Case Study

REDUCE CHANGEOVER TIME BY 65% WITH GUIDED FORMAT CHANGE

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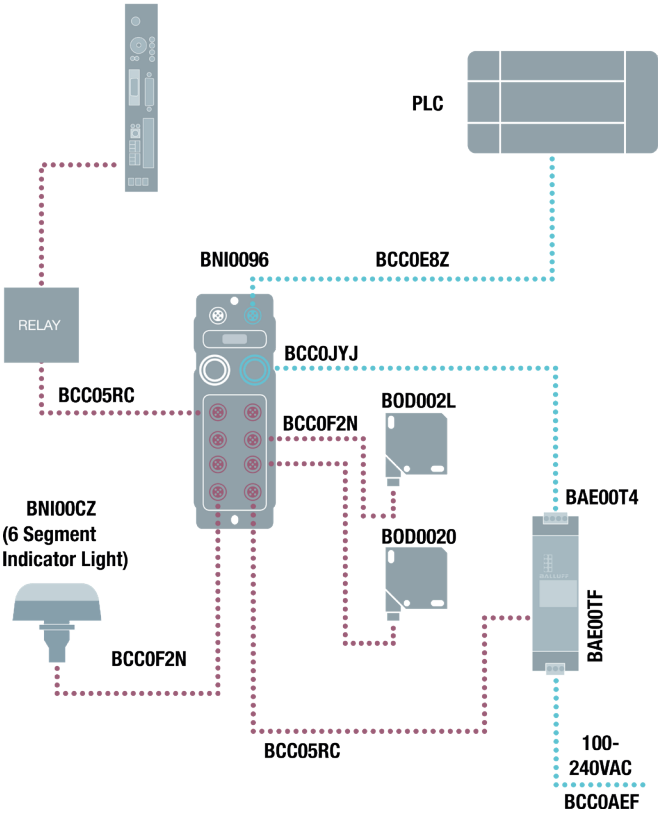
Today's food and beverage companies are producing an increasing variety of products and packages. This requires smaller lot sizes, which means frequent machine changes to accommodate different packaging formats. Quick and efficient changeover is essential in the drive to stay competitive in today's market.

Efficient changeovers are a continuing challenge when the process is entirely manual. The only way to test a changeover is to run material through the machine and check the results. And from operator to operator, the time it can take to complete a changeover can vary greatly. With so many variables, planned downtime can last longer, and material runs can be more expensive.

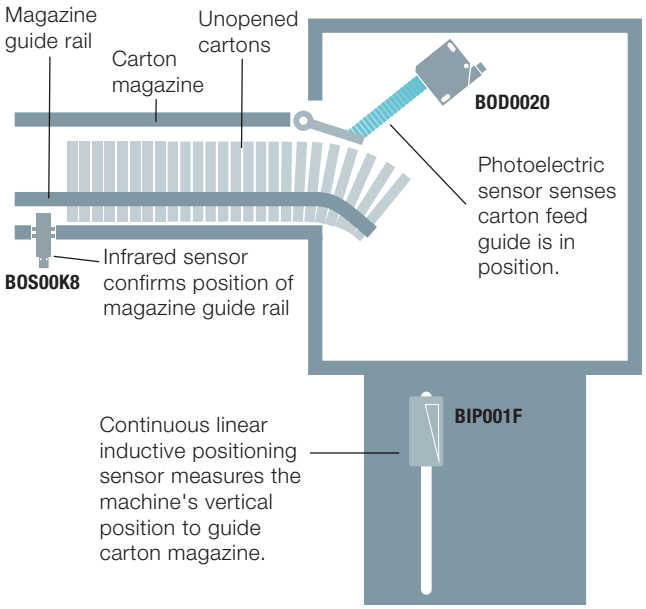
This was the case for a producer of nutritional products, including shakes, protein bars and infant formula, which was experiencing extreme variances in the length of time it took to change their cartoner: from 90 minutes with skilled maintenance engineers to four hours with less skilled operators. This includes the time to adjust all the change points on the machine and make necessary adjustments to the equipment.

