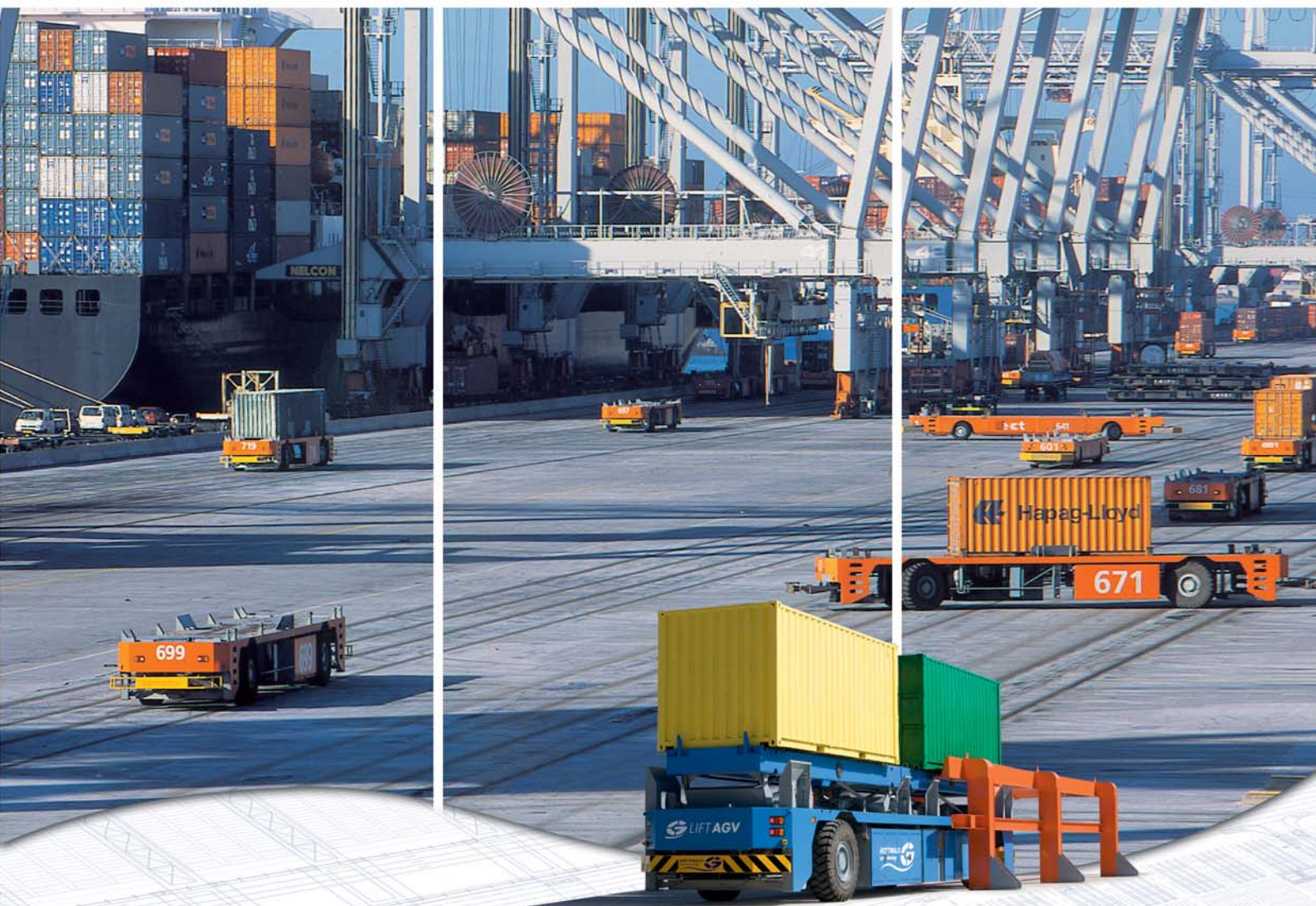


AGV / Lift AGV



Automated Container Transport
Proven Technology from Gottwald

AGV Automated Guided Vehicles

Leading-Edge Technology for Performance-Aware Container Terminals



Automated solutions for increasing container traffic: after unloading, containers are ...

