

## Summary

In the near future, Vector will move to a different location and build a new production plant. At the time of this research assignment, the holding company has approved the development of a new building and an option on a parcel has been signed. This means that the location and dimensions of the parcel are known and the building has yet to be designed. With this move, the opportunity for Vector arises to become a model-EuroDrive, a model plant within the SEW-Group.

One of the main subjects of this reorganization is the internal logistic. Because the so-called production islands are configured for an optimal assembly process, there are lots of storages spread throughout the building. And all these storages need to be refilled every once in a while.

Storages locations are divided into central, de-central and "in isle". Each of these have their own pros and cons. A large portion (~40%) of the components would be stored centrally, because they are simply too big to fit inside an island, or used on too many different places on the production floor. A very small part (<5%) is stored "in isle", but this number is increasing with current developments.

AS/RS stands for Automated Storage and Retrieval System and refers to a variety of computer-controlled methods for automatically placing and retrieving loads from specific storage locations.

This involves the vastly growing spectrum of applied technologies like miniloads, unitloads, carousels, vertical lift modules, shuttle systems and so on. All systems emphasize the same key benefits;

- Automatic transportation of loads from and to storage locations
- Automatic "housekeeping" like identification, inventory control, reslotting, defragmentation

An AR/RS can be seen as an automated central storage solution, which can operate on its own or in conjunction with other storage solutions.

Storage locations in such an automated system are (mostly) fixed and have to be predetermined beforehand. Case studies, carried out by AR/RS suppliers, proposed a number of storage locations ranging from 6000 up to 12000 individual places. This spread is due to our insufficient data (volume) of our products. Assumed that the current level of stock (27 days) remains unchanged.

Each AR/RS solution has its own throughput capacity (in terms of movements). In order to evaluate the system with the required throughput performance on the production floor, some proper assumptions had to be made.

First of all, statistics have shown that an average of 4100 items is being used daily, with peaks well above the 6000 items. To be able to anticipate future request, a maximum of 7000 items is defined as the required throughput. This computes to a maximum of 875 handlings per hour and gives approximately 400 geared drives a day.

Secondly, all products heavier than 23 kilograms will not be placed in an automated system. Although most systems are able to handle 50 kg and up, this will dramatically reduce operating speed, and thus their performance.

Recent case studies have shown two different basic solutions based on the previous stated requests. Although the approach and philosophies of many case studies differ from the one I used in this investigation, results are very close. Knapp and VanDerLande proposed a high dynamic system, which is able to handle up to 1000 items per hour. Sophisticated picking stations maximize the utilization of human capacity.

Shaefer, Jungheinrich, Egemin and Inther logistics combined automated with manual systems. They all divided components with the use of ABC-analysis into different categories, which in turn are handled in a different way. Flowracks are mostly used for handling fastrunners, while miniload systems are used for the medium and slowrunners.

Investment costs differ from slightly more than a million for the high dynamic systems, and ranging from 500.000 to 800.000 € for the latter category.

Implementing an AR/RS as compared to the current situation will;

- simplify workflows for incoming goods
- reduce required (floor) space
- create a "Lean" production floor
- create more flexibility in redesigning production floor
- make sure the assembler stays within his isle
- decrease number of manual movement / transport
- remove cardboard / waste from production floor
- decrease stock volume for non dedicated parts
- facilitate stock management with less errors
- require less stock room employees

Without jumping to direct conclusions, a lot of the above mentioned profits can also be accomplished without the use of an automated system. The possible reduction in FTE and floor space is substantial but very hard to justify against the investment costs. At this point I would not recommend the use of an AR/RS. Technological developments in performance and reductions in costs might considerably change this point of view but, that won't be in the near future.