CASE STUDY

HIGH SPEED BOTTLING LINE PALLETIZER SYSTEM – THROUGHPUT ANALYSIS

PROJECT SUMMARY

A bottle manufacturing plant wanted to determine the number of lanes and lane speeds to support modifications to their end-of-line palletizer system. The right palletizer capacity was determined to ensure that the blow molder blocking percentage was within acceptable control levels. Photoeye positions were also tested before deployment.

SYSTEM DESCRIPTION

The manufacturing line consists of a blow molder that blows bottles at the rate of 38,000 bottles per hour into a long main line air-conveyor. The bottles are tested for leaks using an in-line high-speed leak tester. Leak-tested bottles are then palletized based on pre-set lane patterns. A 1:8 diverter system distributes the bottles from the main line into 8 air-conveyor lanes which in turn feed the palletizer. The palletizer cycle time consists of palletizing time, indexing time and lane switch time. In case the conveyors, leak tester or palletizer break down, then bottles from the main line are dumped into a hopper. Bottles from the hopper then use a dedicated unscrambler, low-speed leak tester and re-feed line to join the 8th palletizer lane.

OPPORTUNITY

Identifying photoeye positions is a challenge in control system design and is critical to smooth flow of bottles on the high-speed line. The number of bottles that need to be accumulated before activating the lane diverter (controlled by photoeyes) depends on the palletizer speed and has to be rigorously tested before implementation. The impact of using two leak testers (one for main line and one for the refeed line) and running the palletizer with just the one lane running exclusively re-feeds was analyzed.

APPROACH

Given the aim of testing various scenarios concerning the material handling system and line speeds under impact of inherent variability; simulation was used as a tool to build models of the manufacturing system. AutoMod® was used as the software to facilitate testing of photoeye configurations on the conveyor system. KPIs such as throughput, equipment utilization, blocking percentage, pre-diverter accumulation and hopper utilizations were collected and analyzed. An alternate proposal to keep running the palletizer with re-feed bottles, even when the main line is down, was tested.

SOLUTION

The simulation results indicate that a palletizer with 8 lanes and a speed of 44,000 bottles per hour achieves the required line throughput. This results in significant cost savings from using a palletizer that is 25% slower than the originally proposed capacity. To avoid blocking the in feed line, the lane switch times on the palletizer cannot exceed 1.5 seconds. Use of the hopper (10,000 bottle capacity) provided an 8% cushion to the blowmolder from downstream stoppages. The alternate lane usage proposal increases system throughput by a further 700 bph.

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