... either transferred by conventional AGV Automated Guided Vehicles ...

... or using Gottwald's latest development, the Lift AGV, from the quay to the stackyard ...

Rapid growth in container traffic and the associated threat of cargo-handling gridlock are driving the development of automated solutions for terminal logistics. Their key benefits are these:

- improved productivity
- reduced wage and operating costs
- increased safety
- predictable, continuous operation almost completely independent of the weather
- maximum use of space
- resource-saving operation.

Gottwald – The Pacesetter in the Automation of Terminal Logistics

Gottwald is the pioneer and pacesetter in the automation of terminal logistics. As well as providing ASC Automated Stacking Cranes

allowing automated container stackyard management, the company is also leading the way in automated horizontal container transport with its AGV Automated Guided Vehicles.

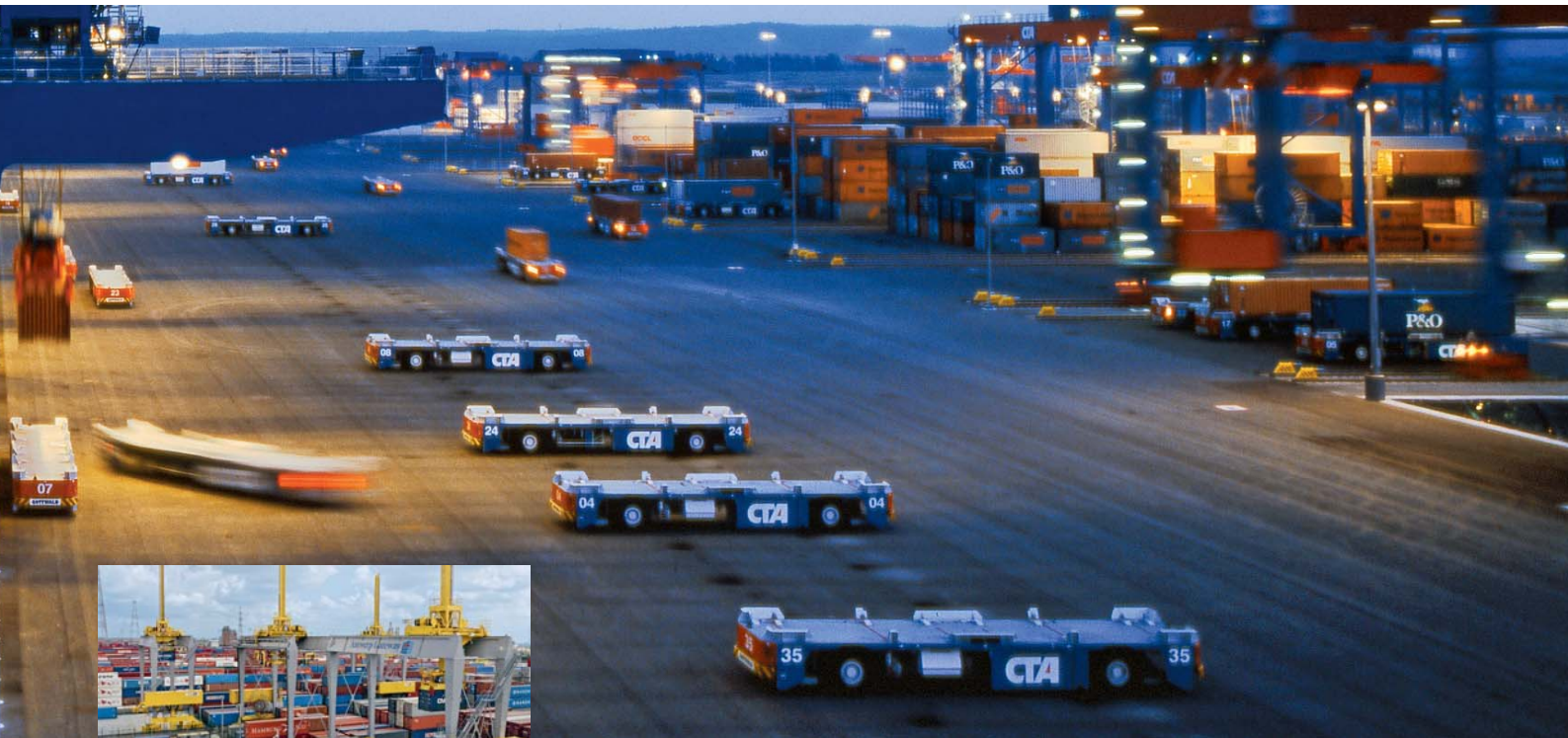
The full range includes innovative simulation and emulation technologies used to present an early, realistic idea of a future terminal structure and its performance to help terminal operators make sound investment decisions.

