SECTION A: EXECUTIVE SUMMARY

Real-time information is critical to supply chain execution systems and to their warehouse links. Manufacturers and/or wholesalers want to be able to know what’s happening to the warehouse space, to the products, and to the equipment at all times. 

Astro is a standard Warehouse Management System (WMS) based on basic logistic principles, where the main focus is on time as the competitive factor. It has been designed and developed on this basis by people with knowledge and experience in warehousing, logistics, and supply chain execution. Astro handles and supports all processes that are used when managing operations in a warehouse.

Astro's main logic is based on basic logistic principles, such as:

- **Real-time information** - enables best possible control
- **Simplicity** - enables short process times with minimal efforts
- **Control of flow** - front-edge logistics enables control of the flow in the warehouse

Another general feature is that Astro is designed to provide increased customer service. Customer demand and the dispatch time of the orders drive the operation in the warehouse.

The Warehouse processes are based on 100% real-time information, and data captured on-line at the source provide the possibility of control. Efficient processes can be designed when the work is performed on-line via RF terminals.

A comprehensive view of some of the areas where Astro provide functionality is given below:

- **Web-enabled.** This means that Astro lets users in remote locations access order information and inventory levels across e.g. multiple Distribution Centers using nothing more than a Web browser. Visibility through the supply chain as suppliers or customers could be given the opportunity to look into certain parts of the warehouse operations.
- **Cross-docking.** This allows warehouses to direct incoming shipments straight to the shipping dock to fill outgoing orders, eliminating the costly put-away and picking operations.
- **Real-time monitoring.** Monitoring of work load and order lines left on a specific trailer/order or per picking area in real-time. Monitoring of capacity and individual workload. Monitoring of Warehouse space and Resource utilization.
- **Real-time optimization.** Regardless of when the order was registered - the order with the highest priority will always be picked first.
• **High inventory balance accuracy.** Stocktaking is built into the normal operating procedures, which ensures a highly reliable inventory balance.

• **Pick and pack optimization.** When the orders are released for picking, Astro optimizes the picking in the boxes or full-pallets regarding fill-rate and orders. This means that there will be no need for repackaging when the picking is done.

• **Labeling.** Astro has a built-in feature regarding creation of customized labeling on picked boxes or full-pallets.

• **Documents.** Astro can generate a wide range of documents, e.g. loading lists for everything that is to be loaded on a trailer.

• **Communication with other systems/applications.** Astro can handle and/or create data that could be transferred into other systems such as EDI applications, transport optimization, crane areas, paternoster, vertical storage units, etc.

A WMS is a strategic application that has helped transform warehouses from unglamorous cost centers to revenue-producing operations critical to overall supply chain performance. Most companies implement a WMS not to reduce head count but to automate the receiving, storage, picking, and shipping activities and support advanced warehousing functionality such as light manufacturing, flow-through distribution, and Value Added Services (VAS).

Most of the benefits affect measurable areas such as order fill rate, order and inventory accuracy, storage use, orders per hour, and cost per order. Another factor is the ability to shorten the lead times due to the increased speed in the handling processes. According to AMR Research some examples include order and inventory accuracy rates exceeding 99%, order turnaround times cut in half, labor productivity rising 20%, and reductions of per-unit labor costs of 6%. On the other hand, it is often the intangible benefits of customer satisfaction and inventory visibility that truly drive the Return on Investment (ROI) justification of implementing a WMS application.
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SECTION B: PRODUCT OVERVIEW

The Astro software is a standard Warehouse Management System (WMS) based on basic logistic principles, where the main focus is on time as the competitive factor. The WMS is a crucial link in the supply chain. The system provides a real-time control over resources needed to fill orders. It manages inventory, people, and equipment from receiving to shipping.

Astro mainly communicates with the Enterprise Resource Planning system (ERP). The ERP-system transfers order information to Astro, and Astro handles and optimizes this information in the best way in the warehouse (see figure 1). It is also common that Astro communicates with other applications such as transport planning systems, EDI applications, crane areas, etc.

![Figure 1. Communication between Astro and the ERP-system](image)

Real-time information is critical to supply chain execution systems and to their warehouse links. Manufacturers and/or wholesalers wants to be able to know what’s happening to the warehouse space, to the products, and to the equipment at all times.

