



Fully automatic transport system in the goods-in store of Zentis GmbH in Aachen

The company Zentis in Aachen is nowadays one of the most important and largest fruit processing businesses in Europe. In Aachen the company employs around 1,300 people and achieved a turnover of approximately 600 million euros in 2006. The company's processing capacity amounts to several hundred tonnes every day. To manage such volumes Zentis has built a highly modern, fully automated goods-in store. As its logistics partner for automating the transport in the goods-in area Zentis decided to appoint H + H Herrmann + Hieber in Denkendorf.

With its pallet conveyor technology H + H is a medium-sized market supplier. However, over more than 45 years and after a series of ambitious projects as an innovative partner of renowned manufacturers, the company has established for itself an excellent reputation in the field.

The Zentis project is based on painstaking and detailed planning of the material flow, fully approved by the customer. Experience shows that this first step is decisively important for later suc-

cess in operation. Delivery, assembly and commissioning then took about 7 months, during which production operations were hardly interfered with at all.

The objective

The planning and design of an automatic storage and transport system is ultimately always an individual job which has to be geared to the business in each case. Such a system can only make sense against the background of the production programme for customers and their developed corporate culture.

Production at Zentis is divided into three different branches:

- ❑ The production of a wide assortment of quality preserves and sweet creams for the end consumer.
- ❑ The production of confectionery products, high-grade marzipan and chocolate products.
- ❑ The production of fruit preparations for the dairy and patisserie industries.

Whereas confectionery produc-

tion was relocated to a newly built branch establishment in the early 1990s, at the parent plant in Aachen the company concentrated on the production of fruit preparations, above all for the dairy and patisserie industries. For example, there is a high probability that the fruit in any pot of fruit yoghurt is a Zentis product.

The production programme of this fruit preparation activity is characterised, not least, by its extraordinary variety. On average the company prepares around 3,500 different customer recipes, to which new ones are added every day, which take into account the numerous wishes of customers as well as seasonal and other market variations. For these recipes Zentis not only processes fruit from all over the world, but also additives of the most varied kinds. The volume of processed and packaged goods amounts to several hundred tonnes every day. On average, the goods-in area deals with about 24 trailer-load deliveries per day.

In the goods-in area and stores Zentis differentiates fundamentally between deep-frozen goods, which are stored at -22°C , and

goods to be dry-stored at about 12°C or above. This general differentiation is taken into account by a corresponding division of the goods-in store. The deep-freeze store has a total of 12,000 storage spaces and the dry goods store about 6,600 spaces.

For this production activity a fully automatic goods transport system had to be planned and supplied, which controls all movements between delivery and production – including the return of empty containers and packaging material.

Store concept

The two separate channel stores, designed as silos, are arranged at right-angles to one another. On the ground floor the goods are delivered by truck in an area enclosed by both stores and transferred to the I-point in the transport system. Returned empty goods (packaging, stacks of empty pallets, etc.) are moved clear from the system at ground level and prepared for collection or disposal.

Before the goods delivered can be passed on to the automatic transport system, it first has to be ensured that only approved load carriers are used and that the goods are stored in a stable manner. Bagged goods are secured with straps for delivery, goods on non-standard pallets are transferred to other pallets by hand and Zentis containers are deposited on special auxiliary pallets.

The goods delivered at ground level are received, checked and transported into the store by a conveyor – optionally, depending on the material, to the deep-freeze store or to the dry-goods store. The system, which normally operates automatically, can also optionally be converted to manual operation if needs be, either completely or in individual areas.

On the upper level is the so-called 'fruit preparation area', in which the goods needed in each case, recovered from the stores, are unpacked, filled to make portions and transported on for processing. The company's quality management system specifies that only the company's own plastic pallets must be used during processing.



Zentis containers are stored on special auxiliary pallets. Only approved load carriers are used and that the goods are stored in a stable manner.

For that reason, when they are first called for from the stores the goods have to be transferred from the usual wood pallets commonly used to company-standard plastic pallets. The automatic pallet-transfer station integrated in the transport system is also on the upper level.

The goods taken from their packs are refilled into special stainless steel transport containers ('fruit trolleys') and weighed. When the quantity needed in accordance with the recipe has been reached, the container (which can be moved manually) is transferred to an overhead conveyor and – under the roof – taken to the nearby processing area.

