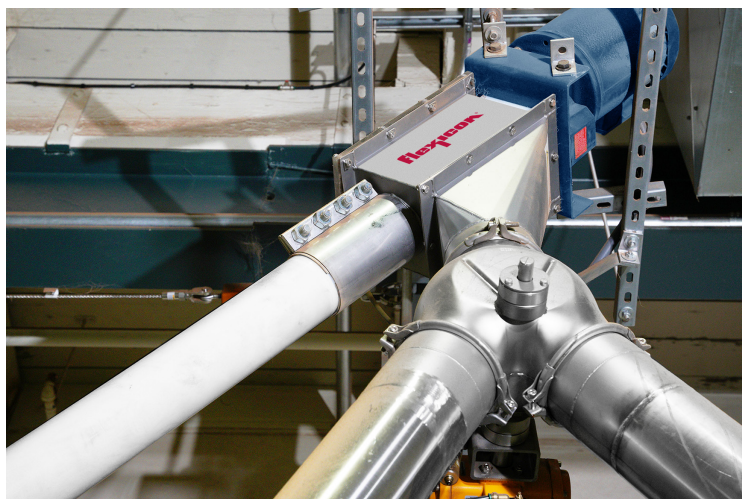
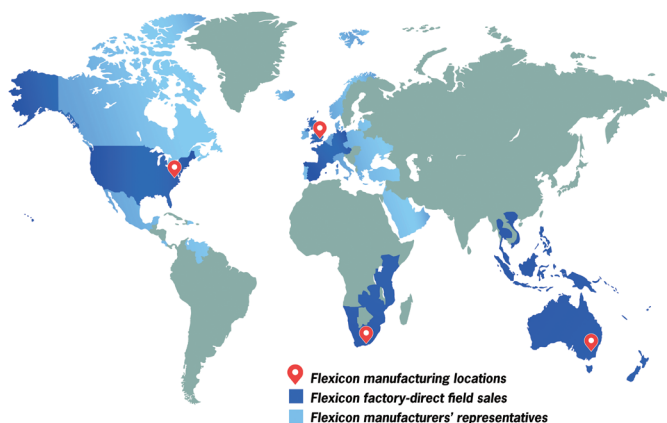




*Bulk Handling System Triples Capacity,
Cuts Staff by Two at Theo Chocolates*

Bulk Handling System Triples Capacity, Cuts Staff by Two at Theo Chocolate

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Bulk Handling System Triples Capacity, Cuts Staff by Two at Theo Chocolate

SEATTLE, WA — Theo Chocolate is among the first US-based chocolatiers to earn certified organic and fair-trade status. The company promotes sustainable agricultural practices while ensuring the highest-quality chocolate by sourcing its cocoa beans directly from farmers in Congo and Peru, who receive above-market prices. Theo produces about 3 million pounds (1.36 million kg) of chocolate products annually including chocolate bars, ganache candies and cookies, all made from scratch by its Seattle employees.

New roaster outpaced upstream manual batching

Chocolate production begins with emptying of 120 lb (55 kg) sacks of dried cocoa beans into a destoner-cleaner to remove any foreign matter. The beans are then roasted and cooled before passing through a winnower, which separates the shells from the oil-rich nibs, the 'meat' of the bean. The nibs are pulverized, transforming them into a liquor, similar to how peanuts become peanut butter. Sugar is then added to the liquor, creating chocolate, which is cooled and tempered.

By 2018, Theo had outgrown its ball-style roaster, which was undersized and in poor condition. "The wheels were coming off," says Marc de Faye, maintenance manager. "It became a bottleneck." Managers decided to replace it with one triple in size, raising batch capacity to 616 lb (280 kg). That led Theo to seek a better, faster way to handle the cocoa beans.

At the time, workers were dragging barrels of raw and finished cocoa beans from one process to the next. At the roaster, a high-powered fan was air-loading the cocoa beans, stirring up dust. An upgrade was imperative.

"We needed much larger containers to load the new roaster," de Faye says. "We also needed a way to load those larger containers, so that was the impetus for our new bulk handling/batching system."

Manufactured by Flexicon Corporation, the new semi-automated system includes two bulk bag dischargers, floor hoppers, four flexible screw conveyors, a tubular cable conveyor, and programmable controls. In addition to meeting Theo's current and future capacity needs, the system reduces labor, increases worker safety, and eliminates wayward dust.

Operation reduces manual labor

The process starts with the emptying of raw beans from burlap sacks into the cleaner-destoner, which discharges into a 5 cu ft (142 L) floor hopper. The hopper's outlet charges a 4.5 in. (115 mm) diameter, 20 ft (6.1 m) long flexible screw conveyor having special screw geometry to gently transfer the delicate beans with little or no degradation.

Inclined at 45 degrees, the conveyor discharges through a wye diverter with



Raw cocoa beans from the destoner-cleaner are transported by the flexible screw conveyor through a wye diverter and into the bulk bags.