AGV – Leading-Edge Proven Technology

Gottwald AGVs are unmanned, software-guided container transporters forming an efficient link between the quay crane and the stackyard.

Since pioneering the technology 20 years ago, Gottwald has continuously developed its AGVs and consistently focussed on using electrical energy for its drives, a simple construction and low dead-weight while ensuring maximum loading capacity. All this adds up to low fuel consumption, excellent economy and ecologically compatible deployment.

Gottwald AGV fleets have been used reliably day in, day out for many years by well-known terminal operators. Many of the more than 460 AGVs already supplied have been in use for over 15 years and have logged as many as 70,000 operating hours to date.



... where they are stacked by Gottwald ASC Automated Stacking Cranes and then loaded onto rail and road vehicles.

Lift AGV – New Heights in Container Handling

A further boost to productivity in automated container transport is provided by the latest development, the active Lift AGV.

Based on the existing AGV technology which has proved its worth over many years, the Lift AGV features a pair of lifting platforms to enable the vehicle to deposit and pick up containers independently on / from racks:

- to decouple the transport and storage processes
- to provide a further increase in working frequency and productivity
- to enable the size of vehicle fleets to be considerably reduced.

The new Gottwald Lift AGV is particularly suitable in these cases:

- new terminal projects
- conversion of existing AGV terminals
- where conventional terminals are to be converted, depending on the size of the apron.

For Container Terminals and Industrial Applications

In container terminals, AGVs and Lift AGVs work hand-in-hand with quay cranes and stacking cranes within the corresponding interchange zones. Together with Gottwald's ASC Automated Stacking Cranes, they create fully-automated, integrated solutions handling containers from quay to stackyard to gate.

Apart from use in container terminals, AGVs and Lift AGVs are also ideally suitable for industrial applications, such as on-site transfer of steel.

AGV technology is easily adaptable to use in industry, as shown here transporting steel coils at a cold-rolling mill in Korea, payload up to 40 tonnes



Automated Transport

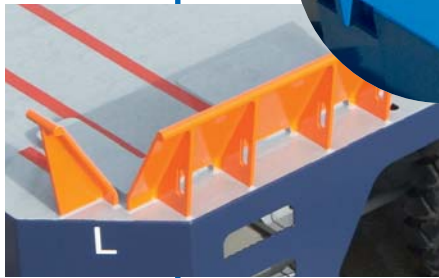
Proven Solutions for Containers and Heavy Loads

Gottwald's AGVs and Lift AGVs set standards for automated horizontal transport of containers and heavy loads in terminals and industry. The reliability of the overall concept is based on the successful application of AGV technology to hundreds of vehicles already in use in ports and the fleet management and navigation software developed in-house. To date, no other manufacturer has installed a comparable AGV system in such locations.



AGV

Positive location: latches on the lifting platforms ensure the containers are held securely in place



Simple: wind and long rope fields on the quay crane are less of a problem to quay crane operators as the guides and positioning markers help to place the containers quickly, safely and accurately onto the vehicle

Ecologically compatible: soundproofed diesel-electric drives with speed-regulated diesel engines minimise fuel consumption and exhaust emissions. A zero-emission battery-driven version is under development.



