

Case history

Turnkey bagging and palletizing line puts profits in the bag

A new form-fill-seal machine and automatic robotic palletizer eliminates a company's bagging and palletizing line ergonomic and production issues.

Gibraltar National Corp., Detroit, produces and packages various cement, construction, and masonry-repair products that can be found in home repair stores across the nation. From late fall to early spring, the company shifts its focus to packaging bulk ice-melting products that are distributed throughout the Midwest. In the past, the company used a dedicated bagging station to package the ice-melting products in 25- to 80-pound handleless plastic bags, which two operators then manually palletized. However, the company found this bagging and palletizing line's production capacities and ergonomics unsatisfactory and wanted to improve the line's performance.

Previously, to bag an ice-melting product, an operator first manually adjusted the scale on the bagger's weigh hopper to weigh out the appropriate product amount for the bags being filled. The operator then manually slipped an empty plastic bag onto the bagger's fill spout and clamped it into place, and the weigh hopper discharged the correct product amount into the bag.

After the bag was filled, the operator released the fill-spout clamps and the bag dropped about 1 inch onto a belt conveyor, which moved it to a heat-sealing machine that sealed the bag's top. From the heat-sealer, a belt conveyor moved the bag up a short incline to two operators who manually palletized the bag on a wooden pallet. The operators worked in tandem, alternately lifting the bags off the conveyor and stacking them on the pallet in the appropriate pattern. A fourth operator used a forklift to move the full pallets to a warehouse. This operator also stretch-wrapped the full pallets for transport and restocked empty bags, slip sheets, and pallets.

The company only used this bagging and palletizing line during the winter season, operating it 1½ shifts a day, 5 days a week.

Manual bagging and palletizing had some problems

After years of using the bagging and palletizing line, the company had become dissatisfied with its operation. "The line wasn't very efficient and



The FFS machine makes handled and handleless plastic bags, packaging both the ice-melting and construction products in various-sized plastic bags.

sometimes ran slowly because the operator had to manually guide each bag's top into the heat-sealer, which wasn't always easy," says Wilf Lockley, Gibraltar operations manager. "The operator also had to monitor the heat-sealer's temperature and manually adjust it to ensure proper bag-sealing. If it was too hot, it melted through the plastic, and if it became too cool, it didn't melt the plastic enough."

"Palletizing the bags was also tough work, especially the eighty-pounders," says Lockley. "Fortunately, we never had any problems with injuries, but there's always that potential when you do things manually."

In early 2003, the company saw a market developing for plastic bags with handles. "Our current bagger couldn't produce handled bags, so we decided to look for a new bagger that could," says Lockley. "We also decided to automate the palletizing operation to proactively eliminate any potential ergonomic issues associated with manually palletizing bags. And to maximize our investment, we decided to expand the bagging and palletizing line's versatility to handle multiple products. That way, we could package ice-melting products from fall to spring and construction

products from spring to fall, using the line year-round. A new bagger and automatic palletizer would allow us to do things faster with fewer operators, increasing our production capacities while decreasing costs."

Looking to automate the line

In spring 2003, Lockley contacted a local manufacturers' rep he had worked with in the past. Bill Payne, a rep for BHE Inc., Ludington, Mich., put together a list of various bagger and palletizer suppliers for Lockley to review. Lockley regularly travels to the biennial Powder Show in Chicago, and he knew what he was looking for. Because he was already familiar with many of the form-fill-seal machines and robotic palletizers on the market, he was able to narrow down the list to two suppliers. One of these was Premier Tech Chronos, Rivière Du Loup, Quebec, a supplier of turnkey packaging systems, from feeder and bagger to palletizer and stretch-wrapper, for the chemical, mineral, food, and other industries.

The company contacted the supplier to discuss the line's operational requirements. The supplier then had the company send samples of the ice-melting and construction products to its facility for testing. After successfully testing

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The robotic palletizer, which sits in the middle of the production area, receives plastic bags from the form-fill-seal machine and paper bags from the other bagging station.

the materials, the supplier put together a turnkey package for the company that included an automatic form-fill-seal machine, a robotic palletizer, bag transfer conveyors, hoppers, bag flat-teners, and other related equipment.

“We reviewed everything and decided to purchase the supplier’s package to replace our existing bagging and palletizing line,” says Lockley. “They make great equipment for competitive prices, and they provide excellent planning and support. They’re also good people to work with.”

In June 2003, the company purchased the turnkey package. The form-fill-seal machine is manufactured by the supplier and produces both handled and handleless plastic bags and packages the company’s ice-melting and construction products in various-sized plastic bags. Fanuc Ltd., Japan, manufactures the robotic palletizer, and a strategic alliance allows the supplier to sell the palletizer as part of its turnkey packages. The company also purchased a bagging station from another supplier to package only construction products in various-sized paper valve bags. The robotic palletizer is programmed to handle both the plastic bags from the form-fill-seal machine and the paper bags from the other bagging station.

The form-fill-seal machine and robotic palletizer

The company hired a local contractor to install the equipment. The supplier’s technicians traveled to the company’s plant to help out during the entire installation process, from positioning and installing the equipment to starting and debugging it.