Residual quantities are returned to store, if necessary after previously re-securing the load. For empty pallets two separate circuits have been installed: empty wooden pallets are transported to an intermediate pallet store located on a platform directly above the pallet-transfer station from where they go back to the empty goods return area on the ground floor. Plastic pallets are collected in a separate stacker, rinsed, cleaned and cycled back to the re-palleting station.



The goods, delivered by truck at ground level, are transfer by a lifting table into the transport system. Load supports not required are removed from the system directly next to the entry point.



One of the two vertical conveyors takes the load unit to the vestibule of the store. Transfer from the vertical conveyor to the vestibule takes place at the upper level

Goods-in and consignment areas

Before the goods are transferred to the automatic transport system, the storage unit must be checked and its data collected. At this point the checking is particularly important, since disturbances of the automatic sequence arise in most cases because of inappropriate storage or defective storage carriers.

After the storage unit to be stored has been placed in the lifting station by an electric fork-lift truck, all the data pertaining to this storage unit are collected manually from the goods entry label by a scanner at the terminal located there. The material flow computer stores these data under a clear LE-number, to which reference is always made at later stages. The goods in transit and all subsequent processes are identified by the material flow computer. No further scanners are involved in the complex installation.

The storage unit first passes through an automatic contour check and a weighing station. Here, the length, width and height are checked by light screens. The free fork dimensions and the bottom platform are checked by means of a special mechanical de-

vice. Then, at the contour check the acceptable total weight and – again by means of a mechanical device – even the sag of the runners are checked. If a fault is detected, this is displayed and before the storage unit gets into the system it is rejected as ‘Not in Order’ (NIO). For defective storage units a short roller track is arranged parallel to the delivery roller track. In this area returning empty units are ejected from the system and taken away by a further, third roller track.

Transport and storage

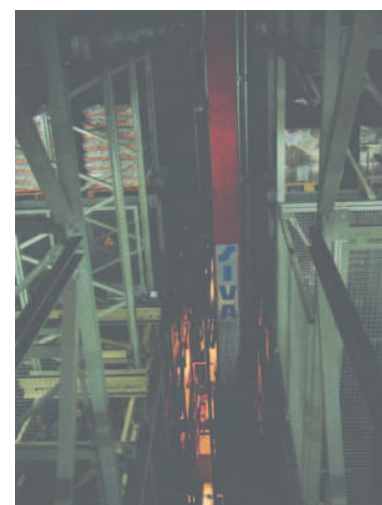
The transfer from material transport to the shelf servicing unit generally takes place at the upper level. Accordingly, the storage units to be stored are first transported by the conveyors at ground level to one of the two vertical conveyors that connect the ground level to the upper level about 7.5 metres above. On the way the storage units pass through a lock consisting of two gates locked relative to one another, which screens the oxygen-reduced store atmosphere from the surroundings.

Storage units on the way to the deep-freeze store pass through a

further temperature lock (again with two gates locked relative to one another), which cuts down energy losses and also ensures that the required low temperature is maintained throughout the deep-freeze store. The climatic conditions in the deep-freeze area pose particular challenges for the conveyor technology. All the components, structural elements and sensors used have to work reliably in the temperature range concerned.

On entering the deep-freeze store the storage units first come into the vestibule of the store. This vestibule, as it were, connects the goods-in and fruit preparation areas with the inward and outward stretches of the three store aisles. The inward and outward arrangements in the dry-goods store are in principle the same: here too a vestibule is provided.

Both of these stores, separate from one another, each have three aisles, along which shelf servicing units with satellites move the storage units in and out. In each case the storage units are brought in by long conveyor stretches, short transverse transport stretches and the necessary transfer stations between the roller tracks. All the control processes in this area are carried out by the material flow computer, which therefore coordinates the conveyor and storage systems with one another.



From the conveyor stretch in the store vestibule the storage unit is transferred in one of the total of 6 store aisles to the shelf servicing unit



Goods recovered from the store for the first time are transferred to in-house pallets on the upper level. After pallet transfer the goods are taken by transverse transporters to the consignment workplaces.

If it is evident that the storage entry aisle specified by the material flow computer is occupied, the storage unit is moved round a circuit by the floor-level conveyor so that it does not block the conveyor stretches. During this, however, it is ensured by control technology means that goods to be deep-frozen do not remain for too long a time outside the deep-freeze zone. When the pallet re-enters the store, it is assigned a new aisle by the material flow computer for its storage.

Removal of material on the first upper level

As already mentioned, units recovered from the store for the first time cannot be taken directly to fruit preparation but, for reasons of hygiene, must be transferred to other pallets. In this working step the wooden pallet is exchanged for a plastic pallet. A special, tested device is used for the pallet transfer process.