LIFTAGV



Flexible: the two lifting platforms on the Lift AGV can be raised and lowered separately or together, for transporting one 20', one 40' or 2 x 20' containers





Proven but forward-looking: Launched in 1988, series production in 1992, 460 machines supplied to date. Effective working load 60 t, suitable for 20', 40' and 2 x 20' containers.

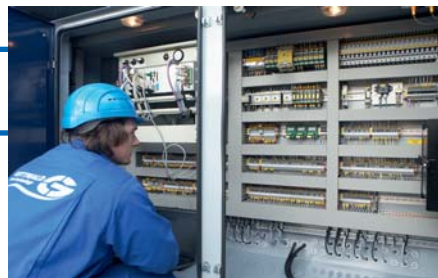


Management System

The travel orders for the AGV fleet are specified by the terminal management system. The AGV management system (AGV-MS), which is integrated in a central control room, processes the travel orders. It also ensures by means of the traffic control system that the vehicles comply with the specified times and positions.



Logical: the electrical components are housed in a switch cabinet to protect them against weathering. Resistant to temperature fluctuations and jolting, they will withstand the toughest demands, such as loading the vehicle with full containers.



Light but tough: lightest active automated container transporter in the market with a 60-tonne loading capacity. Extremely low fleet fuel consumption and minimum loading on the terminal travel surface.



Accurate: sensors on the Lift AGVs enable them to enter the passive rack with the utmost precision while avoiding collisions





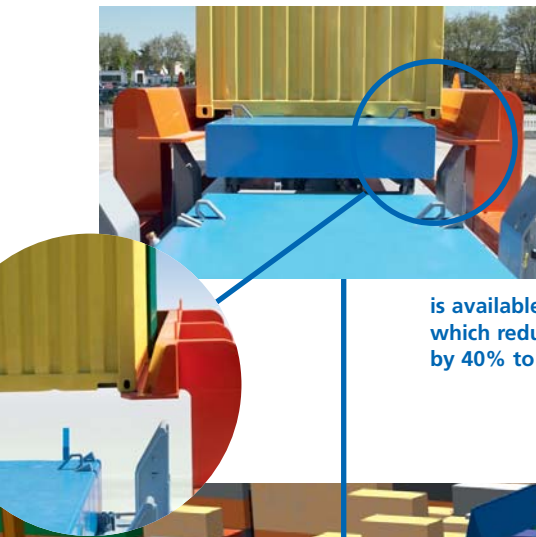
Landside

Reliable: Gottwald's proprietary navigation system together with transponders in the apron surface result in a positioning accuracy of +/- 25 mm



NAVIMATIC

Active: as soon as a Lift AGV has deposited its load on the racks, it is available for the next job, which reduces the fleet size by 40% to 50%

