



In-floor Chain Conveyors

INTERNAL LOGISTICS DIVISION

TOW-LINE



MÓSTOLES INDUSTRIAL, S.A.



Sectors of Activity

The **TOW-LINE** In-floor Chain Conveyor is a system widely used because of its simplicity, reliability, and versatility, and is suitable for the handling of all types of materials in:

- Distribution Centers.
- Transport Terminals.
- Manufacturing Plants.

Distribution Centers

In **Distribution Centers**, the use of this system drastically reduces the costs of handling materials, reduces damages to materials, increases fluidity and discipline in cargo movements to reduce wasted time and waiting, and prevents material losses.

The versatility of this type of installations makes it possible to adopt a configuration in which the products to be transported are delivered to the proper unloading or work station, or to the required warehouse zone.

Another one of the key advantages to the system is that it integrates the different parts and functions of a warehouse, from receiving to expediting, including processing, inspection, storage, picking, and sorting, without forgetting merchandise in Cross-Docking.

The Tow-Line vehicles can be coupled to Orders-Pickers machines, which makes it possible to integrate storage and picking operations in Distribution Centers are of medium or large height.

The Tow-Line Management System (TLMS) is able to control the merchandise movement operations and communicate in real time with the Warehouse Management System (WMS).



Transport Terminals

Sectors of Activity

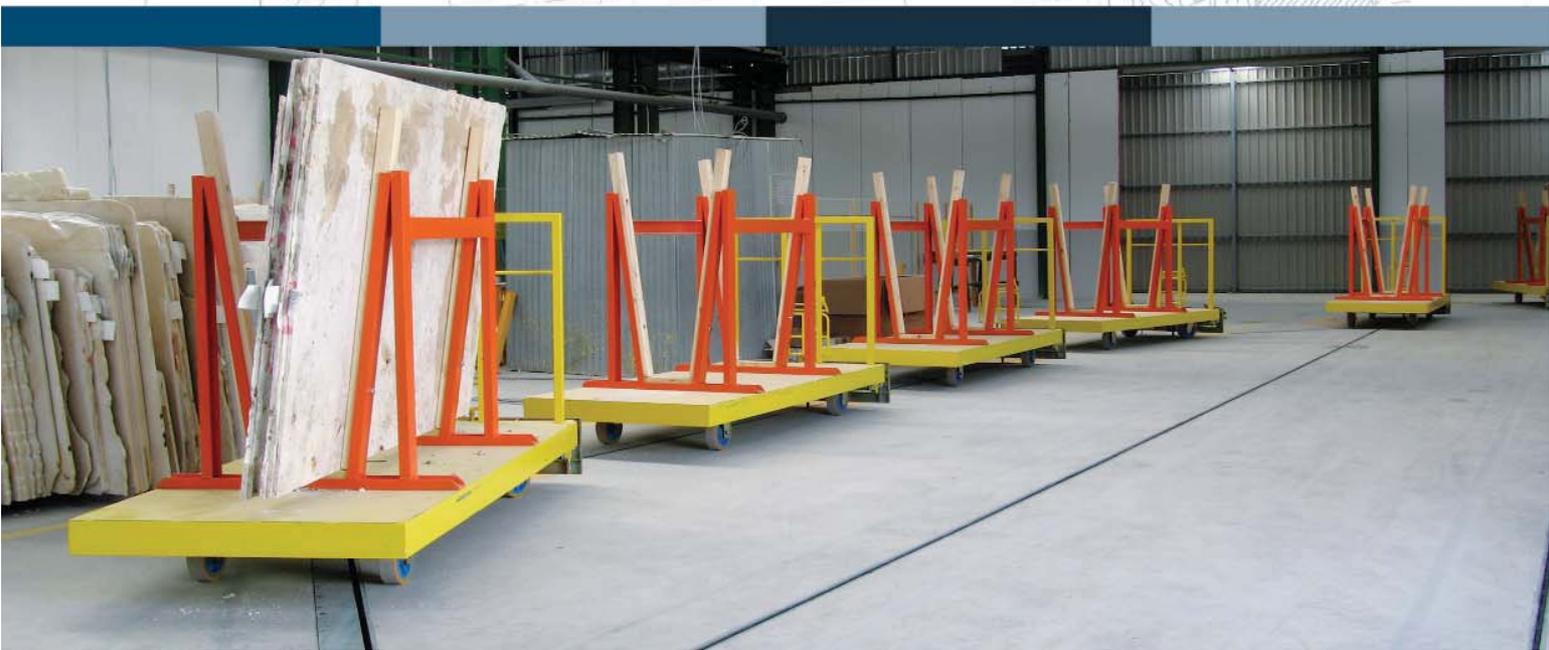
In **Transport Terminals**, merchandise transit times are significantly reduced. It is also possible to control the traceability of the goods to be shipped and supervise the operations carried out, consequently improving customer service.