The pallet transfer device is fully integrated in the automatic transport system. It has its own controls, which communicate with the SPS system. From the incom-

ing wooden pallets the outer packaging is first removed by hand and filling frames are taken away. The pallet exchange itself takes place automatically. The stack of goods, together with the wooden pallet, are moved into the tilting element of the device and tilted by it 120° to the rear. The fork and empty wooden pallet are then separated from the stack of goods, swivelled downwards and lowered. The pal-

lets is placed onto the conveyor and transported away. The empty plastic pallet is brought in, also by the conveyor. With these supports the process is repeated in the reverse sequence: the lifting table moves up, swivels upwards and moves towards the goods stack. The pallet is pressed against the stack with a measured force and automatically stopped. The tilting element swivels back to its starting position and the lifting table is pushed back again to the front position, where it now returns the now laden plastic pallet to the conveyor.

Depending on its destination, on the plastic pallet the storage unit is taken by a transverse transport trolley to the individual workplace in such a way that it can be worked on in an ergonomically favourable position. For capacity reasons two transverse transporters are installed on the upper level (fruit preparation), which supply a total of four rows of consignment work and storage positions with material. At each workplace, from the containers stacked on the pallet the worker fills the quantities specified in the recipe into the mobile fruit trolley. The quantity to be filled in is checked by a weighing scale.

When the fruit trolleys are ready to be taken away, they are moved



Stacking devices for narrow and for wide wooden pallets on the platform in the upper level



Consignment workplaces on the upper level; behind them is a transverse transport trolley for the storage units

by hand into one of the two transfer stations and there automatically raised and suspended on an overhead conveyor which takes them, under the roof, on for further processing.

Pallets not completely emptied are returned to the store. During this return to store it must again be ensured that the position of the load on its support cannot result in interference. For this purpose the transverse transporters are equipped with contour checks which detect any lateral projection, automatically check the height of the load and display errors. Besides the automatic material transport provision is also made for transporting the mobile fruit trolleys between the ground and upper levels. This is done by a separate vertical conveyor (in-house name: 'Fruit trolley lift'). The mobile trolleys are placed by hand into the vertical conveyor. The unit is monitored by safety devices so that personnel cannot be carried up with them.

Return of pallets and empties

The empty pallets are collected in stackers provided for them, separating the wooden and the plastic ones. When a stack is indicated as full it is taken down to ground level. Wooden pallet stacks are sent for exchange while plastic pallets are cleaned in a washing unit and then returned to the circuit for pallet transfer.

Other empty containers (cardboard boxes and other types) are collected in stainless steel bins. The full bins are taken down to ground level, where they are set aside, emptied, cleaned and then stored again.

The wooden pallets emptied at the pallet transfer station are transported onto a platform above the pallet transfer unit. The wooden pallets, delivered individually by a vertical conveyor, are automatically stacked on the platform. For this, there are a total of three stackers: one each for wide and for

narrow wooden pallets and a third, which can stack pallets of both types. The full stacks (with 10 pallets at a time) are transferred by the vertical conveyor to ground level and then taken out of the system by the roller track provided for that purpose.

Conclusions

The installation of this fully automatic transport and storage system at Zentis serves both the growth of the company and economic necessities. From a technical standpoint, a raw material store of the size concerned, operated with floor-level conveyors, would nowadays be difficult to find elsewhere – especially in the deep-freeze sector.

The economic advantages of the logistical investment described here are self-evident. The system as a whole makes it necessary to have operating personnel almost only at the points where goods en-



Full transport containers are transferred by a hoist to the overhead conveyor, which automatically takes them from there for processing

ter and leave the system. During automatic operation all that is necessary is monitoring. Compared with the previous working method this investment has resulted in a significant saving of personnel and floor-level conveyor equipment. Furthermore, and not least, the avoidance of damage during transport counts as another plus. To prevent disruptive effects

in the subsequent sequences, the control system incorporates appropriate re-routing strategies.

However, the prerequisite for the desired effect actually to be achieved is ultimately that the automatic sequences should function faultlessly and that the availability of the installation as a whole should be virtually unrestricted. From that standpoint

H + H regards it as a duty to satisfy the customers in relation to the necessary guarantees. But this, in turn, is only possible by virtue of the broad basis of experience that H + H has gained over time. The result is that the system installed, which has now been operating for several years, has fulfilled the expectations of Zentis in every respect.