# Leaner logistics – higher efficiency

How Wirthwein establishes ship-to-line delivery for BSH Hausgeräte in Nauen

**25 years ago, the former Bosch-Siemens Hausgeräte GmbH (today: BSH Hausgeräte GmbH) set up a production plant for white goods in Nauen in the Havelland region west of Berlin. As one of the most important suppliers, Wirthwein was also challenged to build up capacities for injection moulding, especially of lye containers. The plastics processor established its plant next to that of its customer fence by fence. The intensive cooperation was further optimised in the summer of 2020: Wirthwein is converting its in-house moulded part transport to a driverless system, and a tugger train now delivers the lye containers directly to the assembly lines at the BSH site. Only a narrow slot remained for those responsible for the changeover. K-PROFI was allowed to look over their shoulders during the first weeks after installation.**

*Text: Dipl.-Ing. Markus Lüling, Editor-in-Chief K-PROFI*

At seven injection moulding machines, the driverless transport system switches the special pallets with lye containers at the front of the closing side. It brings full pallets to the station, and empty pallets from there.

A lye container consists of two half-shells: The lighter front part has a round recess for the filling opening. Bushings for the drive shaft are inserted and overmoulded into the heavier and closed rear part. Therefore, two machine sizes with 6,500 and 8,500 kN clamping force from KraussMaffei and Engel are in use. The larger of the two has a supply station for the insert bushings. All the lye containers are made of polypropylene. Wirthwein procures these various compounds via silo trains. The material is conveyed directly from the silo to the corresponding machine and processed.

## Change in delivery logistics as an opportunity

Up to now, Wirthwein delivered the lye containers on special pallets of 120 x 120 cm, 24 pieces each, via shuttle vehicles. The linear removal robots of the injection moulding machines stack the container parts onto the special pallets with a defined accuracy of max. 5 mm.

Against the background of a planned new delivery logistics, BSH and Wirthwein jointly considered further optimisations, which should also be reflected in cost reductions if possible. The end result was a concept based on two key measures: Firstly, the introduction of a driverless transport system (AGV) in Wirthwein's in-house logistics. And secondly, a ship-to-line concept with delivery of the lye containers via tugger train directly to the assembly lines, combined with the elimination of the buffer warehouse at BSH in Nauen. In this context, new special pallets with the dimensions 204 x 120 cm and 30 pieces each were introduced.

## AGV instead of PTS

Up to now, Wirthwein used injection moulding machines to produce on the 120 x 120 cm special pallets and conveyed them along the outer wall of the production hall with the help of a common pallet transport system (PTS) for all seven machines (see illustration above on the left). “Converting the then very modern system to the new pallet dimensions was impossible. A completely new PTS would have been out of date and much more expensive than any other solution,” reports Plant Manager Garri Genrich about the early considerations. In addition, Wirthwein wanted to banish the forklifts, which previously brought empty pallets to the injection

moulding machines, even further from production. “That's why we planned the dismantling to use the freed-up space for an alternative transport method.”

After internally evaluating various concepts, those in charge decided on a driverless transport system. Among the AGV providers, Safelog from Markt Schwaben made the running with its concept. “This was an autonomous decision by the site, albeit within a given budget,” points out Klaus Seybold, Head of the Household Appliances and Electrical Industry Business Unit at Wirthwein. The project was managed by Jürgen Wilhelm, Head of Group Logistics at Wirthwein, and Nicole Mahnke, Industrial Engineer at the Nauen site.

The new planning of the in-house logistics had to take into account the travel axles and, above all, the supports of the linear robots. As a result, five injection moulding machines are equipped with two pallet positions each and two with one pallet position each. The construction of the push and lift tables on the machines and in the station was carried out by Wirthwein itself. The three autonomous, electrically driven transport robots of the type Safelog AGV L1 can move omnidirectionally and are thus very flexible. The transport device with the pick-up points for the pallets is raised and lowered via four lifting columns. The AGVs each have a fixed "home base" under one of the pallet locations and charge their batteries there while there are no transport orders. The AGV station adjacent to the injection moulding plant has seven stations (see illustration below on the left).

In order to realistically test their operation with lye containers, Safelog set up driveways, pick-up stations and a station in a rented hall in the run-up to the installation. Here, a trial run was simulated – with the standard vehicles, empty and fully loaded special pallets and the pallet pick-ups designed by Wirthwein itself at the transfer stations to the injection moulding machines and in the station.

Garri Genrich, who had already been working at Wirthwein in Nauen for some time, has in the meantime managed the Wirthwein plant in Sasbach and since October 2018 has been at the helm of Wirthwein Nauen GmbH & Co. KG.