This type of installations are normally equipped with Automatic Systems for the dynamic Scanning, Volume Control, and Weighing of the goods. The information supplied by these systems is integrated into the Customer Management System to ensure traceability, make billing more reliable, and increase efficiency of shipments to clients.

Manufacturing Plants

In **Manufacturing Plants**, the system can connect the different production areas, guaranteeing a continuous flow of the product, eliminating bottlenecks, accumulation of material at specific points, and jams, so that the product is continuously arriving at the workstations.

The system can be used as work benches for the tasks of manufacturing, assembly, verification, and inspection, and at the same time be used to transfer the merchandise from the warehouse to the different manufacturing areas, and vice-versa, according to the manufacturing plan.





Main Components of the Tow-Line System

Main circuit made up of the following elements:

- **U-shaped rail**, made of special steel, under the floor.
- Block-type **chain** with specially designed tow links placed at regular intervals, with a breaking stress of up to 30,000 kg.
- **Curves** with a radius of 1800 mm., equipped with an auxiliary roller chain to minimize friction with the main chain.
- **Drive Unit**: made up of a reducer motor with hydraulic coupling, equipped with chain tension and speed sensors, and an automatic lubrication unit for the system.
- **Cleaning boxes**: These boxes are placed along the main rail at regular intervals. Their function is to collect any foreign objects that fall inside the rail to facilitate their removal.

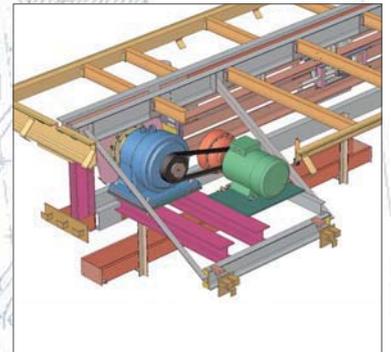
Transfers: These allow two main circuits to be automatically joined. For this reason, they are equipped with their own drive groups, system for the accumulation of trolley/pallet loaders and shunting, and entry and exit sensors.

Accumulators on the circuit: These are mechanisms that allow the automatic stopping and accumulation of trolleys/pallet loaders, in order to carry out manufacturing, assembly, or automatic loading and unloading operations with the transported materials.

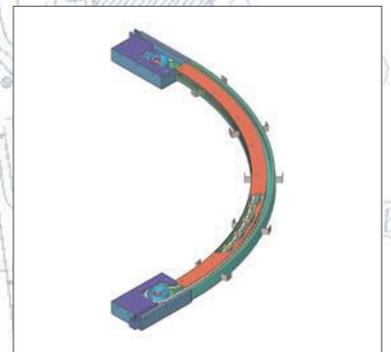
Destination stations: These are also called spurs, or exits, and may be motorized or non-motorized, depending on the type of transport vehicle used and the goods being transported.

Motorized stations consist of their own chain and drive group, intake bypass, end-of-line accumulator, and coder box.

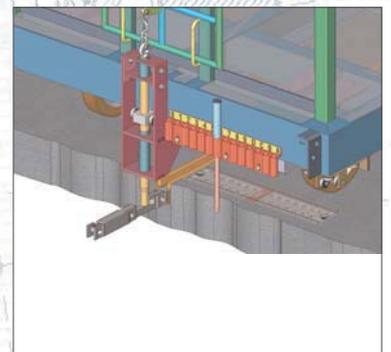
Also, motorized stations may also be Step-by-Step (leaving a space between consecutive vehicles, preserving the quality of the transported goods) or Accumulation (which allows more vehicles, and therefore more goods, to be stored at each one of the stations).