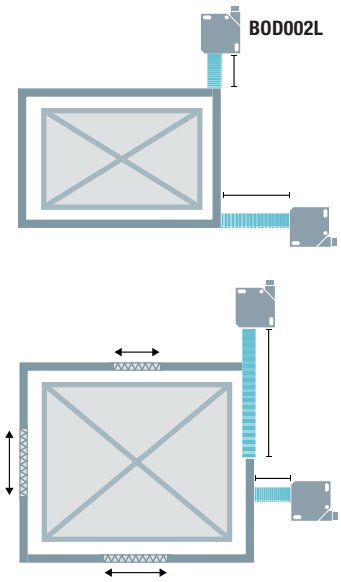
The cartoner runs five different package sizes, each with 10 changeover points. Having so many variables greatly increased the possibility for error. Operators moved the equipment to the correct points of change by following tick marks on the machine. The unguided process provided little consistency with where different operators were setting the points of change. There was no definitive way to determine that the equipment was in the correct position before re-starting production, often resulting in product and packaging waste.



After viewing a video demonstration of guided format change utilizing Balluff sensors, the customer chose the most troublesome component on the machine — the magazine on the cartoner — to implement and test the solution. The Balluff team recommended they install a washdown-rated IO-Link controls architecture, connecting to laser distance sensors and inductive position sensors to detect the position of the adjustable machine components during changeover. This could be added without having to perform major changes to the existing machine. The sensor ports on the IO-Link block also show if the connected sensor is working or not, giving maintenance additional troubleshooting power.

With an IO-Link solution in place, operators have a new workflow. First, the operator selects the required format on an HMI, which retrieves the change position values for that setup. The networked sensors show the target values and current measurements. To minimize trips back to the HMI, a six-segment programmable SmartLight displays the status of the changeover to the operator, flashing blue and red while adjustment is needed and lighting up green when all components are in place.





Photoelectric Laser Distance sensors measure the size and calculates the change in position of the variable length adjustment of the carton magazine frame holding the various sizes of unopened cartons

There was one major roadblock: The PLC on the cartoner was older and therefore could not interface with the IO-Link master block. Looking beyond the cartoner, Balluff saw that the palletizer further down the line had a newer PLC that could connect with the IO-Link master block. So, they connected the I/O-link master block to the palletizer PLC network and use it as a bridge between that PLC and the cartoner PLC. An output from the master block to the cartoner PLC is used as an indicator that all components are in place and the machine is ready to run.

With this roadblock passed, they successfully implemented a guided format change retrofit with Balluff linear position sensors. A reduction in material waste and rework was immediately accomplished, and the changeover time was reduced to 30 minutes, an improvement of at least 65%! Beyond that, the changeover process is now easier to troubleshoot. Machine operators can easily see what components are not in place without having to perform unnecessary material runs, and maintenance staff can see if the changeover process has been performed correctly from a distance thanks to the SmartLight. The maintenance team reported a large reduction in after-hours calls to fix incorrect changeover adjustments.

The success with guided format change spurred the customer to implement change part detection and machine access control using Balluff RFID. Because the IO-Link architecture is simple to expand, they can easily incorporate RFID without investigating significant engineering time or requiring an additional separate controls architecture.

BILL OF MATERIAL

PRODUCT CODE	DESCRIPTION
BNI00E0	I/O-Link 6 segment programmable light
BIP001F	Block style inductive positioning system
BNI0096	IP69K Stainless steel IO-Link 8-port master block
BOD002L	I/O-Link laser distance sensor
BCC0CJ0	M12 sensor cable, stainless steel cover nuts
BOD0020	I/O-Link laser distance sensor
BOS00K8	Infrared discrete photoelectric sensor
BAE00LJ	Power supply
BCC0EZT	M12 to RJ45 network cable, 10m
BCC06J1	7/8” Power cable

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Balluff is one of the world’s leading sensor manufacturers, providing innovative and practical sensing solutions for a wide range of applications and industries. With more than 90 years of experience and 68 locations around the globe, Balluff specializes in delivering dependable, rugged products for industrial sensing, networking, and industrial identification to help prevent downtime, eliminate errors, and innovate the way their customers automate. For more information, visit: www.balluff.com