A bulk bag of raw cocoa beans is hoisted into the bulk bag discharger frame.



The operator closes the iris valve, securing the bag spout and supporting dust.

which the operator, using an HMI touchscreen, alternates the filling of two bulk bags, eliminating downtime otherwise incurred to remove filled bags and connect empty ones.

When needed, filled bulk bags are rolled from a storage area using a pallet jack, to a BULK-OUT® model BFC bulk bag weigh batch discharger. The unit's cantilevered I-beam, with hoist and trolley controlled by a pendant, enables an operator to lower a bag lifting frame, attach the bag loops, and then position the bag within the discharger frame.

The bag spout is pulled through a 12 in. (300 mm) diameter manual iris valve, allowing an operator to cinch the spout, untie the drawstring and open the valve gradually, preventing uncontrolled bursts of material from generating dust as the surge hopper fills with material. The valve can also throttle the flow rate of beans incrementally, or re-cinch the spout for retying and removal of partially empty bags.

Load cells measure the weight of the entire bulk bag discharging system, including its integral surge hopper and 5 ft (1.5 m) long, 6.6 in. (170 mm) diameter flexible screw conveyor inclined at 30 degrees.

As the conveyor discharges beans into the inlet of a FLEXI-DISC® tubular cable conveyor (TCC), the discharger's load cells transmit weight loss signals to a PLC, which slows the conveyor to dribble feed rate prior to stopping it once the accurate batch weight has been lost.

In addition to batching the desired weight of beans, the flexible screw conveyor feeds the TCC at an adjustable, volumetric rate required to feed each TCC 'pocket' with the desired fill percentage of beans.

The TCC is equipped with low-friction polymer discs affixed to a cable that gently slide the cocoa beans through smooth 4 in. (100 mm) diameter stainless steel tubing. The discs and cable are driven by a wheel at the discharge end of the circuit and put under tension by a wheel at the intake end. The circuit at Theo transports the beans 17 ft (5.2 m) vertically, then 45 ft (13.7 m) horizontally to the roaster, through two 48 in. (1,220 mm) radius bends and a 32 in. (813 mm) long clear section to visually monitor conveyor performance and pocket fill percentage.

After roasting, the beans are cooled, released into a hopper, and transported 20 ft (6.1 m) by a heat-tolerant flexible screw conveyor with a 4.5 in. (115 mm) diameter stainless steel tube to a winnower, which separates the bean shells from the nibs.

The nibs are discharged into an existing drag conveyor that transports them to a bulk bag filling station. Filled bulk bags are then loaded into a second cantilevered bulk bag discharger with integral flexible screw conveyor 10 ft (3 m) in length to feed the nibs volumetrically into a stone mill, the first size reduction step in transforming the nibs into cocoa liquor.

QC demands clean conveying

The system's flexible screw conveyors are fully enclosed and prevent material contact with seals. At the conclusion of a production run, the screw and tube



Bulk Handling System Triples Capacity, Cuts Staff by Two at Theo Chocolate



Below the bulk bag discharger, a flexible screw conveyor transfers raw beans into the inlet of the tubular cable conveyor routed to the roaster. Load cells supporting the discharger frame transmit weight loss signals to slow and stop the flexible screw conveyor when the precise batch weight is lost.



Clear section of the tubular cable conveyor (TCC) allows visual monitoring of performance and pocket fill percentage.

interior can be flushed with steam or cleaning solution, or the screw can be removed through a lower end cap for sanitizing and inspection.

Also critical to Theo Chocolate is that the fully enclosed TCC prevents raw product from contaminating the roasted cocoa beans. "Once the beans are in the tubular drag conveyor, it's pretty much sealed," de Faye says. "We didn't have that before because we were manually running containers of raw beans into the roasting area. Now we have an air barrier between the raw beans and roasting room, and the TCC doesn't disturb that, so the raw product isn't contaminating a clean room." The TCC operates air-free, eliminating blowers and filtration equipment. "It was the best option for keeping out dust."

Integrated solution boosts output, cuts personnel

Theo Chocolate sourced the system from Flexicon for its engineering and integration capabilities. "The company that supplied our original drag conveyor couldn't provide a turnkey system," de Faye says.

The result is a higher daily throughput with fewer people. "This system allowed us to reduce our headcount by two," de Faye says. "Now one person can handle everything." Automation also reduced the amount of training Theo must provide, and minimizes the likelihood of errors.

Workplace safety also improved. "From a health and safety standpoint, we're definitely better. We're not dragging buckets around anymore."

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Beans gravity feed from the tubular cable conveyor through a discharge adapter and flexible downspouting into the roaster below.



In foreground and top center, the tubular cable conveyor transports and discharges beans into the roaster.



From the roaster, the flexible screw conveyor transports cooked beans to the winnower which separates the bean shells from the nibs.



Roasted beans cool in the tray before being conveyed to the winnower and subsequent processing into cocoa liquor.