

# AT THE FOREFRONT

## Paderborn Brewery relies on modern inspection technology and robotics for sorting

*At the Paderborn Brewery, a complete sorting and repackaging system for up to seven crate respectively bottle types was created in a minimum of space with an automatic guided vehicle taking care of the supply and disposal of all edge types. In the process, pallet transport was almost completely waived, and an employee-independent supply and disposal of the system was ensured.*

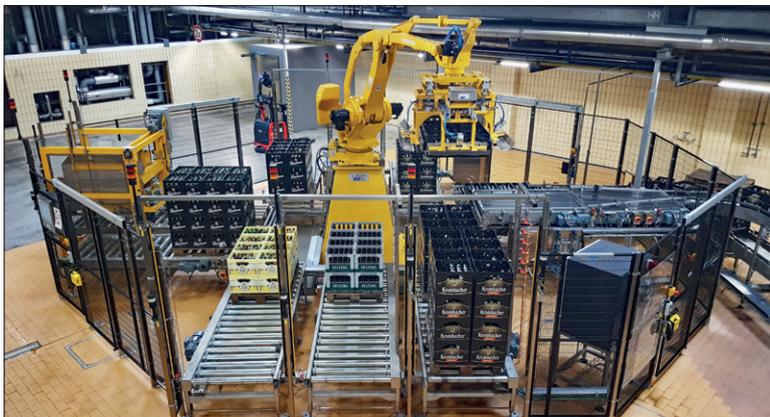


Fig. 1: Palletizing

The Paderborn Brewery was one of the first breweries in the world to rely on sorting robots for the automatic sorting of bottles in crates back in 2003. In 2013, the brewery invested in new empties inspections in order to counter the constantly increasing variety of bottles, which significantly improved the sorting quality – despite the many new bottles. The inspections are equipped with a vision-tec's patented multi-camera system, which is especially designed for the inspection of individual bottles. Thanks to the innovative technology, the system also easily meets today's requirements (e.g. the inspection of new branded individual bottles). In 2014, the sorting plant was equipped with a vision-tec sorting robot of the latest design, with which another quantum leap was made in terms of both sorting performance and plant flexibility. Today, up to 9 different bottle types with a capacity of 1,200 crates per hour are sorted in the system. Due to the large number of bottle types to be sorted,

the sorting system was additionally equipped with an empty crate feeder in order to be able to place the sorted out foreign bottles in the

correct crates at high volumes and thus enable a direct exchange with "neighboring breweries."

All these actions – increasing sorting quality, sorting performance and system flexibility – ensured that the inline sorting concept continued to function perfectly.

As the volume of sorted, unmixed empties from other manufacturers has increased further in recent years, a solution was sought to automatically and economically palletize the finished sorted material. In addition to the small space requirement and a balanced cost/benefit ratio, it was also necessary to keep maintenance costs as low as possible for the future.

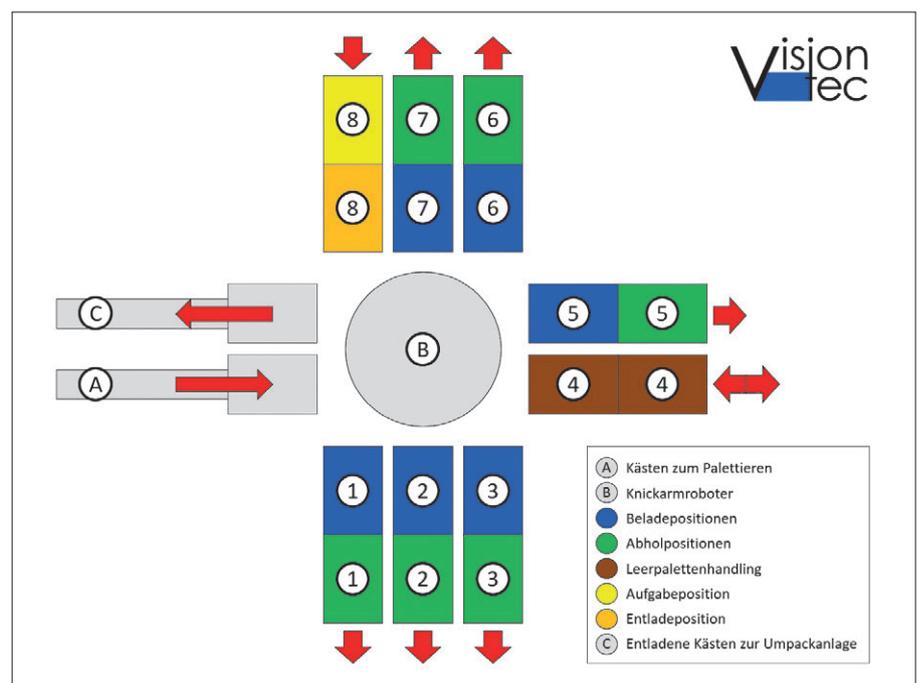


Fig. 2: Palletizing (principle sketch)

Once again, the Paderborn Brewery relied on its long-standing partner vision-tec.

## Plant layout with additional benefits

The system specialists from Kassel designed a layout that met all the requirements and also brought some additional benefits:

The sorting system was rebuilt in such a way that the crates of the production type sorted by the robot continue to run directly into production, but the sorted crates of the foreign bottle grades no longer run into manual sorting, where they had previously been picked up and palletized manually, but directly into the palletizing area.