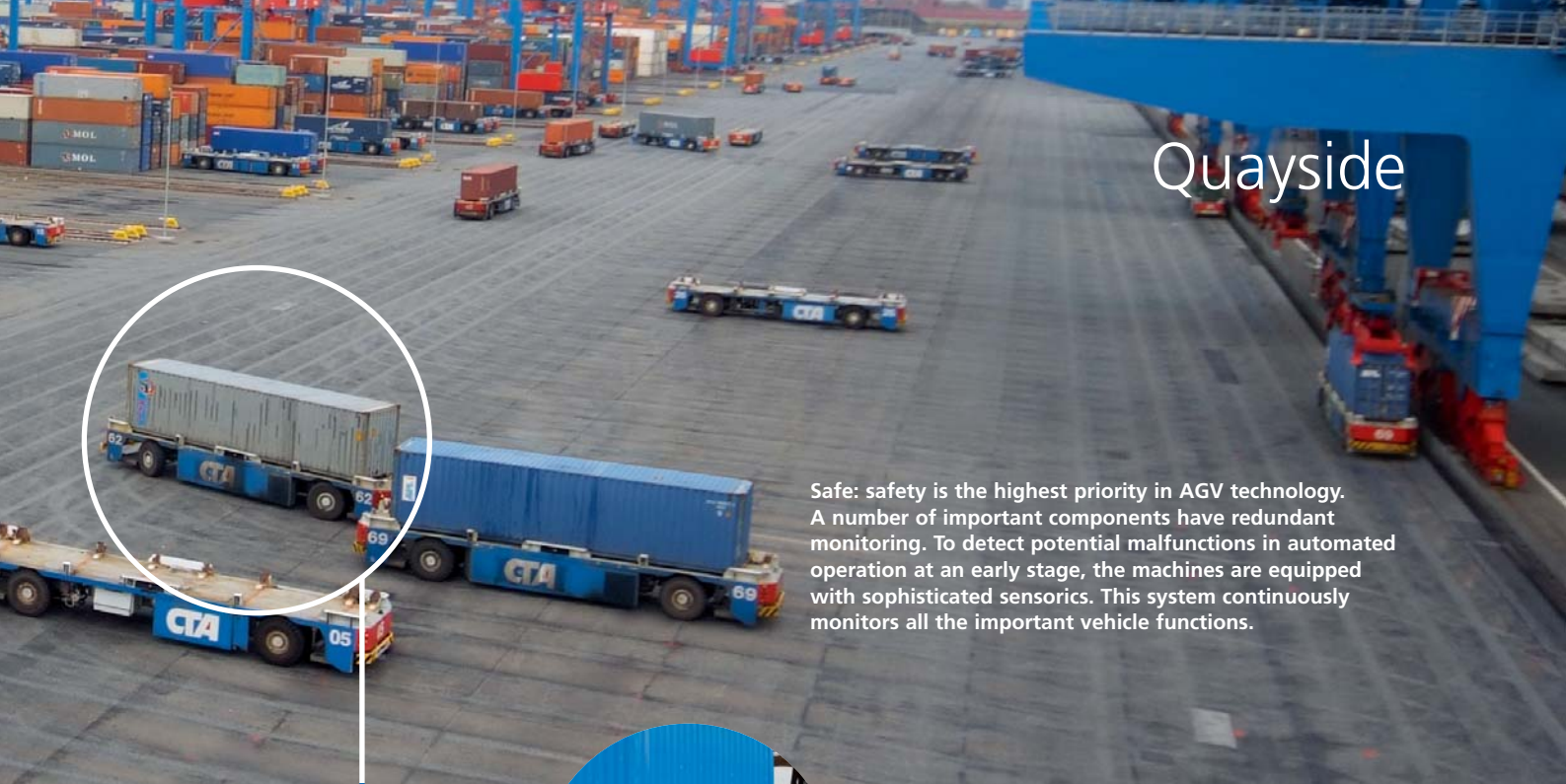


Landside

Decoupled: results in significant increase in productivity in the stacking crane interchange zone

Low-maintenance and economical: uncomplicated Lift AGV construction for collecting and depositing containers – technology that avoids the need for service-hungry spreaders

