TTS cassette systems are designed both for safety and with a committed responsibility to the environment in and around container terminals. These two considerations combine to govern the improvement of capacity and system reliability, generally improving the cost-efficiency of container port logistics.
The TTS cassette system provides an efficient means of transporting containers in order to simplify every operational process in a container terminal. The system fulfills many important prerequisites among which are safety, flexibility and confidence in the equipment.

A cassette is a steel platform that safely supports cargo, such as containers, while being quickly transported. Containers can be stacked and transported on a single cassette in a variety of configurations, for instance 2 x 40'; 1 x 40'; 1 x 45'; or even 2 x 20'. In the case of double-stacking the upper tier is secured by cell-guides which are built as part of the cassette structure.

**Transportation options**

Since a cassette is not self-propelled it needs to be connected to a vehicle, either manned or unmanned, in order to be transported. The integration of cassettes into the terminal system increases the productivity of transport vehicles since they can pick-up, transport and drop-off the cassette without waiting for a container to be loaded or unloaded. When the vehicle drops off a cassette, it can immediately move to the next one for a pick-up. The same is true for quay cranes – their productivity is increased because the transfer of container between vessel and quay uses the cassette as a ‘buffer’, which minimises the waiting time for vehicles such as translifters and C-AGVs to become available.

TTS offers several vehicle options for transporting cassettes, which are all fully adapted to the cassette system.

**Translifter**
The TTS LT translifter is designed to be coupled to any universal towing tractor. These manually operated vehicles lift and transport cassettes, together with which they create a flexible, reliable system for container terminals. The deployment of TTS translifters is able to reduce the total number of required vehicles by approximately 50% compared to conventional tractor/trailer solutions. The translifters are of robust construction, designed for long service in container operations. Construction is the result of computer aided design and rigorous strength calculation. The translifter’s driver-friendly manoeuvrability in confined spaces increases overall container loading efficiency.
C-AGV
TTS has also developed a range of automated cassette-carrying vehicles for container terminals, including the groundbreaking C-AGV. The C-AGV has been designed not only to improve container handling safety by virtue of its advanced automation features but also to improve environmental impact by reducing the number of vehicles required to transport a given number of containers. Also, the new ‘tribrid’ engine technology allows diesel consumption to be reduced by up to 40%.
With a load capacity of 61 tonnes, the C-AGV is able to carry cassettes with either double-stacked 40’ containers or two 20’ containers in a single tier.
Major innovations in manoeuvrability have been made by incorporating individual, electrically-driven and steered bogie axles which enable the C-AGV to be moved in any direction and to turn through 360 degrees. This increases versatility and flexibility while minimising congestion at the quayside.
The C-AGV can be steered conventionally or ‘crab’ diagonally, or it can move completely transversally. New cassette designs enable the C-AGV to enter and exit both transversally and longitudinally, enhancing the system’s cargo handling efficiency.

With their unique sideways manoeuvrability, the latest TTS AGVs are designed to enter the cassette from either end or side. As such, the distance between the stacking cranes and the quay wall can be reduced dramatically – by approximately 40m compared to traditional LoLo AGV requirements. This gives the terminal operator a significant increase in valuable space for stacking containers.

The excellent manoeuvrability of the AGVs also allows the possibility to increase the number of transfer points* under the stacking cranes and STS cranes (even if the STS cranes are placed shoulder to shoulder). This means that both crane- and traffic-management systems are given a buffer of cassettes to work with, offering greater flexibility in planning and therefore productivity.

Also it has been proven that, by handling 50% of all 40’ containers in double stacked arrangement, the number of AGVs could be reduced by approximately 30%.

* Transfer points are positions where cassettes are placed under the cranes to load or unload containers.