsey points to encouragement from mining companies like Magnetite Mines which see great potential in the technology. A key question, however, is who will fund a larger scale demonstration facility.

"The (South Australian) state government said 'we'll give you \$10 million to develop it' but it's sort of died," explained Kelsey. "It'll probably be done by industry itself. It'll be a large demonstration plant probably over at Arrium Whyalla works. That will show how simple the process is – the combination of the Cyclomag and Super-Fine crusher – compared to what they are doing today.