Summary

Vector Aandrijftechniek B.V. (Vector) has been established in 1945 and became market leader in the Netherlands with electromechanical drives. In 1948 a collaboration was started with SEW (a large electromechanical drive company in Germany) and in 1971 they moved to the current building in Rotterdam 'Spaanse Polder' to solely assemble SEW products. In the year 2000 Vector became an absolute subsidiary company of the German SEW-Eurodrive, which has its main office in Bruchsal (Germany). The merge with SEW also led to important changes in the assembly line of Vector by introducing study groups, with own employees, to increase the productivity of the assembly workers. This philosophy is called WiePRO (Wissen, Entwickeln und Prozesse optimieren) and has resulted in the change of production method; one piece flow instead of batch production. The responsiveness to the customer increased and the required quantity of employees and floor surface decreased.

Vectors current main core activities are; Drive components (delivers the actual drives as well as spare parts), Drive Solutions (has the knowledge to design complete drive systems) and Drive Services (gives technical support to the customers). The main production facility for all these products is based in Rotterdam and three supporting offices are spread over the country. By the improvement of the production process in the main production facility at Spaanse Polder a project is started in 2007 for a new building in Lansingerland. Vector is working hard to investigate all possibilities to further improve the current production processes and to eliminate all activities that don't add value. The vision of Vector is also that the development of their new production facility and processes are compatible with other SEW-Eurodrives. For this reason the new production facility is considered as a Model-Eurodrive. One of the main objectives for the new production plant is to increase the efficiency and the flexibility of the transport processes. The replacement of current transport processes with AGVs, Automatic Guided Vehicles, is one of the possibilities, because SEW has made a prototype of an AGV. In this thesis research is described about the required specifications for an AGV system by using a simulation model.

The main production process includes the sorting and storing of the incoming goods and picking, assembling, oil filling, testing, painting, drying and packing of the drives. The incoming goods from the suppliers are sorted and divided by manual transport with use of a forklift or cart into a central storage for the motor parts and a decentral storage near the assembly islands for the gearbox parts. From these storages the parts will be picked on order and transported by cart to the assembly stations which are specialized per type of gearbox. The assembled drives are transported by a conveyor belt to the oil fill and test station. The further transport to the packing station is done by a rail system through the intervening processes. Three routes between the picking and packing station have a high transport quantity per day of parts with standardized weights and sizes and are qualified for a possible replacement by AGVs. The transport between the sorting and storage will be the same as the current process, because of the short process times and high costs and complexity of the required AGVs.

Multiple concepts are made for the three qualified routes and together with the data from the investigation of the process times and quantities a simulation model is made. The simulation model covers the transport and processes from the picking to the packing station, which provides the possibility to test multiple combinations of concepts. The simulations are based on a desired average production quantity of 70.000 drives per year with high daily peaks of 100.000 drives per year. The simulations give information about the required quantity of AGVs on a route, the average productivity of the AGVs and a graphical interface with information about the buffer stations and waiting times of the processes. All these data give the possibility to compare the different concepts, which at the end results in a total concept of an AGV system.

Nine AGVs are required for an AGV system which can handle 100.000 drives per year, without the risk on large buffer or waiting times, and replaces all the present transport systems between the storage and packing stations. Although the different routes have their own requirements for loading and unloading of the drives, but with the same maximum weights and sizes of products, a modular design for the AGV is chosen; the chassis with drives, control and energy storage is separated from the (un)loading devices on top of the AGV. The modular design decreases the purchase, engineering and maintenance costs and increases the flexibility and reliability of the system. Compared to the present transport system the expected annual costs of an AGV system are higher, but the high flexibility, due to the modular concept and non fixed routes, and less required floor surface makes the AGV system a suitable solution for the transport systems in the Model Eurodrive. Almost all other Eurodrives have the same main production processes, with only some differences in product range and production quantities, which makes it is possible to replace the current transport systems by the same AGV system.

The AGV system must be very reliable, therefore it is recommended to make all components and especially the AGV control as simple as possible. As the number of required AGVs is low and the transport routes are not complicated, this is feasible. Due to the complexity of the implementation of an AGV system and the experience of employees with the use of AGVs is minimum, it is also recommended to test the AGV system in a simple transport process in the current production process. It is advised to start with a simple route, with only two or three (un)loading points and only one job at the time. If this implementation is successful, the number of jobs and (un)loading points can be expanded and at the end the AGV system can be a successful implemented transport system.