



Diamond Sparkler's new end-of-line, continuous-motion accumulation conveyor provides

PRECISION PRODUCT PLACEMENT for **OPTIMIZED WRAPPER INFEEED.**

Packaging fireworks

In the U.S. fireworks market, no name shines brighter than Diamond Sparkler Mfg Co. With an average throughput of 48,000 sparklers of varied sizes and types per day, Diamond Sparkler, a division of B. J. Alan Co. Inc. is the only sparkler-manufacturing facility remaining in the U.S. However, the company was experiencing problems handling this volume of product movement efficiently. In particular, the end-of-line infeed of cartoned sparklers into the wrapper was a manual process that would frequently delay process flow.

To resolve this problem, Diamond Sparkler installed a totally automated infeed-conveyor system with continuous-motion accumulation using unique technology that enables precision product placement within the wrapper. The new infeed equipment has not only significantly reduced labor hours, but has the capability of packaging one million sparklers per day.

Various color combinations

Diamond Sparkler employs 18 full-time, year-round employees, and up to 40 additional temporary workers during peak production periods

at its plant in Youngstown, OH. Sparklers are made from a mixture of aluminum powder, very fine iron filings, barium nitrate, boric acid and dextrin. Iron produces the sparks. Aluminum produces silver and white flames and sparks. Barium nitrate creates green colors and helps to stabilize volatile elements. Dextrin and boric acid function as bonding agents for the mixture. Heat differences in the metal also determine the color of the sparks.

This mixture is coated onto blank sparkler poles, ranging in size from 8- to 36 in. long. The sparkler poles are attached to racks that are conveyed through an oven where they are dipped several times into the sparkler mixture, like making candles. It takes about an hour and 45 minutes of dipping to produce a finished sparkler.

"Depending on variations in the mixture, we can produce sparklers that crackle, display various colors or increase and decrease the amount of sparks and smoke," says John Reiss, plant manager at Diamond Sparkler. "Most of our product is produced for use on the Fourth of July, but there is a growing demand for party sparklers on birthdays, anniversaries and weddings, where more sparks, less

smoke and specific colors are desired."

The company begins manufacturing and packaging its sparklers in August for the next year's Fourth of July, and also purchases sparklers from China that it packages at its Youngstown facility. By May, the sparklers need to be manufactured, packaged and distributed to retailers.

Automating the infeed process

After baking, the sparklers are conveyed to a filler/cartoning machine that puts six sparklers into each carton, then closes and seals it at a rate of 180 cartons/min. A worker then manually transfers the closed cartons onto a conveyor for input to the shrink wrapper. The cartons need to be stacked into columns of six or 12 units for wrapping. Because of throughput volume, the stacked cartons would become easily displaced, which would inhibit

When the cartons stop on the surface of the accumulation conveyor, the segmented rollers beneath the cartons also stop, generating low back-pressure accumulation and minimizing product damage, left below. Cartons are stacked two or four high for release into the wrapper, below.



wrapping and slow down or stop the production line.

Diamond Sparklers brought in **Shuttleworth, Inc.** (www.shuttleworth.com) to engineer a solution that would fully automate the wrapper-infeed process. Using an off-the-shelf design that was customized for Diamond Sparkler's needs, Shuttleworth set up an in-line infeed to the filler/cartoner machine that receives the cartoned sparklers, places them in a uniform position, both linearly and height-wise for six-pack or 12-pack wrapping, indexes the packs into the proper space for precise wrapper positioning and then provides a controlled-release of the packs into the wrapper.

The new system really increased our production and saved us a good bit of money.

The infeed's multi-level, continuous-motion accumulation conveyors stack the cartons either two- or four-high as a setup for the six-pack and 12-pack wrapping cycle downstream. The stacked cartons then convey to a fixed stop, and are pushed with a shear-face pusher in a 2x3 or a 2x6 setup into a **Texwrap** (www.texwrap.com) wrapper. The infeed is completely automated and linked with the other equipment on the line for safety. In the event of a safety activation, the entire line will shut down.

Low line-pressure accumulation

The infeed conveyors are equipped with Shuttleworth's Slip-Torque® technology, which minimizes sparkler damage by creating low backpressure. This low line pressure throughout the continuous-motion accumulation conveyors allows for precise product placement. Should the line need to slow or stop, the conveyors can continue to accept product from the upstream line instead of stopping. A low-pressure accumulation buffer absorbs irregularities in the production flow, and provides a smooth, even flow on the line.

"Slip-Torque utilizes individually-powered, rotating roller shafts and loose-fit rollers, which become the conveyor surface," explains Phil Zahm, project manager with Shuttleworth. "It is powered by a

continuous chain to control the drive force for the sparkler cartons, and the size and weight of the cartons determine the driving force and roller selection. When the cartons stop on the surface of the conveyor, the segmented rollers beneath the cartons also stop, generating low back-pressure accumulation and minimizing product damage."

Diamond Sparkler desired to expand its output, while increasing

cost-efficiency. With the new infeed system, the company has achieved this objective. "We process close to 50,000 cases through our infeed system seasonally," says Reiss. "These cases are one- and two-gross of sparklers. Before, we were processing 18 cases/hour, and now we are handling 22 cases/hour, which is an 18 percent increase in throughput. Additionally, we eliminated one full-time employee position. It really

increased our production, and saved us a good bit of money. In addition, we were also able to complete our production run for our peak season 30 days ahead of schedule."

More information is available:

Shuttleworth, Inc., 800/444-7412.
www.shuttleworth.com
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