Astro handles and supports all processes that are used when managing operations in a warehouse. One general feature of Astro is the real-time design:

- Astro works in real time in respect of inventory balance, customer order planning and the generation and optimization of pick runs. This ensures reliable and short lead times and makes it easier to fulfill the demands of the customer.

- Astro is insensitive to changes, e.g. adding or canceling orders. This is due to real-time order processing and no reservation of goods that should be picked in a later stage.
• **Astro** is designed for use with RF (Radio Frequency) terminals. Another general feature is that **Astro** is designed to provide increased customer service. Customer demand and the dispatch time of the orders drive the operation in the warehouse:

- Orders can be released automatically
- Short lead times and quick response to the customers
- Real-time cross-docking
- Control of the flow in the warehouse
- Full traceability and FIFO
- Planning is done in real-time and it is possible to monitor the work in the process

**Astro** optimizes the flow in the warehouse. This will make it possible to reduce operational cost in the warehouse. **Astro** also increase the quality of the operations in the warehouse such as traceability, control of FIFO-handling, supervision, and the increased safety in inventory balance.

When **Astro** is implemented the manufacturers and wholesalers can offer their customers a supreme level of service by improving the warehouse operations according to the statements above.

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**Astro controls the flow through the warehouse**

**Astro** connects production, warehousing and distribution to be able to control a single well-organized flow. Customer and packing orders are transmitted automatically from the ERP system to Astro. In the WMS all picking is planned and controlled on the basis of the trailer's departure times. Customer orders are divided into full pallets and/or picking items and Astro then divides them in different assignment queues.

Via monitors, management can follow the work in real time, i.e. at the same time as the work is carried out. Any deviations from the plan can be quickly corrected.

To support the flow of goods through the warehouse **Astro** has a number of features that will be described below:

**Real-time put away logic.** Replenishment, crossdocking and the put-away location are decided in real-time when the pallet/box is scanned.

**Automatic transport planning.** Manual replanning is possible for such operations as moving of an order to another trailer or dispatch day or changing the priority. Real-time automatic prioritizing of the orders to be picked and packed.

**Real-time monitoring.** Real-time monitoring of work load and order lines left on a specific trailer or per picking area. Monitoring of capacity and individual workload.
**Real-time optimization.** Regardless of when the order was registered - the order with the highest priority will always be picked first.

**Flexibility in compiling pick runs.** The pick run is compiled in the right sequence according to the scheduled time for the order and the location of the goods in the warehouse.

**Features in the picking process.** The system can calculate box sizes. Replenishment assignments are generated automatically and put into the queue with high priority. Fast and efficient stocktaking procedures integrated in the picking process.

**Real-time loading.** Real-time monitoring of the level of progress and status of the work. By verification through scanning, the system is able to check that everything belonging to a shipment is loaded and that the correct goods are loaded.

**Traceability.** The system knows exactly what is in every package leaving the warehouse.

**Labeling.** Astro has a built-in feature regarding creation of customized labeling on picked boxes or full-pallets.

**Documents.** Astro can generate a wide range of documents, e.g.: loading lists for everything that is to be loaded on a trailer with information such as ID-number, type of package and location.

**Web-browser environment.** Astro is run in a web-browser environment. This enables visibility through the supply chain as suppliers or customers could be given the opportunity to look into certain parts of the warehouse operations, e.g. inventory balance, order balance etc.

**On-line communication.** Astro communicates with the ERP-system in real-time, which speeds up the flow in the warehouse. Astro also uses standard ways of communicating with e.g. transport planning systems, EDI applications, crane areas, etc.

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**Astro's logic**

Astro's main logic is based on basic logistic principles, such as:

- Real-time information
- Simplicity
- Control of flow

These are the basic requirements that Astro is designed to fulfil. Some of the basic principles in Astro will be described and commented in this chapter.
When a pallet arrives to the warehouse Astro will direct the pallet to a place where it is most needed at the moment. The place suggested will be based on the logic of figure 2 below. The first step that will be checked is if the pallet should be directed to another trailer as a transit/cross-docking pallet. Else the pallet will be directed according to the priority as follows: picking area, nearby buffer or bulk storage area.

The definition of **transit** is that there is an order on the box/pallet, and the definition of **cross-docking** is that there is no order on the box/pallet i.e. the information about the box/pallet is gathered in a label and/or in the WMS. Astro handles both kinds of appearances.