All photos: K-PROFI/Schneider

A tugger train supplies the assembly lines at BSH with lye containers every quarter of an hour and in the correct sequence. To do this, an employee removes trolleys with empty pallets from the four trailers and loads them with trolleys with filled pallets.

### Conversion during the customer's production break

The conversion in the existing building and on the seven included existing machines was concentrated during ongoing operations in calendar week 30/2020, when BSH had suspended its assembly for a maintenance week. Essential steps were the dismantling of the pallet transport system, the establishment of a manual interim operation to maintain production and the installation of the new AGV.

To optimise the use of space, the production grid of the seven machines was also condensed and two machines were moved slightly. In fully automatic operation, one container part per machine per hour is automatically separated as a QA part via conveyor belt. In the days of the conversion, this manual discharge path for QA and defective parts was also used to discharge the regular production. With the conversion, Wirthwein also installed a new WLAN illumination system to ensure internal communication between the AGVs. The vehicles have a sensor-supported, automatic recognition of people, machines and vehicles in the movement area.

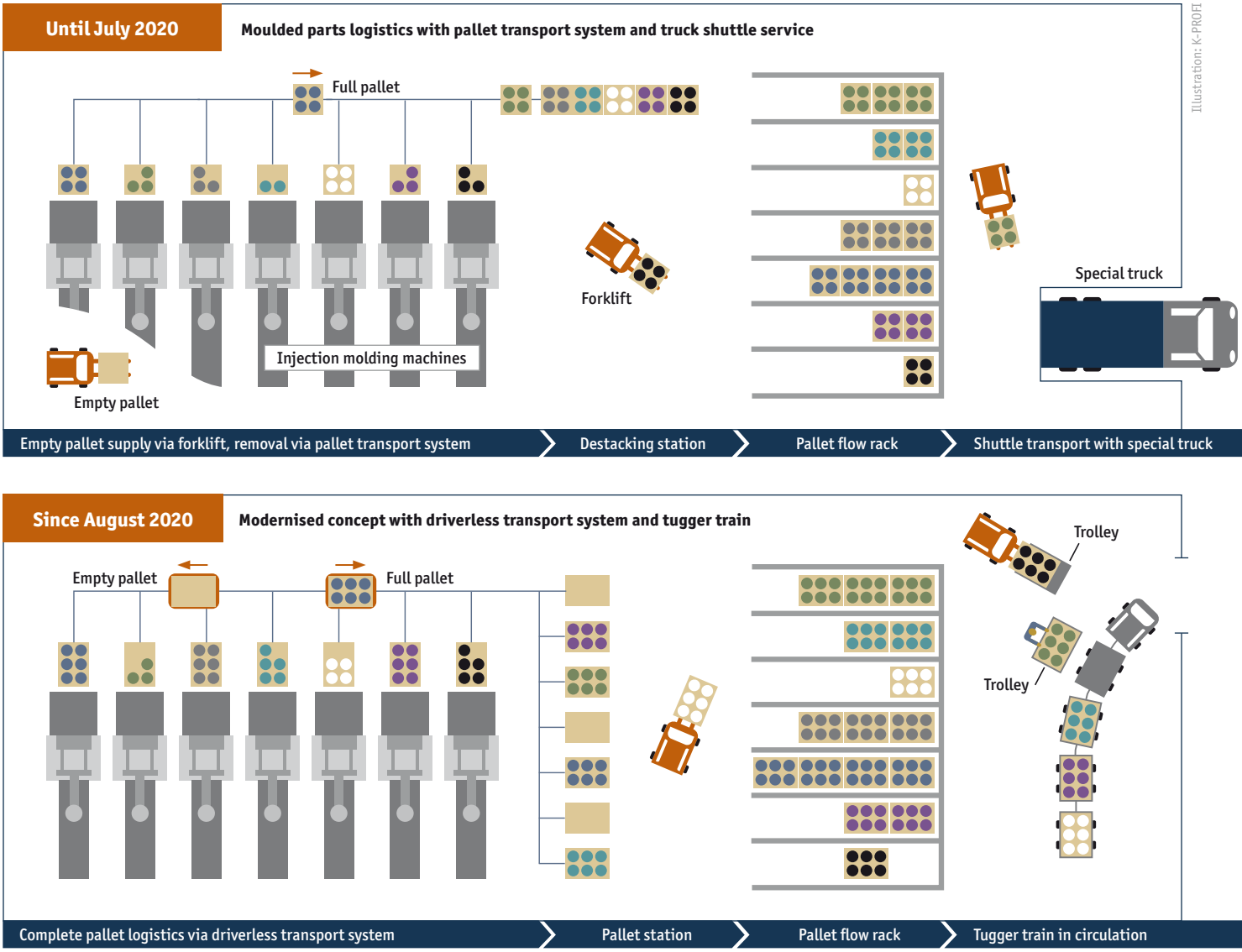
### In-house contribution as a leap of faith for one's own team

