Scheid, Wolf-Michael :

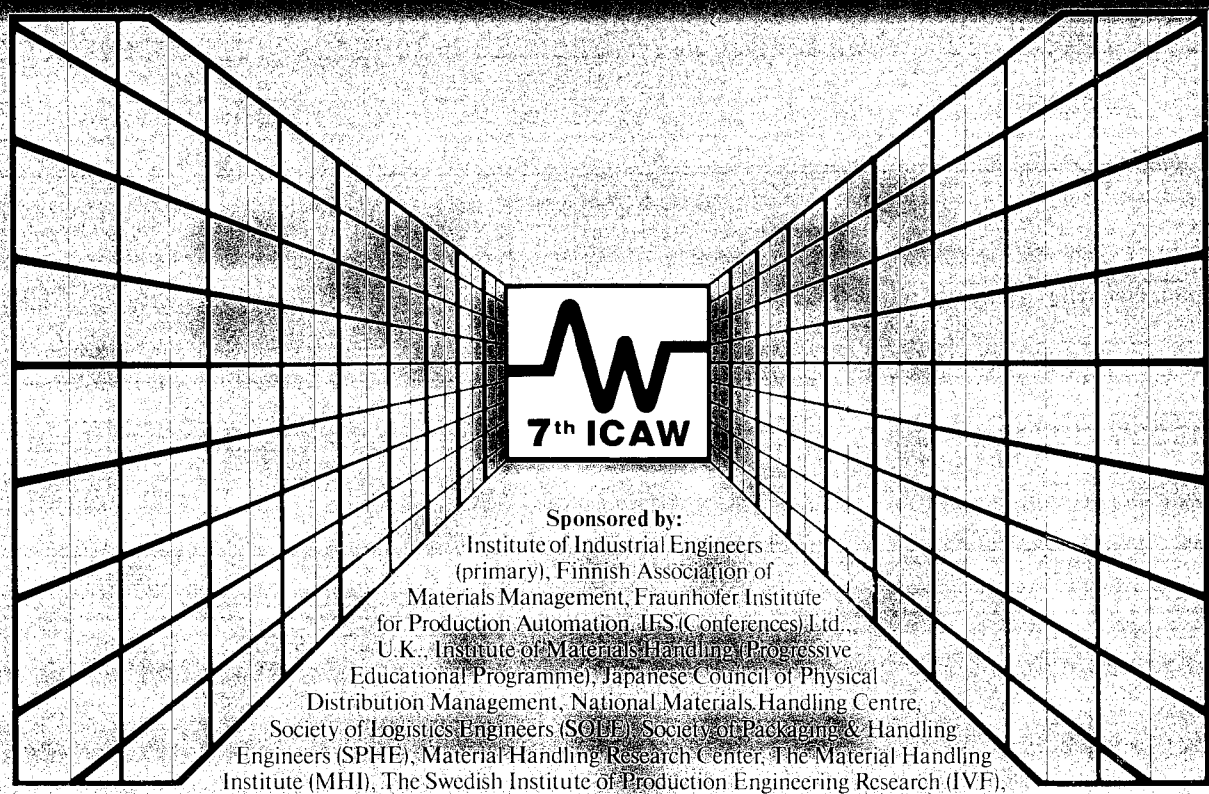
Germansy´s order picking philosophy: latest developments in computer controlled order picking plants

Zuerst erschienen in:
Proceedings of the 7th International Conference on Automation in Warehousing : October 13 - 15, 1986, San Francisco, California / ed. by J. A. White. - Kempston, Bedford : IFS ; Berlin [u.a.] : Springer, ISBN 3-540-16331-X - ISBN 0-387-16331-X - ISBN 0-948507-16-0, 1986, S. 51-57

Proceedings of the

7 International Conference on Automation in Warehousing

October 13-15, 1986
San Francisco, California



Sponsored by:
Institute of Industrial Engineers (primary), Finnish Association of Materials Management, Fraunhofer Institute for Production Automation, IFS (Conferences) Ltd., U.K., Institute of Materials Handling (Progressive Educational Programme), Japanese Council of Physical Distribution Management, National Materials Handling Centre, Society of Logistics Engineers (SOLE), Society of Packaging & Handling Engineers (SPHE), Material Handling Research Center, The Material Handling Institute (MHI), The Swedish Institute of Production Engineering Research (IVF), International Materials Management Society (IMMS), Warehousing Education Research Council (WERC)

7th International Conference on
Automation in Warehousing
San Francisco, USA, October 13-15, 1986

Germany's Order Picking Philosophy: Latest Developments in Computer Controlled Order Picking Plants

Dr. Wolf-Michael Scheid
SIEMAG TRANSPLAN GMBH
Leichlingen, West Germany

GERMANY'S ORDER PICKING PHILISOPHY
LATEST DEVELOPMENTS IN COMPUTER
CONTROLLED ORDER PICKING PLANTS

W.-M. SCHEID
SIEMAG TRANSPLAN GMBH, WEST GERMANY

ABSTRACT

For years sophisticated distribution centers have increased their service level (and cut costs!) by use of uniform tote boxes with fixed coding to collect all items of an order.