Quayside

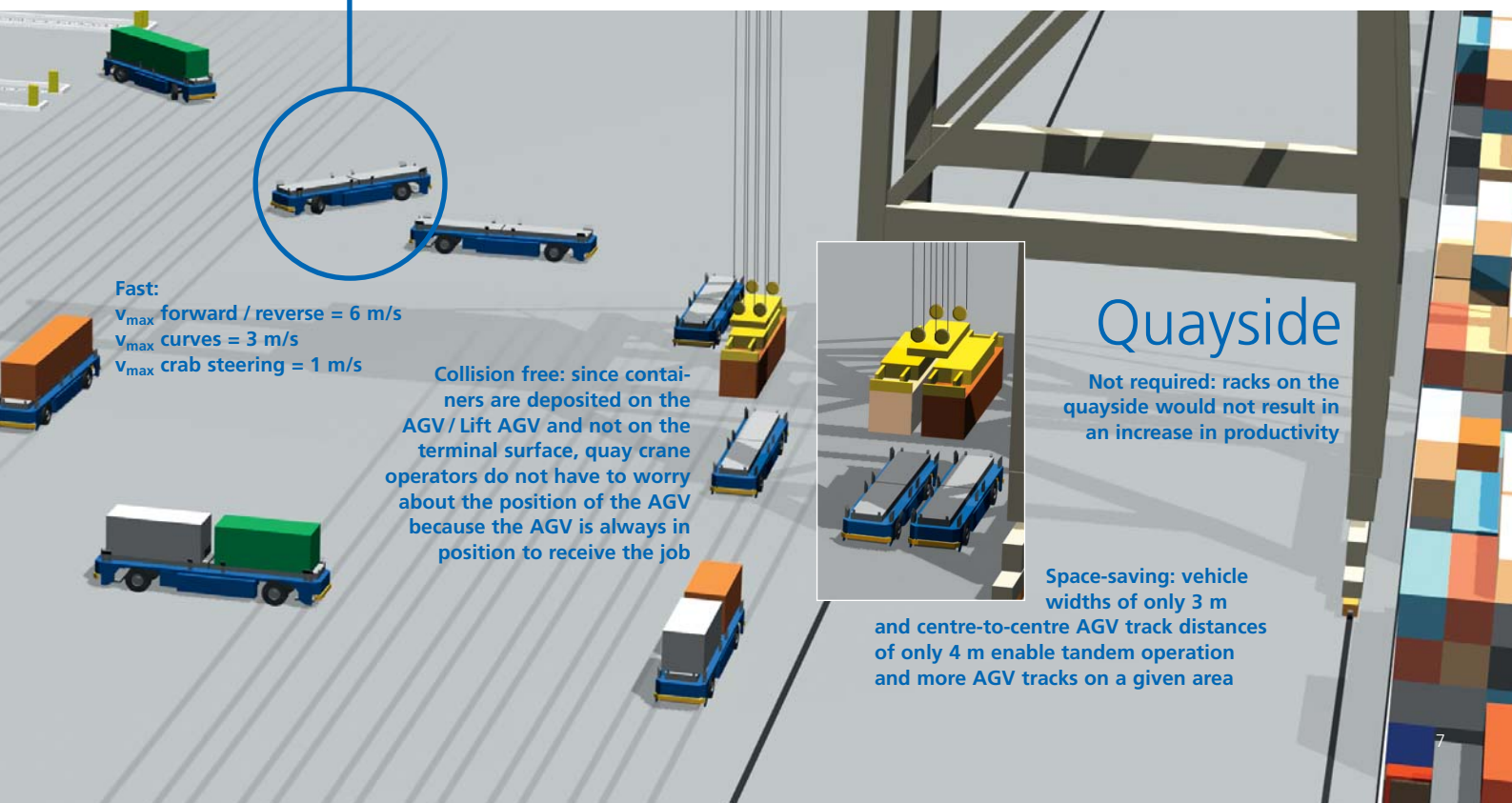


Safe: safety is the highest priority in AGV technology. A number of important components have redundant monitoring. To detect potential malfunctions in automated operation at an early stage, the machines are equipped with sophisticated sensorics. This system continuously monitors all the important vehicle functions.



Manoeuvrable: the drive technology and individual axle steering on both axles ensure maximum manoeuvrability. Travel routes can be freely programmed. All the drives are directly controlled to enable even the finest position changes.

Reduced: use of Lift AGVs together with double-trolley quay cranes and a buffer zone halves the vehicle fleet size. Even if the quay crane is a single-trolley type, the vehicle fleet size can be reduced by 40%.

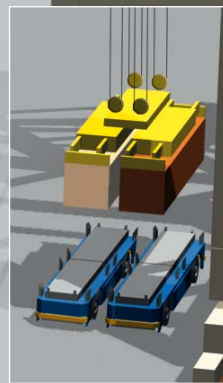


Fast:
 V_{max} forward / reverse = 6 m/s
 V_{max} curves = 3 m/s
 V_{max} crab steering = 1 m/s

Collision free: since containers are deposited on the AGV / Lift AGV and not on the terminal surface, quay crane operators do not have to worry about the position of the AGV because the AGV is always in position to receive the job