"The biggest challenge was neither the mechanics nor the moving of the machines, but the programming of the interfaces and the IT linking of the production systems", Garri Genrich reports the experiences of the first days. After all, interventions in the communication structure and in all machine controls were necessary, the communication of each machine with the conveyor system had to be adapted and the AGV had to be integrated vertically and horizontally into the IT systems.

The biggest surprise for him was the discovery of "hidden talents" among the staff: "Being allowed to do most of the tasks themselves is seen by the staff as a vote of confidence." Much of the work on machines and fixtures as well as the safety control system could well have been contracted out to the machine manufacturers or the AGV supplier, but "we wanted to do a lot ourselves. Ultimately, we have to be able to control our system in regular operation. Then it's good not to have to call a service at the slightest problem.

Material flow of the lye containers - in the past with pallet transport system and truck shuttle to BSH (above) and today with driverless transport system and circulating tugger train (below).

**Wirthwein Nauen**

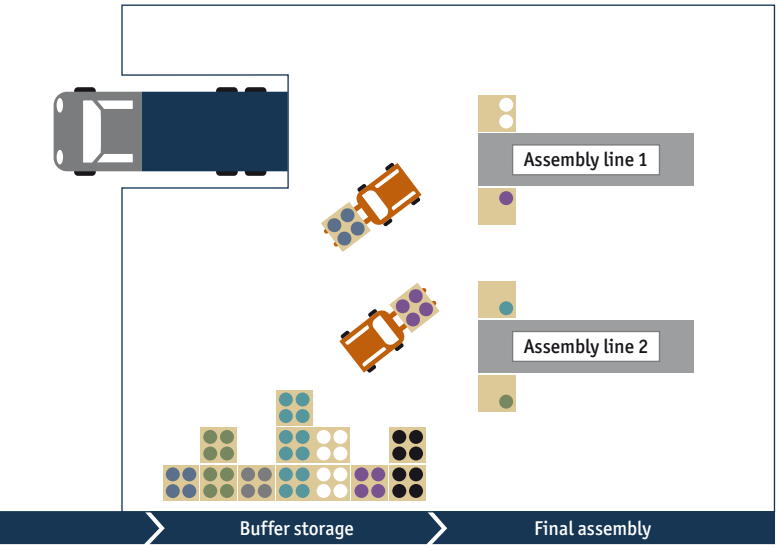


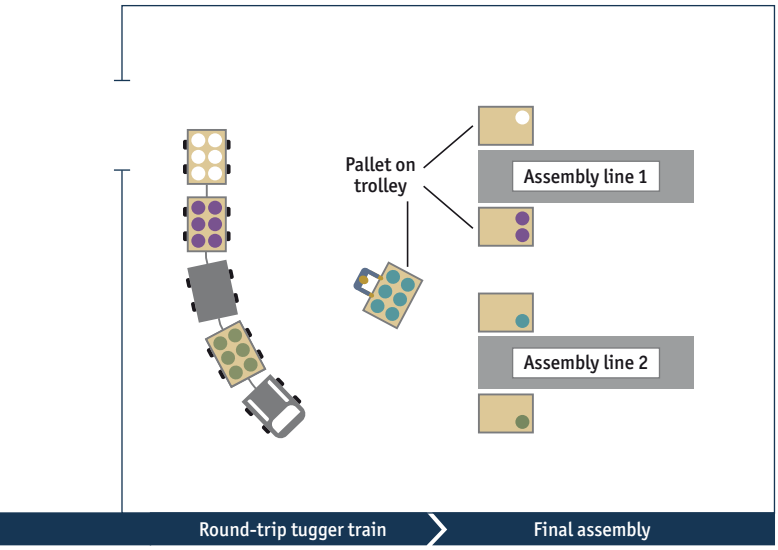
And that's despite the fact that the system here is not completely off the shelf." The automation technology team at the Nauen site around Danny Schmidt worked very closely with the Safelog technicians to ensure the sophisticated control and communication between the systems.