Here, the crates are first inspected by a crate inspection and distributed to the buffer tracks using the crate logo and the bottles in the crate.

Instead of the usual long buffer tracks for collecting at least 40 crates of one type, which would not have found a place in the system, short buffer tracks were provided, each of which can hold 16 crates of one type. The crates are not removed from the buffer tracks on pallets but in layers and transported to the palletizer. This not only saved investment costs, but also enabled an innovative palletizing concept.



Fig. 3: Empty pallet handling and AGV

## Modern control concept

vision-tec has equipped the transport system with an innovative control concept with a modern, user-friendly interface. The PC-based control system with Windows-interface works on a Windows-platform; all I/O interfaces are operated via EtherCAT modules with extremely short cycle times. In order to meet the ever faster and more precise requirements in the processes, the concept also provides for the direct connection of analog value encoders and rotary pulse encoders. Individual actuators such as solenoid valves and motors can be switched in manual mode as part of the safety concept. Manual functions can be tested directly in the system using a WLAN tablet. Sensor functions can also be tested directly in the system. The concept is designed

in such a way that settings (such as speeds, waiting times and logical links between sensors) can be independently adapted and changed by trained specialist personnel. By an optimal representation on the surface of the operating units it is possible to zoom from the plant overview down to the individual sensor.

## Early notification of changes

By networking the crate inspections, the system control, the sorting robot and the palletizing system, trends in empties – i.e. changed mixing ratios – are detected and reported at an early stage. For example, an optical display in the pallet infeed area is triggered by the filling of an empties crate magazine in order to indicate to the forklift driver whether A, B



Fig. 4: Automatic guided vehicle

or C empties have to be set up in order to ensure a reliable system flow. Furthermore, the bottle mixing in the sorting crates is indicated in order to provide other empty crates for the robot sorting if necessary. The networking of all system components enables remote maintenance access to the individual systems in order to be able to help quickly and effectively around the clock in the event of faults.

All system components (crate inspections, sorting robots, system controls and palletizers) are connected to the brewery's production data acquisition system. The operating data is stored and processed on the individual computers in order to make it available to the higher-level system. This enables the filling manager to call up all statistical data on incoming empties at the touch of a button. Of course, the quantities of the finished empties are also recorded and reported back in order to use them in the higher-level merchandise management system. Other key figures, such as system running times, resulting maintenance cycles, congestion and fault messages, are provided for maintenance.

## Individual palletizing

A standard jointed-arm robot was used as the palletizer, which was set up to handle 8 palletizing positions with a total output of 1,000 crates per hour: The various foreign types are palletized in layers at six positions, the seventh position is used for depalletizing a crate type for the parallel repacking system, and the entire empty pallet handling is handled via the eighth position. All eight palletizing stations each have two pallet positions: a loading position for palletizing the crates and a pick-up position

for picking up the finished pallet. While a finished pallet is waiting for collection in the pick-up position, the next empty pallet is already positioned in the loading position and can be loaded with further crates of this type. This avoids any waiting times in the palletizing process.

The palletizing in layers enables the production of pallets loaded in different heights (four, five or six layers high), which can be specified depending on the type of crate. This option has quickly become the most popular feature of logistics: If, for example, the logistics department knows that the neighboring brewery "xy" always comes with a "gooseneck trailer" to pick up the sorted crates of its type, the required number of pallets of different heights is automatically produced at the palletizing position "xy" (e.g. 20 % pallets with six layers, 40 % pallets with five layers and 40 % pallets with four layers). These specifications can be stored for each type of crate or palletizing position, as well as being freely definable.

## One transport system for all tasks

For space and cost reasons, pallet transport between the loading and unloading positions was completely eliminated. Instead, an automatic guided vehicle is used which, thanks to a sophisticated safety system, automatically supplies and disposes of the loader/unloader in taxi mode. A system equipped with a lithium-ion rechargeable battery was selected in order to be able to carry out all tasks in the palletizing area with a single transport system (collection of finished pallets with third-party empties, delivery or collection of

stacks of empty pallets, delivery of crates for the repackaging system). If required or during a non-ordered period, the device drives automatically to the charging station, where both short and fast charges are possible (and permitted).

The individual driving jobs are transmitted via WLAN; the same applies in the opposite direction for information such as battery charge status or the next maintenance date. The combination of a laser navigation system and WLAN-supported communication with the loader/unloader enables optimized driving operation in the entire area of application. Equipped with two laser scanners, both directions of travel can be used at the same speed; cumbersome turning and unnecessary cornering are avoided. The laser scanners provide maximum safety, so that there is no danger to persons or objects that happen to be in the driving area.

At present, the pallets for supply and disposal are being made available or collected individually on a staging area. For the future, however, the use of a second automatic guided vehicle is already planned, which will assemble the pallets with the third-party empties in a separate position in blocks of six for further use.

## Conclusion

The Paderborn Brewery now has one of the most modern and effective sorting and palletizing systems in the industry. Productivity has been significantly increased. Instead of several workplaces for monotonous and physically strenuous auxiliary work (acceptance and manual palletizing of foreign types), a workplace was created for a qualified specialist (monitoring and operation of the entire system). The low mechanical effort with low energy and maintenance requirements also led to a resource-saving effect. □



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