Quayside

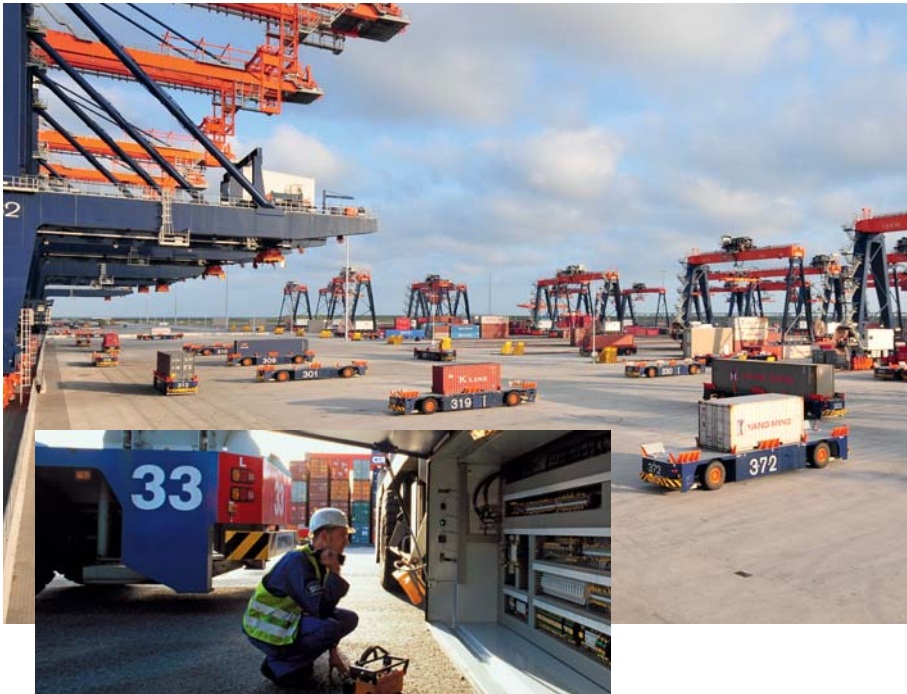
Not required: racks on the quayside would not result in an increase in productivity



Space-saving: vehicle widths of only 3 m and centre-to-centre AGV track distances of only 4 m enable tandem operation and more AGV tracks on a given area

Services for Automated Cargo-Handling Equipment

Gottwald Keeps Machine Fleets in Motion



Technical data for the AGV & Lift AGV

Positioning accuracy	+/- 25 mm
Fuel tank capacity	1,400 l
Fuel consumption	approx. 8 l/h (approx. 10 l/h*)

Container Types

1 x 20', 1 x 40' and 1 x 45' container
2 x 20' containers
1 x 30' container as an option

Load Weights

Max. weight of a single container	40 t
Max. weight of 2 x 20' containers	60 t

Dimensions

Length (depending on bumper)	approx. 14.8 m
Width	approx. 3.0 m
Loading area height	approx. 1.7 m (2.2 m*)
Dead weight	approx. 25 t (34 t*)
Tyre size	18.00 R 25

Speeds

Max. speed forward / reverse	6 m/s
Max. speed in curves	3 m/s
Max. crab steering speed	1 m/s

Fuel consumption depends on site and operating conditions

* Different data for the Lift AGV

Automated Gottwald cargo-handling machines such as the AGV and Lift AGV work as software-controlled systems and are operated as fleets in sophisticated integrated installations. If machines fail, quayside operations can be impaired.

Fleet Management Service

Gottwald has set up a special service organisation to ensure that your automated equipment fleet is properly supported. The expertise of these

service engineers enables them to deal with the special requirements of automated terminals.

As the pacesetter in the field of automated port technology, Gottwald develops detailed action plans tailored to meet the exact needs of each terminal to facilitate monitoring and support of fleet management activities. Our aim is always to provide the agreed levels of availability and reliability.

Services include:

- coordination and performance of preventative maintenance, repair and overhaul work
- immediate performance of unscheduled corrective repairs
- supply of spare and wear & tear parts
- hotline support customised to the needs of automated products

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