### Ship-to-line instead of shuttle traffic and buffer storage

Directly opposite the AGV station with its seven stations is a pallet flow-through warehouse. Forklifts, which have been given 70 cm longer tines because of the larger pallets, take the loaded pallets out of the station and lift them into the predefined tunnel of the buffer warehouse. The entire storage rack is inclined to the rear and equipped with free rollers and brake rollers in such a way that the pallets line up at the rear removal position without further intervention. The buffer storage is necessary to be able to react quickly and flexibly to all customer requests and changes in quantity, even at short notice.

**BSH Hausgeräte**



The vehicles orient themselves on fixed magnetic strips placed at right angles on the floor. They can turn on the spot. Each vehicle has its own parking position for recharging its batteries.


The supports for the linear robots on the various existing machines required several layouts in order to optimally arrange the pallet positions on each injection moulding machine.

The injection moulding machines dispense the products on the operator side - the finished parts to the clamping side, the QA parts to the injection side. The larger machines have a feeder for the insert bushings (under the conveyor belt).

At the station (in the foreground) in front of the buffer warehouse, the driverless transport system sets down filled pallets and picks up empty pallets. On the opposite side, a forklift takes over and lifts them into the buffer warehouse.

**Profile of BSH Hausgeräte**

With sales of around 13.9 billion euros in 2020 and 60,000 employees, BSH Hausgeräte GmbH is a global leader in the household appliance industry. In addition to eleven well-known household appliance brands such as Bosch, Siemens, Gaggenau and Neff, the Group's brand portfolio also includes the Home Connect ecosystem brand, as well as various service brands, including Kitchen Stories. BSH produces in 39 factories and is represented in around 50 countries. At its Nauen site, BSH Hausgeräte GmbH has been successfully producing premium washing machines for the global market since 1994. BSH is a company of the Bosch Group.

Klaus Seybold, who has been with Wirthwein since 2011, is now Head of the Household Appliances and Electrical Industry Business Unit. This means he is responsible for sales and project management for the division across all locations.

While the AGV is a reactive system that functions without an interface to the ERP system, SAP Warehouse Management (WM) is indispensable for warehouse management. It regulates the loading and unloading from the storage system and observes the necessary curing time of the lye containers. With the support of the SAP WM team from the head office in Creglingen, this challenge was also mastered well.

Previously, Wirthwein had used a special truck adapted to the pallet size to shuttle to a rear docking station at BSH, where the pallets filled a small buffer store (see illustration above on the right). Forklifts then moved pallets to the assembly lines as needed. Today, the tugger train from Still, equipped with four trailers at Wirthwein, delivers trolleys with preassembled pallets directly to the two BSH lines in the right sequence (illustration below on the right). For each assembly line, one trolley is loaded with front parts and one with rear parts of the lye containers. The tugger train runs in a delivery cycle harmonised to the production lines, bringing the trolleys with empty pallets from BSH and picking up loaded ones. The tugger train system has an extremely tight turning circle. In the first few days after commissioning, the logisticians and forklift drivers optimised the route and the parking positions for unloading and loading.

### Expandable and adaptable logistics concept

The AGV and the concept of the tugger train are not tied to the lye container project at BSH but can be expanded and reused in many ways – at all locations. Only the receptacles designed for special pallets and the programming had to be adapted. "It was a special challenge to implement the new logistics concept with seven machines within the very short time window available," explains Garri Genrich, but in terms of forklift freedom and occupational safety, the AGV was the best solution. Klaus Seybold finds the pilot project interesting

**Profile of Wirthwein Nauen**

Wirthwein Nauen has been in operation since 1996. Initially designed exclusively to supply BSH with products for white goods, the automotive industry was added as a second customer sector in 2006. The main product of the location with a total of 150 employees continues to be plastic components for household appliances, and BSH continues to be the main customer in Nauen. A total of 21 injection moulding machines in the clamping force range from 3,500 to 16,000 kN and with a focus between 6,500 and 8,500 kN are distributed between a hall section for the production of household appliance parts and a hall section with automotive interior parts. Seven of the 21 injection moulding machines produce the two halves of lye containers. The main automotive products are door modules for passenger cars and light trucks, some of which are foamed and finished after injection moulding. The site processes about 9,000 t of plastic annually and is mainly supplied by seven double-chamber silos with 25 t per chamber, six of which are designed for PP and one for polyamide.

To pick up the pallets in the station, the driverless transport system raises its loading platform by a few centimetres; to set it down, it lowers it. Wirthwein built the pick-up devices itself.