In 1984 new automated picking plants have become part of such systems and the first picking robot was put into operation. In December 1985 the first picking system that was designed to use automated units besides manual pickers was commissioned.

Automated handling of replenishments will be introduced in the near future.

INTRODUCTION

Regarding order picking systems in Germany one will notice that the distribution centers of wholesalers for medicine are trendsetters. As most of the medicine is prescribed by the doctors and retail prices are fixed by the government the retail shops for medicine compete by better customer service only. And so do the wholesalers!

They try to keep their customers and win new customers by offering

- higher availability of goods
- shorter delivery times
- more frequent deliveries per day

The basic ideas of the systems, that enable them to do this, have been developed in the 70s. In the 80s they have gone into the details of their systems and secured an optimum of efficiency. Now they are checking how to integrate automated resp. paperless picking to reduce costs and increase service level even more.

SYSTEM DESIGN IN THE 70s

As initially there was no need for mechanisation, system design concentrated on the picker. Considering the amount of time a picker uses you will note that the picking proper takes a small amount of time only. Most of their time, pickers walk or even rest. Therefore, the first approach to cut costs was to increase the productivity of the picker by reduction of walking time.

Following the completion of an order, a picking bin containing the goods picked was placed on a conveyor that brought it to a control and packing area. At the next stage, empty bins with picking instructions were automatically conveyed to the areas of a warehouse. Pickers specialized on their specific areas and did not move around in other areas. As an order normally skipped some areas this again saved walking time.

When analyzing this method one recognizes that peaks occured in some areas, whereas other areas were underoccupied at the same time (resulting in increased "resting time"). Instead of moving the people to the peak areas, a peak was eliminated by introducing material flow control systems and adopting the following method: "Skip occupied locations and return to them later."

There was no longer a fixed sequence in which the picking bins resp. the picking orders moved through the warehouse. It was just a strategy of equalizing the utilization of the various storage areas. Consequently fast movers, ordinary movers and slow movers got mixed.

There was only one disadvantage: control over the time for order completion of the individual orders was lost.

The solution:
Calculated completion times, priority flags and priority for the picking of such orders in connection with space reservation in the warehouse areas (i.e. no "skip and return" for priority orders).

This permitted reduction of the execution time for an individual order to a minimum, if necessary by splitting one order into sub-orders. And this was an important argument in competition.
The distributor calls the customer and receives his orders by phone. The goods are by van brought to the customer at a fixed hour.

Now the time between placing an order and receiving the goods could be reduced further.

SYSTEM OF THE 80s

There was not only the problem of picking, but also preparation of order instructions, assignment of picking tote boxes to warehouse areas, recognition of priority cases control of proper picking, assignment to packing locations resp. delivery vans etc.

Productivity instruments:

- use of the host computer for automated preparation of picking instructions (i.e. quantity, storage location, article assigned to warehouse areas, calculation of order completion time, assignment to van and customer).
- on-line data transfer to the process control computer for the order picking system
- assignment of order picking paper resp. instruction to an adequate order picking tote box (right volume, fixed code)
- automated time-check at every destination to set the priority flag automatically in time
- automated control of picking quality by weighing
- automated linking of tote boxes if the volume picked exceeds the capacity of a tote box
- automated diversion of completed orders out of the system to the delivery van
- automated calculation of the picks of an individual picker (in connection with incentives)

To adjust system's operation to individual profiles of special requirements, the operator may alter

- the ratio of space reservation for priority orders
- the number of "returns" permitted within the "skip and return" method
- the modus for the time calculated to set a priority flag
- the assignment of warehouse areas to tote boxes
- the assignment of vans to customers

To give him all the data required he may ask the computer about

- the actual utilization of warehouse areas by priority resp. normal orders
- the degree of completion of an order
- the actual assignment of an order to a tote box (and vice versa)
- how many and which of the tote boxes assigned to a van are not yet completed
- any type of statistics (number of orders completed so far, number of orders handled in a warehouse area, skips and returns, etc. etc.)

By adequate use of these instruments German order picking systems today complete orders of approx. 35 items (out of 70 to 100.000 articles on stock) within 35 to 45 minutes, receive and deliver orders up to 5 times per day in urban districts.