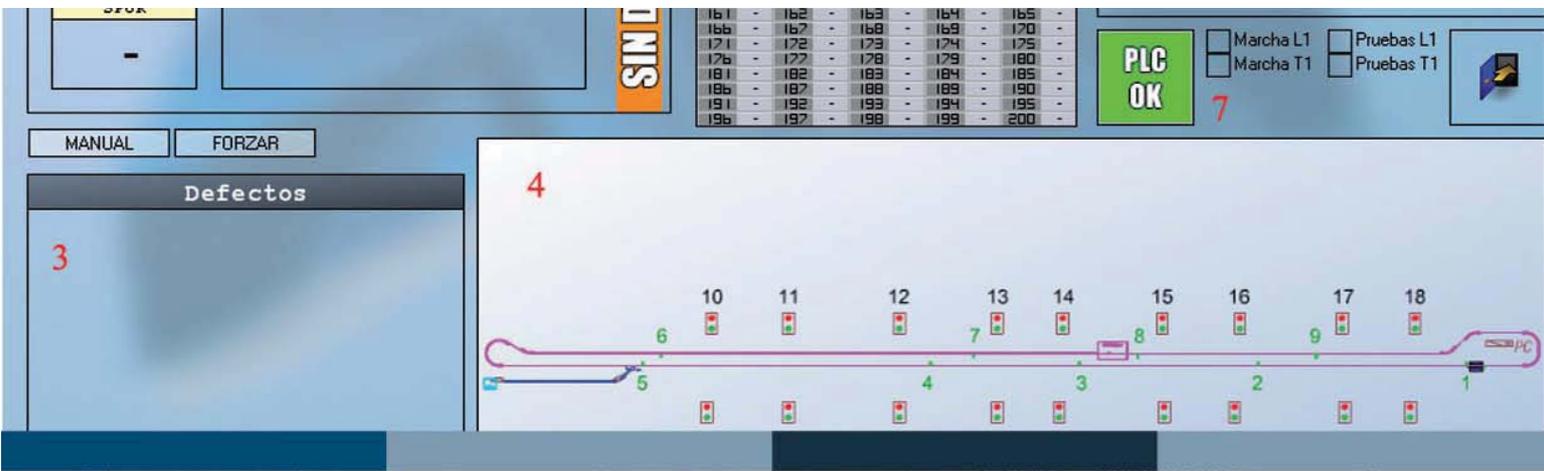
Drive Group (Main Circuit)



Horizontal Curve



Tow System and Manual Coding



Main Components of the Tow-Line System

Automatic Merchandise Transfer: Allows the transported merchandise to be loaded and unloaded automatically (if it is on pallets). Very useful in Production Plants and Distribution Centers.

Load scanner: Allows automatic dynamic scanning of up to five sides of the barcode of the transported merchandise, transmitting the information to the Tow-Line Management System.

Load Volume Control: Makes it possible to dynamically determine the volume of the transported goods, transmitting the information to the Tow-Line Management System.

Load Weight Control: Makes it possible to dynamically determine the weight of the transported goods, transmitting the information to the Tow-Line Management System.

Automatic sensors and control boxes: which make it possible to obtain complete control of the installation; these may be, among others:

- Scanner boxes: these make it possible to activate bypasses, transfers, and exits to take the vehicle to the desired destination.
- Vehicle presence sensor: makes it possible to assign the right of way at circuit intersections.
- Empty tow link sensor: The purpose of this sensor is for the empty link to pick up a trolley that is waiting at the transfer.
- Pushed vehicle sensor: Installed before each curve. This sensor allows the system to be deactivated in case of improper handling (a vehicle not locked into the chain is pushed by another one).
- Tow-bar height sensors. These are located before ramps to ensure that trolley tow bar is in the right position.



Automatic Merchandise Bypass



Transfer with RFID Sensor



Dynamic Volume Control System



Dynamic Weight Control System

Tow-Line



Transport Vehicles

The **transport vehicles** most commonly used in the TOW-LINE system are pallet loaders and trolleys equipped with a tow mechanism, a safety system in case of collision, and a code rack (in the case of manual scanning) or a TAG support (for automatic – RFID reading).

The trolleys are made with a sturdy frame made of steel shapes and special wheels that make it possible to transport, depending on the design, loads from 300 kg up to 4000 kg.

The most suitable cargo platform is designed based on the goods to be transported, and the ideal dimensions for the vehicle are also calculated.

The vehicle can be programmed to exit at any outlet station, where an operation may be carried out or material may be loaded or unloaded, manually or automatically, follow any route through the different circuits and transfers that make up the system, or stop at specific points in the system with the accumulation stops, to allow operations to be carried out right on the line.



Rack Trolley
(Marble and Glass Transport)