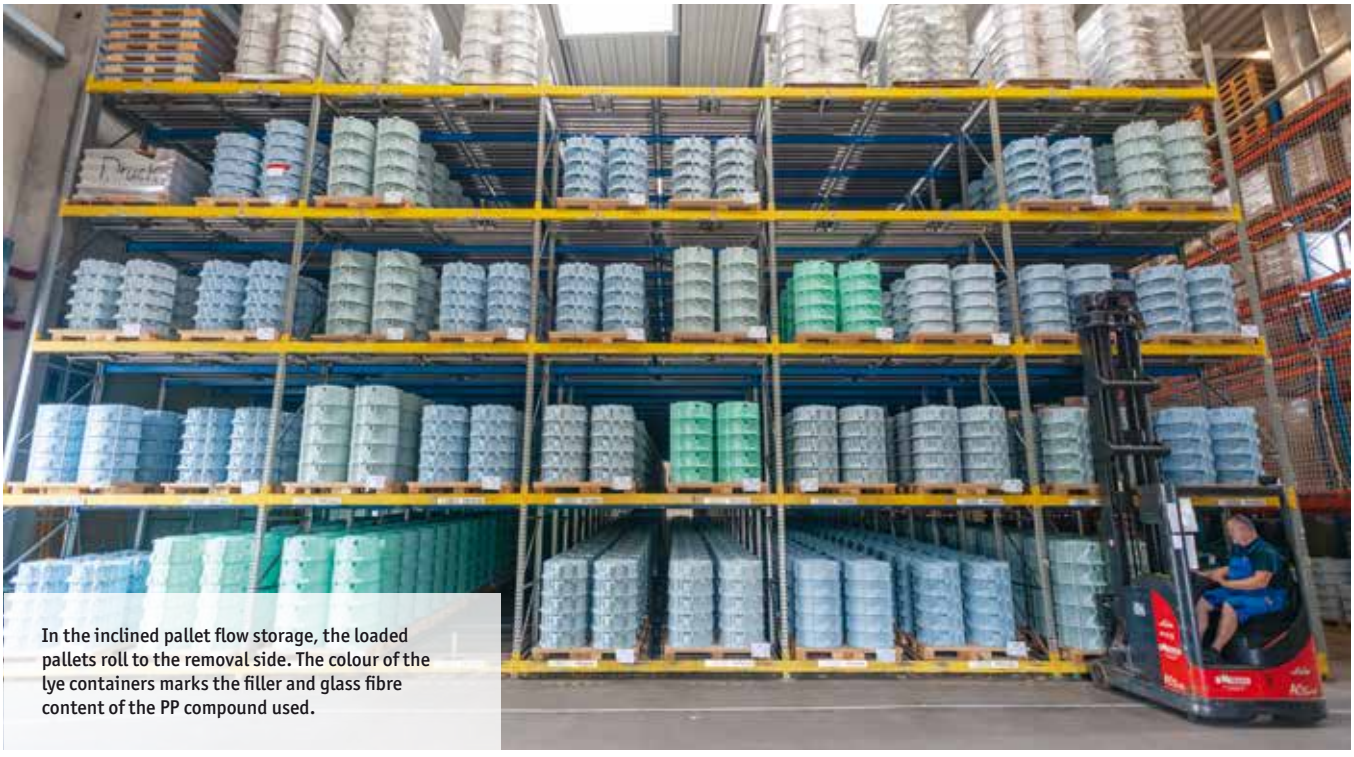
To lift the 204 x 120 cm special pallets into the buffer store, the tines of the forklifts were extended by 70 cm.

for other plants as well, because Wirthwein operates another fence-to-fence plant in addition to Nauen, as well as a shop-in-shop model for or with BSH in Poland and another shop-in-shop model in the railway technology division at a Chinese customer.

In his quest to create more value for Wirthwein, Klaus Seybold is always on the lookout for new products and processes that can be transferred from one location to another through knowledge transfer. For him, it is quite conceivable that the now experienced employees from Nauen will accompany an AGV introduction at another Wirthwein location. "In autumn, we run into the months with the highest turnover in white goods," Klaus Seybold reports. "That's a big task every year, and a particularly exciting one this year with the introduction of the AGV."

Garri Genrich hopes for orders from a new automotive customer in the medium term. In any case, there is room for additional machines to injection mould automotive parts in Nauen – also due to the reorganisation in the production of lye containers.

*www.wirthwein.de*
*www.bshg.com*
*www.safelog.de*
*www.still.de*



In the inclined pallet flow storage, the loaded pallets roll to the removal side. The colour of the lye containers marks the filler and glass fibre content of the PP compound used.