No wonder, that features of these systems are more and more adopted by order picking plants in other branches of trade and industry.

AN ADVANCED SYSTEM OF TODAY

If one will integrate advanced manual order picking and automated picking in one system it must be taken care of the special features of automation

- limited capacity i.e. regarding picking limited throughput of tote boxes/hour through a picking plant and a limited number of pieces picked per item
  or
  limited number of pieces/hour picked by a robot (and no access to the items served by this robot by another one at the same time).

- different order picking capacities required at different times in different warehouse areas (Note: peaks always occur when you don't expect them at places where you did not care for peaks - otherwise it is no peak or "bottle neck")

- different order picking capacities offered at different times in different manually served warehouse areas due to the expected requirements (Notes you don't want pickers being lazy).

If you have only one automated unit everything is easy as tote boxes enter this automated area immediately after system's entry point. Planning the capacity be aware of necessary skip and return (automated picking plant) or buffer conveyor (robot).

If there is more than one automated unit you need buffers between all sections, especially before entering areas where automated picking is used.

The following description of a system commissioned mid November 1985 in Munich may underline these comments:

Empty tote boxes of 2 different sizes (refering to small and large orders) are placed on a buffer conveyor in front of system's entry point. The order numbers are read from order papers (printed by the main frame computer) and keyed in the process control computer. The computer already knows about all order data (as an on-line data transfer took place before). So, the right size of tote box is assigned to the order, an adequate tote box conveyed to system's entry and its code "attached" to the order paper resp. data.

If goods have to be picked within the automated fast movers area the tote box enters the SKA 2000 picking machine (2000 fast moving articles): 1200 tote boxes/hour, 5 picks/item.

If more than 5 pieces of one item are required and there is only one location for this item the "skip and return" method is used for the picking machine. There is a long buffer conveyor after the 'exit' of the picking machine, either to keep returning tote boxes until they may enter the machine once more or to keep them until they may proceed to one of the following warehouse areas.

Although the SKA picking machine has an extreme high reliability an automated weighing control secures correct picking. It may for example happen that replenishments have not reached the machine in time and therefore the picking was incorrect. This must be detected and corrected.

For ordinary movers manual picking is used. Tote boxes reach this area directly from system's entry point (thus skipping the SKA picking machine) or from the above mentioned buffer conveyor. They may also skip the ordinary movers area and go directly to the slow movers area.

The manual picking area for ordinary movers is devided into 12 destinations which are reached via zip sorters (thus avoiding any stops of tote boxes). Skip and return is used within the area. Correct picking is controlled by automated weighing before the exit of the area. Incorrect orders will be diverted on a correction conveyor.

If the slow movers area is not skipped tote boxes finally enter this area. It is formed by 8 so-called "batch picking stations" which represent one destination each. Skip and return is used within the area.

The term "batch" refers to the picking method used in this area. As slow movers occupy a large space whereas only a few items per order are picked with an ordinary sequential picking method travelling time of pickers (or robots) per item would increase. Therefore batches of orders are picked parallel in one area. After picking the "batch" it is automatically split into the individual orders (i.e. the respective goods are automatically placed in the correct tote boxes).

Such a parallel "batch" picking is a main feature of the German Peter picking robot. It is capable of picking up to approx. 250 - 350 items (equal to 250 - 700 pieces)/hour along a rack of approx. 30 m length and 2 m height.

In Munich the "batch" picking itself is still done by human pickers. But the splitting of the batch into the individual (up to 8) orders per batch is done automatically (as with the robot). According to tests carried out during the planning it has been found out that a buffer conveyor for 24 tote boxes for each "batch picking station" was required to secure the maximum throughput. This figure naturally depends on the characteristic features of the respective distribution center and may be versified by an adequate dynamic simulation.

Naturally the slow movers area is controlled by automated weighing (correction conveyor for tote boxes detected as incorrect).

All tote boxes then reach a check-point. From there 3 destinations may be chosen automatically dependend on the tote box coding:

- return to a certain area
- packing of goods of extreme small orders in paper-bags before shipping
- shipping area

As at this decision point the maximum throughput capacity of tote boxes/hour is required the sorting of tote boxes is realized by a newly designed diverter (sorting in 3 directions without stoppage of tote boxes).

If the goods are packed into paper-bags they are then placed on the conveyor leading to the shipping area.

If the goods return to a certain area they will later-on return to the final check-point (and then reach the shipping area).