Rack Trolley



Pallet Loader with Tow System

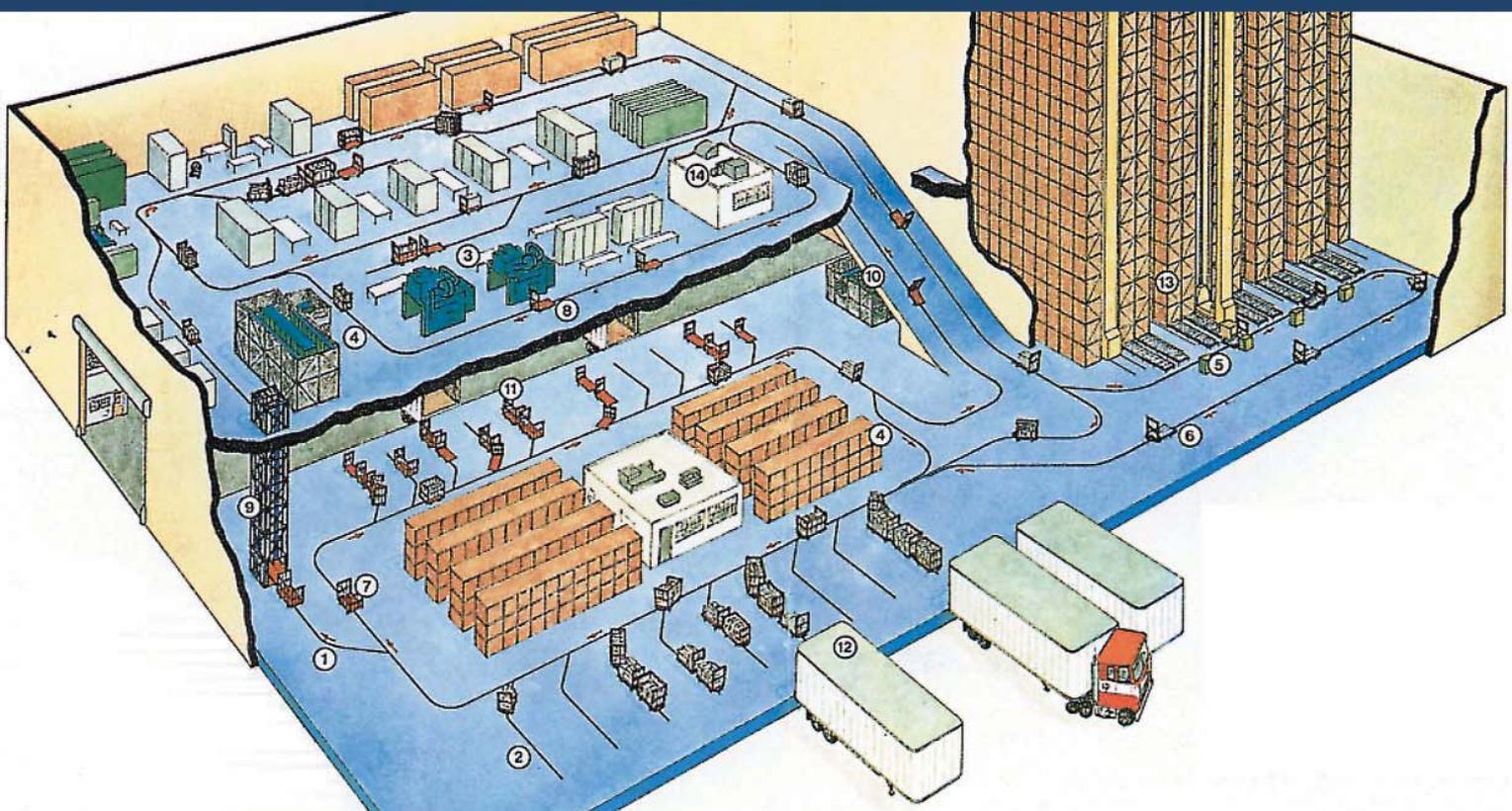
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The TOW-LINE transport system can be used in any **Distribution Center, Manufacturing Plant, or Transport Terminal**, regardless of the size of the building, although it is clearly justifiable in Centers larger than 6,000 m², and is undeniably applicable in Centers with a high level of merchandise movement, and can transport any type of merchandise, from light products to very heavy ones, with a unit load capacity of up to 4000 kg.

When studying the implementation of the system, different data must be taken into consideration, such as the unit and volume to be transported (pallet, box, basket, etc.), the weight, average and maximum daily flows, the distance and route of the merchandise, points for the loading, unloading, or handling of merchandise, etc. To analyze the profitability of the investment, its amortization period must be compared with that of other systems (rail-guided trolleys, forklifts, etc.).

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|--|---|
| 1. - Motorized outlet | 8. - Merchandise trolley |
| 2. - Non-motorized outlet | 9. - Elevator |
| 3. - Parallel outlet | 10. - Ramp |
| 4. - Transfer | 11. - Receiving dock |
| 5. - Unloader | 12. - Expediting dock |
| 6. - Merchandise trolleys/pallet loaders | 13. - Automatic storage and pickup system |
| 7. - Cage trolley | 14. - Computer room |



Main advantages of the Tow-Line in-floor chain conveyor:

- Low installation cost.
- Highly flexible.
- Prevents damage to merchandise.
- Optimization of the available space.
- Does not interfere with the movement of people or machinery.
- Low maintenance cost.
- Increase in productivity and optimization of human resources.
- Rapid return on the investment.