The FFS-200 form-fill-seal (FFS) machine is custom-built to withstand the ice-melting products’ corrosiveness. The supplier constructed the FFS machine’s frame of mild steel and applied a special corrosion-resistant coating to it. The FFS machine’s material-contact parts, from the bag filler to the bag-discharge point, are all constructed of stainless steel. The

FFS machine can make handled and handleless plastic bags in sizes from 8 quarts to 100 pounds using roll-stock U-film with a thickness of 2.75 to 5.5 mills. The rate at which the FFS machine fills bags is based on a material’s flow characteristics and the bag size. The more free-flowing the material and the smaller the bag size, the faster the bag-filling rate, and vice versa. The supplier writes the FFS machine’s operating programs (or recipes) that are entered into its PLC and can program it to fill virtually any product amount into almost any sized handled or handleless plastic bag.

Although Fanuc makes the palletizer’s robotic arm, the supplier makes the bag-gripper at the end of it. This picks up the bags and places them on a pallet. The supplier also designs and manufactures the robotic palletizer’s frame, safety fence, conveyor, slip-sheet dispenser, and pallet dispenser. The supplier designed the palletizer’s slip-sheet dispenser to hold about one shift worth of slip sheets and the pallet dispenser to hold between 12 and 15 wooden pallets, depending on whether they’re 48 by 40 inches or 42 by 40 inches. Additionally, the supplier writes the palletizer’s recipes that are programmed into its PLC. Each recipe tells the palletizer which product type, bag type, and bag size are being sent to it and which pallet size, stacking pattern, and bag count to use.

Filling and palletizing the bags

The company only needs two operators to run the new bagging and palletizing line — one to monitor the FFS machine and robotic palletizer and the other to remove full pallets and restock film rolls, slip sheets, and pallets.

To bag a product, an operator first chooses the proper recipe on the FFS machine’s PLC and the palletizer’s PLC. A screw conveyor then moves the product inside the plant and discharges it into a large surge hopper located above the FFS machine’s two weigh hoppers. The surge hopper has



After photocells alert the robotic palletizer that a bag is in place, the palletizer lifts the bag, moves it to the pallet, and stacks it in the appropriate pattern.

two bottom discharge tubes, and each discharge tube directs product into a weigh hopper. As product discharges from the surge hopper into a weigh hopper, the weigh hopper’s scale continuously sends weight readings to the FFS machine’s PLC. The PLC stops the product flow when the appropriate amount has filled into the weigh hopper. The weigh hopper then discharges the product to the bag filler, which fills the product into a bag. As one weigh hopper is discharg-

ing product to the bag filler, the other is being filled with product for the next bag.

To make a bag, the FFS machine pulls the appropriate length of U-film from its roll and cuts it at the proper spot according to the recipe. The U-film consists of one film layer that's been folded once and rolled onto a spool. The fold forms the bag's bottom, and the cut edges form its sides. As the FFS machine cuts the film, it simultaneously heat-seals the bag's side seams. The bag filler then fills the bag with product, and the FFS machine heat-seals the bag's top. If a handle is required, the FFS machine leaves excess film above the bag's top seal and extends a heating element through the excess film to create a hole that forms the handle.

After the bag is filled and sealed, it drops onto a conveyor that moves it from the FFS machine to the robotic palletizer, which is positioned in the middle of the production area. To flatten the bags for a neater, more stable pallet, the supplier installed a conventional bag-flattening device in each conveyor leading to the palletizer. When a pallet is completed, the second operator removes the full pallet to the warehouse and the process continues.

The supplier installed photocells along both conveyors leading to the

robotic palletizer. The photocells monitor a bag as it moves to the palletizer and signal the palletizer's PLC to start operating when the bag reaches the right spot. If the palletizer were to malfunction and shut down during a shift, the bags would stack up on the conveyor and the photocells would detect this. They would then signal the PLCs to shut down the conveyor and all of the other equipment behind it, including the FFS machine.

Melting the problems away

Since starting the new bagging and palletizing line in October 2003, the company has increased its production capacity threefold while reducing labor requirements by half. "The new line, which we operate all year long packaging both ice-melting and construction products, is much more efficient than the old one," says Lockley. "It allows us to achieve our packaging objectives much faster for less cost, and we no longer have any ergonomic concerns. Since we now can make plastic bags with handles, we can pursue new business and market opportunities."

The FFS machine and robotic palletizer require very little maintenance and overhead to operate. "This saves us money because it minimizes our maintenance budget, and it also eliminates the headaches that downtime causes," says Lockley. "To ensure that the equipment is maintained properly, we

use a computerized maintenance management system that automatically generates the work orders the operators use to maintain the equipment."

After a couple months of operating the new bagging and palletizing line, Lockley says, "We found that it's fairly easy for the operators to learn how to operate the FFS machine and robotic palletizer, and they like the trend toward reducing physical labor requirements because they are becoming less like laborers and more like technicians. In fact, they all want to work on the new line instead of doing anything else because it's so easy to operate." **PBE**

Note: To find other articles on this topic, go to www.powderbulk.com, click on "Article Index," and look under the subject heading "Bagging and Packaging," or see *Powder and Bulk Engineering's* comprehensive "Index to Articles" in the December 2004 issue.

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