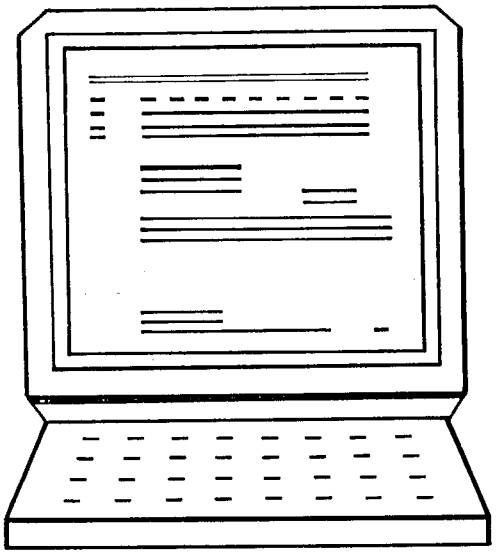
Within the shipping area there is a loop conveyor from which a lot of routings resp. their tote boxes are sorted manually and there are certain routing conveyors which are reached via material flow control automatically.

The system that is roughly described above includes all necessary buffer conveyors for automated picking resp. parallel manual picking (which might be altered into a parallel automated picking at a later stage). Systems design has taken special care of the needs of automation. Automated replenishments of goods is not (yet) realized.

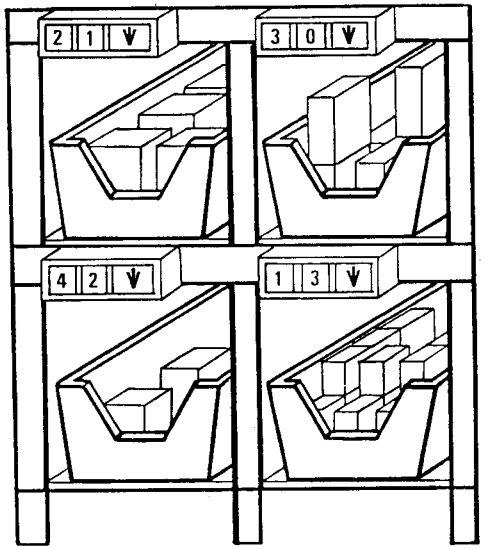
Remarks: A film showing the system described is available.

Fig. 1:

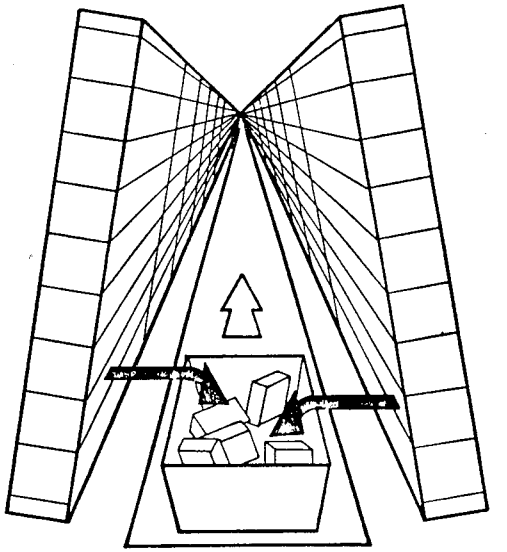
PAPERLESS PICKING



Display of order data
Confirmation of correct picking by picker

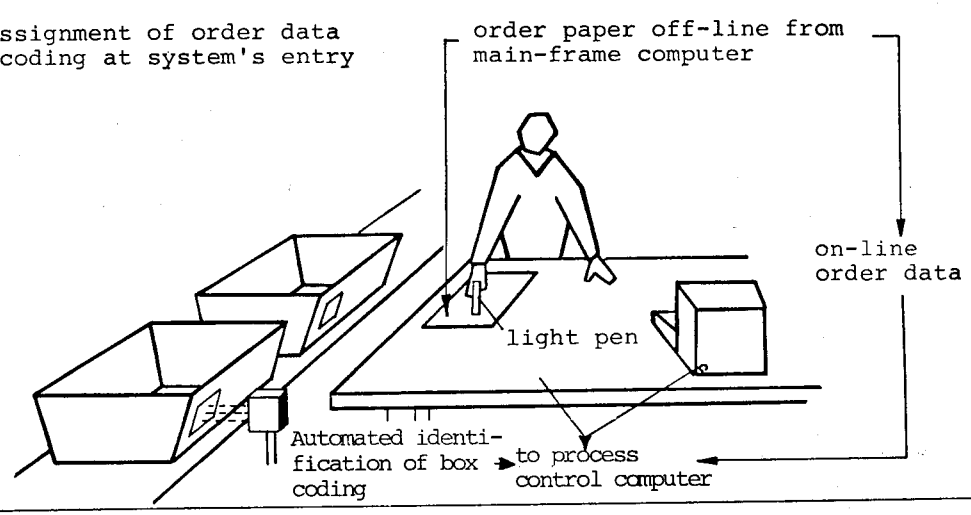


Display of quantity to be picked at the storage location
Confirmation of correct picking by picker



Order data transfer to picking machine (or robot)
Confirmation of correct picking automatically on-line

What is done today? Manual assignment of order data and box coding at system's entry



What is possible today? Automated assignment of order data and box coding, at system's entry.

