

Innovative Empties Sorting

HOMOGENEOUS | In November 2017, the private brewery Erdinger Weißbräu Werner Brombach GmbH, Erding, Germany, inaugurated a new bottling line. The brewery also invested in a new central sorting facility, which ensures the supply of all three filling lines with pure empties.

THIS TASK entrusted Erdinger Weißbräu to Vision-tec GmbH, Kassel, Germany, which has evolved since its foundation in the year 2011 to one of the market leaders for automatic sorting equipment and which implemented the project in Erding as general contractor. The plant layout based on the specific requirements of the brewery. The focus was on conversion-free sorting of 20-, 24- and 11-bottle crates used in Erding, which are handled simultaneously in mixed mode in the sorting plant. In cooperation with Krones AG, Neutraubling, Germany, the sorting plant was connected to the line-management-system (LMS) of the filling lines to ensure a smooth flow of all logistical processes in the brewery.

The place for the sorting plant was given from the outset. A two-storey plant layout was created by Vision-tec to accommodate all tasks (sorting of all crates as well as transport and palletizing of the sorted empties) in this area. The storage conveyors for the ready-sorted crates were positioned on the stage, so that with a simple steel stage a large area was created economically. The cost for such a layout – compared to an installation in a correspondingly larger hall on ground level – is only around 30 per cent.

Crate Inspection Units in the Filling Lines

To inspect the incoming empties, each of the three filling lines has been equipped with a new empties crate inspection (fig. 1), which corresponds to the latest state-of-the-art: with up to 17 camera systems per crate inspection, the incoming empty crates are inspected precisely with a capacity of up to 5000 crates per hour. In addition to the “usual” inspection criteria such as crate structure, crate logo, foreign objects, bottle colour, bottle height and bottle contour, in particular proper identification of individual bottles (Krombacher, Bitburger, Köstritzer, Radeberger, Hasseröder, etc.) is the biggest challenge, which the patented

“multi-camera-system” from Vision-tec masters perfectly.

In this system, several camera-/lighting-units with biconvex lens system come to use. The number varies (according to crate sizes and running direction) between four and eleven units. The special high-speed-camera systems are arranged in way that of each single bottle in the crate a picture with different lighting options (incident light/transmitted light) in different brightness levels is taken. So, for example, even dusty bottles can be identified correctly (fig. 2).

For the branding inspection of individual bottles (fig. 3), the taken pictures of bottle shoulders, which achieve an optimal contrast ratio between bottle body and branding, are prepared with special software to provide the individual branding for evaluation. So, these individual bottles are reliably inspected and it is ensured that only pure production crates filled with production bottles get into the filling lines.

Sorting Plant

All other crates (non-production crates or crates with non-production or foreign



Fig. 1
Crate inspection unit with patented multi-camera-system

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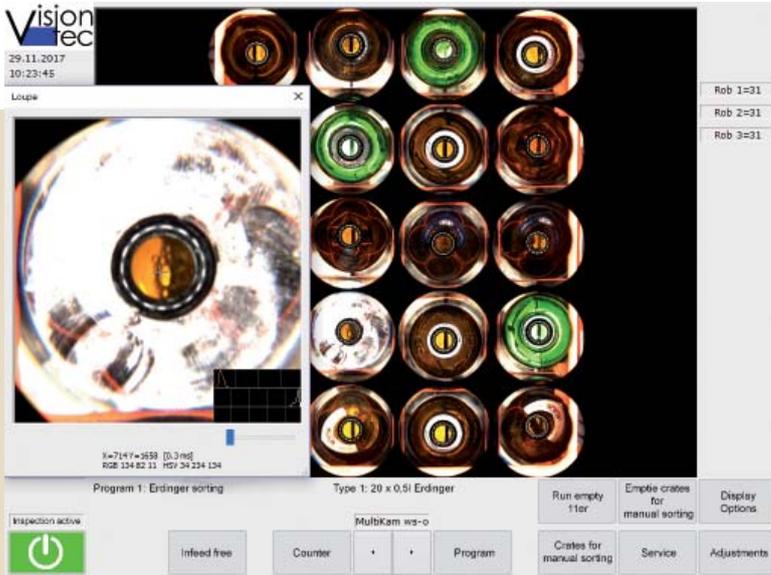


Fig. 2 Highly dusty bottle in the crate

bottles) are guided into the central sorting plant (fig. 4). Here, the sorting crates from all three filling lines are merged to one conveyor. During this, 20- and 24-bottle crates coming from line 1 and 3 are spun, so the 20- and 24-bottle crates get short-side-leading (SSL) and the 11-bottle crates long-side-leading (LSL) into the sorting plant.

The crates continue to the master inspection of the sorting facility, which is equipped

– as well as the inspection in the individual filling lines – with a multi-camera-system. Afterwards, the crates are distributed as follows: not automatically sortable crates (e.g. crates with foreign objects) are rejected in the manual sorting and – after a manual clean-up – fed back in the crate lines before the inspection.

In case of an increased volume in the manual sorting, an additional loop can buffer the hand sorting crates. This buff-

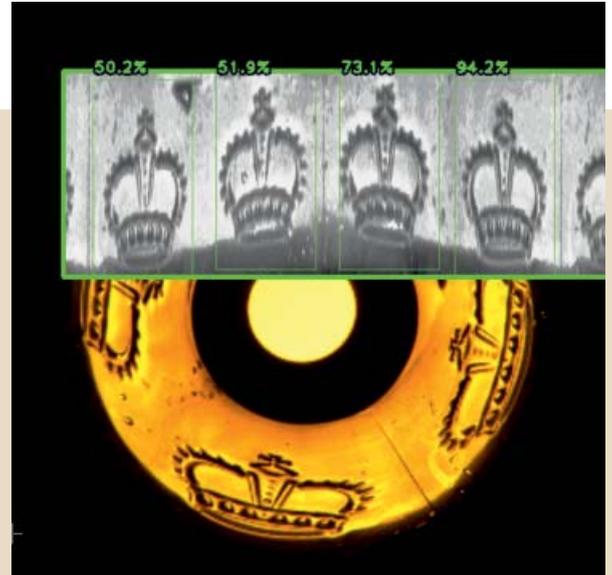


Fig. 3 Branding-inspection for individual bottles

er line will automatically be filled once a backlog on the hand sorting line is detected.