![Figure 2. The put-away priority in Astro](image)

When the customer orders have been transmitted to Astro, they are processed in Astro in real-time to optimize the picking and packing. As the orders are released Astro can calculate the size of the box/pallet that is needed for the picking. This ensures that the fill-rate will be as high as possible in the same time that there will be no need for repackaging. Since packaging can be reported during the pick run there is 100 % control of which items that are put in each box/pallet. The highest priority order will always be picked first. When picking it is possible to verify both the location and the box.

During the picking process there is a fast and efficient stocktaking process e.g. when the pallets become empty or when the remaining quantity reaches a predefined level. This is one of the factors that ensures that the inventory balance is accurate at all times and updated when there is need for it.

Loading of goods is performed in real-time. By verification through scanning, the system is able to check that everything belonging to a shipment is loaded and that the
correct goods are loaded. Real-time monitoring of the level of progress and status of work is possible.

**Real-time focus**

When the expression real-time information is used, it means that the information is updated when the event it relates to is actually performed, e.g. when an operation is performed in the warehouse or when the inventory balance is updated. In *Astro* the information is processed in real-time. The forklifts are connected to the server on-line through the use of RF terminals.

The Warehouse processes based on 100% real-time information together with data captured on-line at the source, provide the possibility of control. Efficient processes can be constructed when the work is performed on-line via RF terminals. One example is that stocktaking is built into the normal operating procedures, which ensures a highly reliable inventory balance. The operating procedures can be monitored in real time, which enables corrections to be made in time.

**Standard system**

The basic principles for the warehousing process are the same in most kinds of warehousing environments, and the differences (e.g. local requirements, material handling equipment, and restrictions in physical layout) can be configured by adjusting parameters. *Astro* is a standard WMS that has been designed according to this philosophy, and has been successfully implemented in a wide variety of warehousing environments and business sectors. One of the basic ideas of a standard system is to utilize functions and procedures which give proven results and are well developed and stable.

*Astro* does not share databases with other systems. This means that system maintenance, problem solving and definition of responsibility is simplified. Only platform-independent standard communications procedures are used.

A comprehensive training package has been developed for *Astro*. The package consists of different training modules, each covering a system category such as system administration, planning, forklift operation, etc.

The standard system simplifies supporting activities. Each member of the support organization can solve a customer problem, even though they have not been involved with that specific installation. This improves the level of service and support to the customers.

The standard modules in *Astro* are continuously upgraded. In order to simplify this activity and provide our customers with better service and support, these upgrades are distributed as new releases.
Technology and communication

The Astro-system is based on a client-server solution, where you work from your local PC. You can run the Astro system in your local network on IBM RS/6000 (AIX) or Windows NT Server platforms.

The Astro system is run on Oracle or Microsoft SQL Server database systems.

The Astro system is programmed in the C language and has a graphical user interface, which is written in Java and executed in an Internet browser.

To communicate with local ERP systems Astro uses standard ways of communicating e.g. FTP or Sockets.
SECTION C: ADVANTAGES OF ASTMERO

Some of the typical advantages of implementing Astro include:

• **Increased Customer Service, possible to handle Larger Volumes, and More Revenue**
  After implementing Astro manufacturers and wholesalers can offer their customers a supreme level of service by improving availability, reducing direct costs and inventory levels as well as decreasing response times to changes. This in turn means sales could rise, producing more revenue.

• **Increased Warehouse Effectiveness**
  One of the important goals when implementing a WMS-system is to increase the effectiveness in the Warehouse. After implementing Astro, the areas below will be affected:
  1. Decreased lead-time
  2. Decreased order turnaround time
  3. Increased throughput
  4. Decreased capital in inventory
  5. Decreased administration costs
  6. Increased storage area utilization
  7. Improved control/utilization of forklifts
  8. Reduced stocktaking costs

• **Increased Warehouse Quality**
  Another important goal is to increase the Quality in the Warehouse. The areas where Astro supports this is described below:
  1. Traceability
  2. Control of FIFO-handling
  3. Supervision and control of resources
  4. Increased inventory accuracy
  5. Improved shipment accuracy
SECTION E: EXPLANATIONS

**Astro** - MA-systems Warehouse Management System

**Cross-docking** - Transfer of goods through the warehouse without order-structure

**ERP** - Enterprise Resource Planning system

**FIFO** - First In First Out

**FTP** - File Transfer Protocol

**RF terminals** - Radio Frequency terminals

**Transit** - Transfer of goods through the warehouse with order-structure

**VAS** - Value Added Services

**WMS** - Warehouse Management System