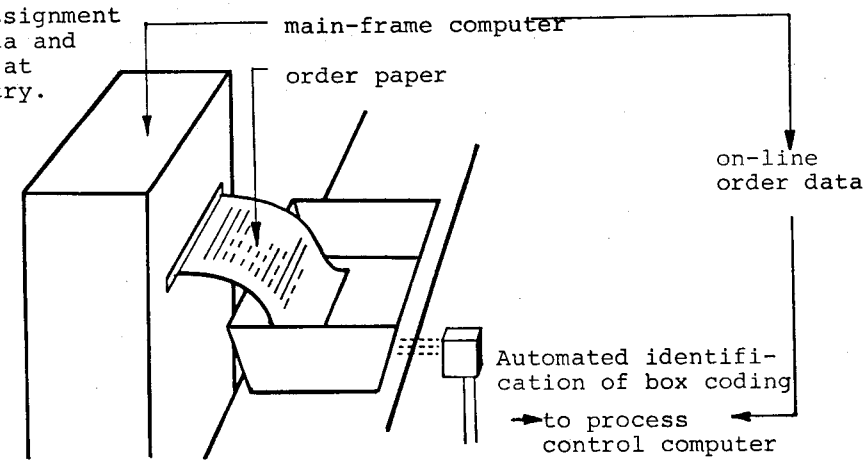
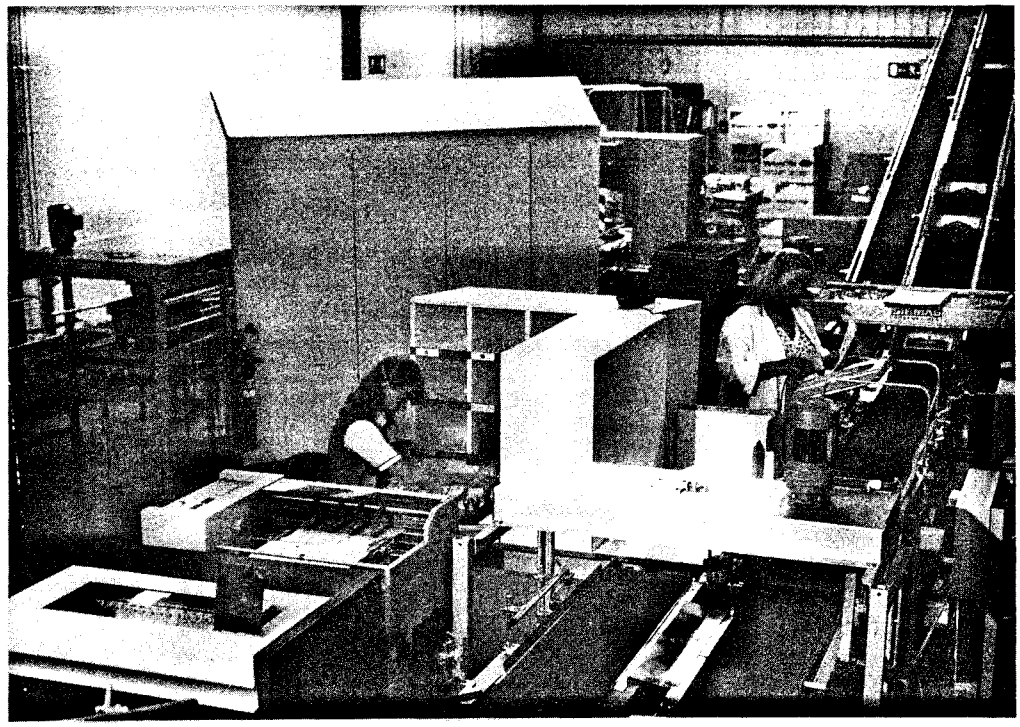


Fig. 2: System's entry point

Fig. 3: System's entry point



- on-line connection to main-frame computer;
- reading of order no. by light pen (OCR characters)
- use of 2 different tote boxes (according to volume pre-calculation)
- transfer for direct connection to second warehouse area (if there are no articles to be picked for an order in the first warehouse area).