Homogeneous filled crates (e.g. crates adjusted in the manual sorting) pass on the sorting robots in order to not unnecessarily burden the sorting capacity and directly access to the filling line, where this type is needed.

The crates to be sorted are divided on the sorting robots.



Fig. 4 Sorting plant

A 75"-large screen ensures the smooth running of the sorting, it depicts the complete plant layout. Any faults (e.g. shortage or backlog situations) are clearly displayed, so that the employees in the plant are led purposefully to the scene and the faults can be eliminated quickly and easily.

Automatic Sorting of Bottles in the Crate

The sorting plant consists of three sorting robots (fig. 5), which automatically sort the bottles in the crate. The three robots are redundant systems, arranged one after another, which are able to process 20-, 24- and 11-bottle crates in mixed mode. The infeed conveyors of the robots are used as a buffer, so that – regardless of crate type and mixing – the first robot in running direction is to be filled first, then the second, then the third. Due to redundancy, assignment of crate or bottle types on a particular robot was omitted.

The sorting robots consist of twelve separate sorting stations each with two packing bells (fig. 6), which each handle a crate partition (taking the wrong and inserting the correct bottle). The correct bottle is directly brought from the storing magazine so that the travelling distances are reduced to a minimum.

Both removing of foreign bottles and placing of correct bottles occur during the crates are running through the sorting robot; i.e. the sorting heads with the packing bells move together with the crates with the speed of the conveyor. It is not necessary to stop the crates. The speed (and also the capacity of sorting) is kept constant.

The capacity of the sorting robot is independent of the empties mixing and approx. 1200 crates per hour (including empty crates) while sorting 20- and 24-bottle crates and approx. 2000 crates per hour while sorting 11-bottle crates.

Due to the fact that each sorting station is responsible only for one bottle and that the packing bells may reach every position in

the crate, it is possible to sort different crate types at the same time. It is possible to sort crates with 20, 24 (SSL) and 11 (LLS) bottles at the same time. Change-over respectively special format sets are not necessary.

The sorting robots are equipped with an infeed for empty crates (fig. 7), with which three types of empty crates can be feed in (a major and two minor types), so that certain types of bottle are set right into the right crates. The withdrawal of empty crates is done automatically and controlled by the robots.

Supply of the Filling Lines with Pure Empties

The assorted crates of the robots unite with the crates of the overflow line (homogenous goods crates, which came directly from the master inspection), and all the crates run together on the stage to crate inspection 2, where they are redistributed:

Crates not needed in the filling lines are pushed out on one of the eight storage conveyors and finally transported to the palletizer. The storage lines are designed to accommodate 60 crates each, so that they can be further filled with crates during the withdrawal to the palletizer.

For the filling lines 1, 2 and 3, certain crates are rejected with segment-rejectors and running directly in the respective filling plant. The crates for the lines 1 and 3 are spun, so that they run – as needed – long-side-leading. So, the supply of all filling lines with pure empties is ensured.

Conclusion

Erdinger Weißbräu is very satisfied with the cooperation during the implementation of



Fig. 5 One of three sorting robots



Fig. 6 Sorting stations in the robot



Fig. 7 Empty crate infeed for three crate types

the project through Vision-tec, as well as with the new sorting plant. Finally, the private brewery can sort the incoming empties efficiently and cost-saving. The realization of such a sorting plant was possible only through the use of state-of-the-art technologies.

The sorting robot developed and patented by Vision-tec is, according to the manufacturer, the only machine on the market which can sort bottles with a height difference of up to 80 mm at the same time, independent of the crate partitions. Only so, the three bottling plants that process independently different bottles in different crates can be supplied at the same time.

Another condition was the proper identification of all bottles – in particular of all individual bottles – in the crate. Vision-tec continually develops the lighting as well as the image recording technology specifically for this task. Thus, brilliant images arise that allow the evaluation of the individual characteristics of each individual bottle. This developed software runs on industrial-PCs with Windows 7/10 operating system. The connection to a remote maintenance system and an overall data acquisition is done easily through the use of a standard operating system. Computers of the newest generation can still be used. The necessary computing power is provided by 8-core processors, for example, which are available as standard industrial computers.

So, the good crates can be separated of the crates to be sorted in the infeed of the filling lines. The empties, which then reach the production, are pure more than 99.8 per cent. This only allowed the separation of palletising centre and filling plant. The crates to be sorted are led out to the

sorting centre and the sorted crates from the sorting centre to the respective filling line.

The sorting centre is used in filling free time to sort extremely bad empties (e.g. 0.33l empties from the gastronomy often include less production than foreign bottles). Such empties were formerly completely transferred to a service provider and transported over long distances. Today, only the sorted bottles are transferred to the bottle changer;

the usable empties remain directly in the brewery.

Since Vision-tec provides the inspection and sorting equipment as well as special software for signal tracking and their own crate rejection systems, all core competencies needed in the sorting plant were in the hand of the general contractor. Interface declarations were made in-house and have not burdened Erdinger Weißbräu in any way. ■